

A Nation Of Spectators-We Must Act!

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Background

As I observe the masses of students that are in and out of school on a daily basis, I have noticed that there is a significant problem with weight among our younger generation. My immediate instinct was blame it on junk food, convenient stores, and the overall lack of knowing how to eat properly. The more I investigated, the more the root of the problem became exposed. Our environment is currently undergoing change, by way of Global Warming. Since the climate is changing, the normal process that takes place for food growth has been altered. Foods are being massed produced for the mere fact of economics and production. The overall lack of the nutrition has simply been overlooked. Being a science teacher, I have always heard the coined phrase, Global Warming but never took time to fully understand its true impact on the environment and especially the fuel that is needed to maintain life, food.

As a mother of three, during a simple night of leisure I was viewing HBO and luckily, a documentary was about to play. The name was *The Weight of Our Nation*.¹ The information that was presented clearly gave me an edge on what and how I wanted to center my curriculum unit. I want to bring awareness to the necessity of making more conscious decisions on how we fuel our bodies.

This unit is designed with 9th grade Earth and Environmental students in mind, but could be useful with a wide range of students. I teach at a Middle/High school in the State of North Carolina where we are currently converting to the new Common Core Standards and the Essential Standards. In my instruction, I follow the local pacing guide that was supplied by my district. The curriculum is based on the North Carolina Essential Standards for Earth and Environmental Science.

Most of my students receive both free and reduced lunches which categorizes and qualifies my school as Title One. The vast majority of my students look like me, African American. However, there is also a significantly large population of Hispanic visible at my school. My students could be first generation college graduates if successful while in their High School career. Even with my continued guidance and referencing to college and its potential impact on their adult lives, most will probably not attend because of what they see and know outside of school such as making fast money, buying cars with rims and making a dollar out of 15 cents. My goal is to serve as a role model for them even though my growing up experience is nowhere near the experiences that they encounter in their daily life. I had two parents that were both college graduates. Even as my experiences have been somewhat different, I can relate to my students culturally. I understand their language, yet I stress that there is an appropriate time and place for everything.

Although I will remain optimistic about college, I do wonder why we force a college track for those that may want a technical track. If the power were left up to me, I would teach them an alternative method of survival. With the economic downfall, we need to learn how to live off of the land as we once did.

As I watch them come into school daily, I notice the mass of junk food they purchased on the way to school by means of an EBT card. This is the ATM look alike card that is provided by our government to make food purchases. I think my unit will serve as an eye-opening experience for someone who has never thought about food and the problematic events related to it by way of climate change. If styles of clothes change yearly, most children tend to badger parents into purchasing new clothes to look similar to their friends. Hopefully, this unit will have a similar effect by encouraging and challenging them to be different and make better food choices and others will follow.

Introduction

The primary objective for this curriculum unit is for students to understand the connectivity of the sciences and how we are both directly and indirectly affected by the changes in the environment. I want students to learn how the harmful activities that we participate in daily drastically impact our environment and ultimately all of us, including our food supply. As a result, when our power supply (food source) is hurt or damaged, so

are our bodies. We become ill and develop diseases as direct impact. With some basic understanding of climate change, the global warming process and food origin I will hopefully engage my students and make them more conscience to the major obstacle that all life forms will ultimately encounter on Earth. Students will explore these issues, and learn to make subtle changes in their life time in hopes to bring our mother Earth back to its equilibrium.

According to Dictionary .com, climate change is defined as a long-term change in the earth's climate, especially a change due to an increase in the average atmospheric temperature.² The major cause of climate change can be contributed to the enhanced greenhouse effect. The greenhouse effect term was probably coined from the fact that the earth's atmosphere has entrapped infrared heat that comes from greenhouse gases. These gases primary duty is to block heat from escaping.

One of the most abundant greenhouse gases is water vapor. It acts as a feedback to the environment because the more it increases, the more the earth warms, thus creating both clouds and precipitation. Carbon dioxide is the next most important contributor to the greenhouse gases. After reviewing the following website: <http://climate.nasa.gov>, I found that Carbon dioxide is a minor but very important component of the atmosphere, carbon dioxide is released through natural processes such as respiration and volcanic eruptions and through human activities such as deforestation, land use changes, and burning fossil fuels.³ Humans have increased atmospheric CO₂ concentration by a third since the Industrial Revolution began. This is the most important long-lived "forcing" of climate change. Methane is not as abundant in the atmosphere, yet it is far more active. Methane is a hydrocarbon gas that is produced by decomposition, human activities and natural sources. Students get excited when I relate this to gas that comes naturally out of our bodies. CFC's is another type of greenhouse gas. It may be the one that most of my students are most familiar. It is the main contributor to the destruction of our ozone layer which protects us from harmful ultra violet light. Last but not least is nitrous oxide, which is produced during burning biomass, the use of organic and commercial fertilizers and soil cultivation practices. This unit will build a baseline understanding about the implications of direct human activity on the earth.

Why is global warming important and why aren't people concerned? According to *The Psychology of Climate Change Communication* "research shows that Americans do not feel a personal connection to climate change. They are aware of it; they may even rank it as a concern, but according to 2008 Pew Research Center for People and the press, they

do not perceive it as a near-term priority on par with economic downturn.⁴ Efforts to prepare for climate change must come in the form of education. It can get better if we bring about significant awareness. As the Earth warms Agriculture, Water Resources and Biodiversity are affected playing a tremendous role in the quality and sources of our food.⁵

Agriculture

Agriculture very much depends on the climate. If there is too much or too little precipitation, crops fail and have zero yield. According to the EPA, Agriculture is a diverse system that covers a wide range of species and production systems.⁶ Since agriculture concentration is so vast, only systems species and productions that are available in the US were evaluated. As I studied the charts and graphs, I noticed that since 1982 the amount of grazed forest land and pastureland has decreased by millions of acres. Pasture land is land that is used primarily for livestock to live and graze. In the last 25 years the amount of this land that exists has done a downward spiral due to population increase in the Eastern US. The land use was once composed of only forage plants for livestock grazing that had to constantly undergo fertilization treatment to keep it optimal conditions. Now it, the land has been overtaken by other inhabitants, people.

Livestock may be at risk, both directly from heat stress due to climate change and indirectly from reduced quality of their food supply according to the EPA.⁷ Heatwaves threaten livestock directly. A number of states have reported that more than 5000 have been lost as a result of one heatwave.⁸

Lack of Water

Drought is another condition that threatens our livestock food supply as our climate continues to change. Areas are now experiencing reduced available forage due to increases in temperatures and a reduction in the amount of precipitation. With the lack of precipitation, and the early onset of seasons the amount of parasite numbers has increased because of optimal conditions to thrive. As a result our live stock population is diminished.

Water is a resource that no life can live without. Our bodies consist of over 60% water. With evidence showing climate change has an impact on water resources, it is advisable to understand how and what might be affected. Water also makes up most of our planet Earth. Nearly 70% of our planet blue is consisting of water. Of that 70%, 97% is in the form of salt water with the other 3 % being fresh. The percentage of fresh water seems low, it has the most dramatic impact on our ecosystems leaving due to climate change. Although most of the fresh water on Earth is in the frozen state, we all know that when temperatures increase, the frozen stuff thaws. As a result fresh water levels are increasing due to runoff. The ocean levels are increasing and becoming more acidic changing the type of ecosystems that once thrived.

Some of the observed climate change impacts come in the form of melting mountain glaciers and ice caps. According to *Linking Climate Change and Water Resources: impacts and responses 2007*, “glacier retreat causes striking changes in landscape which will affect living conditions for all life forms around the world.”⁹ The report also states “as a result, freshwater ecosystems have shown a change in species composition, organism abundance, productivity and migration.”¹⁰ Due to these changes, our lakes and rivers have a decrease in nutrient levels and oxygen levels to provide a conducive environment for fish to thrive. In regions where fresh water is vulnerable to climate change, sustainable development is also put at risk.

GMO's Genetically Modified Organisms

Species extinction is a direct result of human behavior and climate change. As atmospheric temperatures increase our animal population decreases, thus creating an altered food chain. Due to food sources not being plentiful, major food producers are resulting to altering food resources genetically.

So what is a GMO you may ask? According to the Proquest Website, a GMO or genetically-modified organism is most commonly used to refer to crop plants created for human or animal consumption using the latest molecular biology techniques. These plants have been modified in the laboratory to enhance desired traits such as increased resistance to herbicides or improved nutritional content.¹¹ What this essentially means is that the DNA of the organism has been altered to suit the needs for supply and demand. I contribute this theory to our changing climate which has lowered the quantity of food

supply for livestock and humans. There is currently serious debate ongoing in regards to the ethics of this process. Opponents suggest that there are three areas of concern with GM foods, environmental hazards, health risk, and economic concerns.

A couple of years ago, Americans went through an anti-bacteria phase and scientists proved that we were not only killing bacteria, but producing more deadly strands of bacteria. The same theory applies in the case of GM foods. Scientist are worried just as some populations of mosquitoes once developed resistance to the now-banned pesticide DDT, many people are concerned that insects will become resistant to other crops that have been genetically-modified to produce their own pesticides.¹²

Another concern is that crop plants engineered for herbicide tolerance and weeds will cross-breed, resulting in the transfer of the herbicide resistance genes from the crops into the weeds. These "super weeds" would then be herbicide tolerant as well. Other introduced genes may cross over into non-modified crops planted next to GM crops.¹³

As far as human health is concerned, the uncertainty of harmful affects it being weighed. With the altering of genes, who knows the potential harm until questionable diseases start revealing themselves in humans in the years to come. Also many children in the US have developed life-threatening allergies to peanuts and other foods. There is a possibility that introducing a gene into a plant may create a new allergen or cause an allergic reaction in susceptible individuals.¹⁴

The growing concerns regarding GM foods have resulted in major difficulties for Monsanto, the major developer of genetically modified foods, and for growers whose crops are losing markets abroad. In an article released by the *Organic Consumers Association* in November 2002, "it is reported that Monsanto has warned that profits from its agrochemical business would be lower than forecast, has pulled back from its plan to bring the first genetically modified wheat to market by 2005 because millers in Europe and Japan have said they don't want the product, and that there is already a rapid spread of weeds resistant to *Roundup*TM herbicide."¹⁵ In an article reprinted from the *New Zealand Herald* it is claimed that "in 1996, before GM crops were introduced, US corn farmers made a profit of US\$1.4 billion, and in 2001 they lost US\$12 billion. The US government picked up a third of this in farm subsidies. Four countries, the US, Canada, Argentina and China grow 98% of the GM crops, and all are backtracking. The gates to

Europe and Japan for North American GM commodities have all but closed. They not only do not want GM foods, they allow zero tolerance for contamination by GM foods. and lastly, the same article states, [t]here are no proven market models for either farmers or food companies to gain benefits from GM crops. To date, only herbicide companies have reaped profits.”¹⁶

Although most of the information presented here seems to be negative, there are some advocates for the GM process of making foods. For some farmers, just being able to monitor and spray for insects can be costly. Producing these types of products could virtually eliminate the cost because the crops can become resistant to pests. It is also very costly to remove weeds and GM foods are resistant to herbicides which could reduce dangers of agriculture waste runoff. The crops are also resistant to cold temperatures.

Content Objectives

EEn.2.6-Analyze Patterns of Global Climate Change over Time.

EEn.2.6.1 Differentiate between weather and climate.

EEn.2.6.2 Explain changes in global climate due to natural processes.

EEn.2.6.3 Analyze the impacts that human activities have on global climate change (such as burning hydrocarbons, greenhouse effect, and deforestation).

Strategies

Use of Technology

In this unit, I plan on linking Agriculture, Lack of Water, and Genetically Modified Foods to Climate Change. My school has recently become a one to one school, which makes technology available to each student. Students will have access to I pads throughout this unit.

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| <div data-bbox="272 361 748 489" style="border: 1px solid black; padding: 10px; width: fit-content; margin: auto;">Vocabulary Word</div> | <div data-bbox="862 361 1360 489" style="border: 1px solid black; padding: 10px; width: fit-content; margin: auto;">Definition</div> |
|--|--|

Vocabulary foldables are a joy to use. They are easy for placement in notebooks and they make science data become real. Dinah Zike's *Big Book of Science* has numerous foldables that will enhance student learning.¹⁸

Student Activities

Activity 1: Facing the Agriculture problem

As a warm up activity students will complete a K-W-L Chart about the word Agriculture. Students will list what they already (K) know about agriculture, (W) want to know and (L) want to learn.

Students will brainstorm facets that are essential to food production. Ideal answers should include soil, water, seed, pesticides, herbicides, sunlight, ideal climate, animals and many others. To get them thinking, list the ingredients of a hamburger on the board. Questions to pose:

1. Where did each ingredient come from?
2. Where did each of your ingredients in question 1 come from? (Most can be traced back to the soil including animal products).
3. Why is soil important to our food supply?

Break student up into groups and have them create a graphic organizer of the list that was just created. Teacher and students now have the opportunity to reflect back on the background information and make a connection between Climate Change and soil. Have

students create a hypothesis about soil and climate change. If climate change affects the soil, then.....because.....

Desired outcome is for students to realize that soil is the foundation of the farm ecosystem. Today with a constant warming, that drives human activities creates food scarcity.

Activity 2: Organic vs. Conventional

The purpose of this activity is for students to develop alternatives, and to find a earth friendly approach to eating. This lesson will involve not only students, it will also involve the whole family.

Materials: A variety of fruits and vegetables both organic and conventional with all tags/prices still intact, online access.

As a warm up set out vegetables and allow students to walk around and view. Ask students if they can identify any differences in the pairs of vegetables. Students may notice size variance, color, and packaging. Next ask students if they can tell how the vegetables are alike. Students may not come to a conclusion which will generate some discussion. Have students draw a T-Chart with Sustainable and Organic as one of its column headings. The other column heading should be Conventional. Under each heading the teacher will define each word. Organic-without chemical pesticides and sustainable-a way to use a resource, so that it is not depleted, Conventional-foods that have been chemically treated.¹⁹ The next step is for the teacher to share the cost of each pair of vegetables to generate discussion, then the students will list advantaged and disadvantages of each type of product. Students will probably notice that the organic foods are more expensive. Have students research why organic and sustainable foods cost more than conventional foods. This is an excellent opportunity to generate a debate discussion on cost vs. benefits. The benefits should include environmental stewardship and health concerns.²⁰

To extend this lesson, have students create a meal then take students on a field trip to your local grocery store to purchase the ingredients. Have one group shop for conventional and the other group shop for organic. Compare the cost for each meal. Have a class discussion and come to a conclusion. Most will probably favor organic/sustainable foods but will notice the significant price difference. Have students

share their findings with family members. Write local legislators requesting ways to help alleviate price on local organic food products and ways the community can get involve creating its own sustainable garden. Another extension of this lesson is to have the students find the product label and trace its origin. Find foods to see if they were locally grown in your area by using the following site:

<http://www.mpilabels.com/products/labels/food-traceability>.²¹

If time permits, teacher can have students research current issues affecting the United States in regards to Genetically Modified Food. In the state of California there is a current debate on GMO's and whether or not the public should be aware of food contents in the form of labeling. Students can formulate peer focus groups to survey peers to find out how they feel about the issue at hand.

Activity 3: Water Crisis

Drought is a condition that threatens our livestock food supply as our climate continues to change. Areas are now experiencing reduced forage that is available due to increase in temperatures and a reduction in the amount of precipitation. With the lack of precipitation, and the early onset of seasons allows the amount of parasite numbers to increase because of optimal conditions to thrive, and as a result our live stock population is deminished.

Drought is a global issue, many people around the world do not have access to clean drinking water. Our children in the United States may not be aware of this global issue. In effort to combat the lack of knowledge, it would be a great idea to incorporate this problem into the activities surrounding lack of water for agriculture due to climate change. Teacher and students can go to the following website: nanosense.org/activities/finefilters/watercrisis/FF_Lesson1Student.pdf to view pictures of maps that show water scarcity in 2006 and its projection for 2025.²²

Students will create a Venn Diagram that compares and contrast these two maps. Students should be able to see which countries are going through physical water scarcity. They will also predict what type of climate these counties are experiencing. Students will also learn from visiting this site that Agriculture is the sector that uses the most water around the world.

Students will watch the following video on from the Discovery Education website:
Planet Earth: The Future: Into the Wilderness. The URL is:

<http://app.discoveryeducation.com/>²³

In this video students will view how climate change forces human activities that are harmful for ecosystems. The program observes how logging, pollution, and overpopulation disrupt many habitats and ultimately harm human societies.²⁴

Students will make a vocabulary foldable for the following words:

Conservation, Ecosystem, Global Warming, and Naural Resources.

Students will then keep a daily log of water usage for one week . Students will estimate how much each of their logged activities requires. After one week, students will research actual usage amounts. As a classthey will have a discussion and develop mechanisms to use in effort to limit water usage. Students will then create a brochure on water conservation in which they will include a conservation action plan for their community.

Notes

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- ¹ *The Weight of the Nation*. Directed by HBO. 2012.
- ² Douglas Harper, Historian. *Dictionary.com. Online Etymology Dictionary*.
- ³ *Nasa*. <http://climate.nasa.gov> (accessed september 15, 2012).
- ⁴ Shome, Debika, and Sabine Max. *The Psychology of Climate Change*. New York, 2009.
- ⁵ *The Weight of the Nation*, 2012.
- ⁶ Peter Backlund, Anthony Janetos, and David Schimel. "The Effects of Climate Change on Agriculture, Land Resources, Water Resources and Biodiversity." Report by the U.S. Climate Change Science Program, Washinton DC, 2008.
- ⁷ *Agriculture and Food Supply Impacts & Adaptation*. <http://www.epa.gov/climatechange/impacts/adaptation/agriculture.html#impactslivestock> (accessed September 22, 2012).
- ⁸ Ibid.
- ⁹ *Linking Climate Change and Water Resources: impacts and responses*. IPCC, 2007.
- ¹⁰ Ibid.
- ¹¹ Whitman, Deborah B. "Proquest." *Discovery guides*. 2012. http://www.csa.com/discoveryguides/gmfood/abstracts_s.php (accessed October 20, 2012).
- ¹² Ibid.
- ¹³ Ibid.
- ¹⁴ Ibid.
- ¹⁵ *European Food Information Council*. February 2012. <http://www.eufic.org/page/en/page/FAQ/faqid/difference-organic-conventional-food/> (accessed October 31, 2012).
- ¹⁶ Hanten, Helen B. "Environmental Stewardship Commission." December 2002. <http://www.envsteward.com/events/res1-gen.htm> (accessed October 20, 2012).
- ¹⁷ *Freeology*. <http://freeology.com/cornell-notes-template> (accessed October 20, 2012)
- ¹⁸ Zike, Dinah. *Big Book of Science*. San Antonio, TX: Dinah-Might Adventures, LP, 2001.
- ¹⁹ *European Food Information Council*. February 2012. <http://www.eufic.org/page/en/page/FAQ/faqid/difference-organic-conventional-food/> (accessed October 31, 2012).
- ²⁰ Alvarez, Lydia. *Learning to Give*. <http://learningtogive.org/lessons/> (accessed October 27, 2012).
- ²¹ *MPI Label System*. 2012. <http://www.mpilabels.com/products/labels/food-traceability> (accessed October 31, 2012).
- ²² *Nanosense*. <http://nanosense.org> (accessed October 27, 2012).
- ²³ *Planet Earth: The Future: Into the Wilderness*. 2007.
- ²⁴ Ibid.

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Reading List for Students

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