

## Searching For Answers to Global Warming

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### **Rationale**

One of my earliest memories from school is bomb drills. Every year we practiced getting under our desks and putting our arms over our heads much as children do today for tornado drills. I remember living with the fear that some Russian soldier could, at any moment, decide to extinguish the lives of myself and all the people I knew and loved by pushing a single red button. I remember the ridiculous act of hiding under a desk knowing it offered me no protection, and the resulting realization that “nothing” was the best the adults in my life could do to protect me. The media and teachers fed this fear by explaining the horrors of the nuclear age and recounting anecdotes of the “survivors” of Hiroshima and Nagasaki. Even Hollywood, with movies like *War Games*, reminded me that civilization was on a dangerous precipice, and that if we fell we would likely take every living thing on the planet with us.

Growing up in the Cold War led to my first views of science as a great evil in our world. Science allowed the bad guys to amass too much power. Science could be used to destroy the world because it was in the hands of the people in power, and they might be ignorant enough or evil enough to use it in highly irresponsible ways. Eventually the Cold War ended, but I do not remember a day when my fears were resolved. There was no moment when the threat of annihilation was removed and science became a positive or even benign force in my mind. Instead, as I advanced through my science courses, my understanding of science matured, as well as my views of science, and I saw the potential for science to improve people’s quality of life, cure disease, and bring dreams alive. I realized that science had the power to do as much good for the world as it did to destroy it. The evil was not the knowledge, but what people chose to do with that knowledge.

Today in science classes across the nation we breed fear into our children much the same as we have in generations past. Again we are on the brink of destroying not only ourselves, but every living thing on the planet from polar bears to tropical frogs. This time, however, the enemy is not some Russian sitting in a silo thousands of miles away; it is us. It is mom and dad, and even the children themselves. If mom drives us to soccer in an SUV, or dad moves us to a suburb with a long commute, then they are destroying our planet. If children want to eat red meat or drink milk they have to feel guilty for the increased methane from cattle and dairy farms. There are few decisions anyone can make that cannot somehow be connected to guilt over the impact it has, or may have, on our planet. According to the *National Geographic* article “Borneo’s Moment of Truth” even the simple act of eating a snack could lead to global warming and the destruction of one of the world’s most primitive and pristine rainforests. The people of Borneo have been

cutting down the rainforest to plant oil palm plantations to feed the world's growing demand for palm kernel oil. Nearly a third of the rainforest that was Borneo in 1985 has been lost. Along with it are 50% of the endangered orangutan population and all but 1000 pygmy elephants. Eat a bag of chips, destroy the world.

To make the issue even more complicated, doing the right thing can sometimes be the wrong thing. When my family purchased a van ten years ago, one of the key factors of our vehicle choice was the fact that it burned either gas or ethanol. We hoped to be able to use ethanol and thereby limit the amount of CO<sub>2</sub> our family was releasing into the air. But here we are ten years later and according to the *Time for Kids* article "Ruining the Rainforest" the production of ethanol, a corn based bio-fuel, is leading to more carbon remaining in the atmosphere due to deforestation of the Brazilian rainforest to grow corn than if we had purchased a gasoline-only engine. Of course, as with Borneo, this also means the destruction of habitat for many species of plants and animals. Also, since selling corn for bio-fuel production is more lucrative than for human consumption, bio-fuels are also causing rising food prices and increasing hunger in poverty-stricken areas. All this negative impact from trying to do the right thing can be very discouraging.

Obviously, there is no way to live in American society and not leave some negative impact on the environment. We have spent over a century building a society based on ever-increasing convenience and time-saving ways of living. To revert to living off of and in complete harmony with the land is simply not feasible. There are also those scientists, though dwindling in numbers, who believe that the idea that humans could effect a system as complicated as the world's climate is arrogant at least and ludicrous at best. Of course the very complexity of the system makes it impossible to prove whether humans do or do not have the influence to alter global weather patterns. So what do we do while we wait for scientists to figure out if global warming is our fault, or even being slightly influenced by us? Well, according to *Time's* book *Great Discoveries*, "the problem with the problem: if we wait to find out for sure what's causing global warming, it will probably be too late to do anything about it."<sup>1</sup> Their point, and mine, is that we need to refocus our attention from finding someone, or something, to blame for the possible cause as this is an impossible argument to win, and refocus instead on guiding our actions through science to the best possible future we can imagine. We must show children that all generations have had challenges to face which can, and have been, overcome with good, responsible use of science. Science in the hands of future generations isn't the evil; it is the answer.

## **Background**

The students I am preparing this unit for are fifth graders in a public suburban elementary school. Since I teach all subjects, this unit integrates literacy and art. There are 25 students in the room 13 male and 12 female. The population is middle class with no children receiving free or reduced lunch. Although the class is not very diverse in terms

of economic status they are quite culturally diverse. There is one Hispanic child, four children from India, two from China, one from Korea, one from Belgium, and one from England. Only the child from Korea has an ESL designation. Thirteen of the children have been identified by the Talent Development Department, and one child is identified for speech. Two students are reading below grade level, but are not identified as learning disabled. Because global warming is a topic that has strong political allegiances on both sides it is important to point out that my children come from families who are fairly evenly divided between being very conservative in their views and very liberal. Whenever I teach about the environment my class is always divided between those families who do not believe in global warming and those that strongly believe in it.

## **Memory**

In creating this unit I have developed lessons based on the concepts of memory in John Medina's book *Brain Rules*. His research shows that there are four major categories of memory: semantic, procedural, emotional, and episodic. The more categories of memory one lesson can trigger the more likely the memory will not only be stored, but the more easily it can be retrieved later. I have tried to create lessons that hit many if not all of these categories so students will have maximum retention with minimum effort. The goal is for them to remember this unit as adults as one of the more influential experiences of their elementary education and lead them to make more responsible decisions later in life.

The first lesson in this unit is on the Gulf Stream current. It can illustrate the concepts of the four categories of memory. The semantic category encompasses words, symbols, facts, and figures. It is the most used and if it is the only category stimulated then around 90% of the information is lost after 30 minutes. We will look at data in this lesson that compares average temperatures of Saskatoon and London. We will also compare latitudes of the two cities. If we only viewed this data we would expect only a 10% retention rate after about 30 minutes. Activities will be used from other memory categories to increase retention.

The second category is procedural. This is triggered when doing something interactive like using manipulatives, or employing other hands-on tactics. In the Gulf Stream lesson graphing the data rather than looking at a graph already complete will help to create a memory for students in this category. Most teachers are aware of how effective it is to use hands-on techniques when we want students to retain information. We generally see this strategy emphasized in mathematics, but it can be powerful in any subject area.

Emotional memories are among the strongest and most memorable. Everyone knows where they were and what they were doing when the space shuttle Challenger exploded or the World Trade Center was attacked. However, you do not need a tragedy to spark a memory in this center of the brain. Even raising a chuckle in students can help to make the lesson more memorable. It is worth the effort to work on your rapport with students

as it will be easier to create emotional experiences if you do. In the Gulf Stream lesson there is an element of surprise when the latitude of London is revealed and they realize their picture of the world and the location of Europe has been flawed. When you experience something that alters your perspective of the world it triggers an emotional response.

Finally, to create episodic memories the activity must connect to an event in their life, or be an event in and of itself. You can elicit an episodic event by tying information to something in their lives they have experienced, like going to the beach, or by creating an event that they can take part in. In the Gulf Stream lesson students will also compare London's climate to Charlotte's because this is the place they are from and have experience with. If your students are from another area it would be more appropriate to compare London with their location to create a more powerful episodic experience.

## **Lessons**

### Lesson 1: The Gulf Stream

#### *Strategy: Graphing and Analysis*

One of the first strategies I will employ in this unit is the graphing of collected data and its subsequent analysis. Graphing the data will help students better organize it in their minds than simply viewing a graph. It will also lead to a better analysis of the data than simply presenting them with a graph. Graphing the data themselves is a Constructivist strategy that helps students discover the learning the data is meant to represent rather than having to be told the lesson. This also employs the strategies that Medina suggests in *Brain Rules*. Graphing data makes the activity an event and therefore more memorable than simply viewing the data.

Because my main goal in this unit is to show students that through science they can help control what happens to their society in the future students need to understand that this is not the first time a society has had to endure the problems created by climate change. I will do this by using Europe's Little Ice Age as an example of a society's experience with a changing climate. However, before my students can understand the Little Ice Age and its effect on Europe's people they must understand the current climate of Europe. We will do this with a lesson focused on the Gulf Stream current and its effects on London's climate.

#### *Objective*

Understand the warming effect the Gulf Stream has on Europe's climate and mapping the Gulf Stream onto an outline map.

### *Teacher Background*

To open this lesson we will compare the average monthly temperatures in London, England and Saskatoon, Saskatchewan in Canada. Saskatoon was chosen because it lies at 51 degrees north latitude, which is the same latitude as London, England. It is important not to let students know this until it is revealed later in the lesson.

In fifth grade in North Carolina students must learn the concept that average temperatures of an area are affected by bodies of water. Students do experiments in heating and cooling water to show that water heats and cools more slowly than land and therefore acts to moderate the climate of land near bodies of water. This lesson takes place after these activities which act as background knowledge for understanding the effects of the Gulf Stream on London's climate. This lesson could also be done without this background knowledge if this lesson were to be used to teach the concept that bodies of water affect climate by keeping the areas around them from becoming too cold or too hot.

### *Materials*

You will need one globe for every 4-6 students. I borrow these from other teachers. You will also need a copy of the novel *20,000 Leagues Under the Sea* by Jules Verne.

### *Procedure*

To begin the lesson show students pictures of modern-day London in various seasons of the year and then show modern-day Saskatoon in various seasons as well. I obtained photos for my lesson by doing a Google image search of both cities. Along with the pictures I also gave these brief statements about the climate of each city.

- London is a city with a temperate, mild climate with above average rainfall and somewhat mild winters.
- Saskatoon is a city with a harsh climate with below average rainfall and short cool summers and long cold winters.

After this, show students a table of data that displays the average monthly low temperatures for both cities. I obtained the weather data from <http://weather.msn.com>. I have included a table with that data below.

### Average Low Temperatures in Fahrenheit.

|           | <b>J</b> | <b>F</b> | <b>M</b> | <b>A</b> | <b>M</b> | <b>J</b> | <b>J</b> | <b>A</b> | <b>S</b> | <b>O</b> | <b>N</b> | <b>D</b> |
|-----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| London    | 41       | 41       | 43       | 40       | 50       | 56       | 59       | 60       | 56       | 51       | 46       | 42       |
| Saskatoon | -6       | -0       | 14       | 29       | 40       | 49       | 53       | 50       | 40       | 27       | 12       | -1       |

Using this data have students create a double line graph. Students will see Saskatoon has a great arch in its data as it spans a greater range of temperatures while London's line is a much smaller arch indicating its temperatures do not vary as widely and stay much warmer than Saskatoon's.

Next display the data for Charlotte and London. I chose Charlotte because my students live here and understand what the climate of this area feels like. It is also remarkably similar to London's temperatures.

|           | <b>J</b> | <b>F</b> | <b>M</b> | <b>A</b> | <b>M</b> | <b>J</b> | <b>J</b> | <b>A</b> | <b>S</b> | <b>O</b> | <b>N</b> | <b>D</b> |
|-----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| London    | 41       | 41       | 43       | 40       | 50       | 56       | 59       | 60       | 56       | 51       | 46       | 42       |
| Charlotte | 31       | 34       | 41       | 49       | 58       | 66       | 70       | 68       | 62       | 50       | 41       | 34       |

Once again students create a double line graph of the data. What is truly amazing is that our winter average low temperatures are actually lower than London's! This is not generally surprising to students at this point in the lesson because they are unaware what London's latitude is. These two graphs will be quite similar with the Charlotte data showing a slightly greater range of temperatures.

Next display the short climate statement for each city and assign each child a partner. Partners will discuss the following question briefly. Most students will predict that London's latitude is closer to Charlotte's and that Saskatoon is colder because it is located at a higher latitude.

- London is a city with a temperate, **mild** climate with above average rainfall and somewhat **mild winters**.
- Charlotte is a city with a temperate, **mild** climate with average rainfall and somewhat **mild winters**.
- Saskatoon is a city with a **harsh climate** with below average rainfall and **short cool summers and long cold winters**.
- What could cause the difference in the climates of these cities? Talk with your partner and discuss what is probably true about these two cities based on the data you have graphed.

After this brief discussion ask students to answer this question independently.

Which city has the same latitude as London, England?

- A. Charlotte- 35 degrees north
- B. Washington D.C.-38 degrees north
- C. New York- 40 degrees north
- D. Montreal-45 degrees north

After students have had an opportunity to answer, reveal that it is a trick question, and that London's latitude is actually 51 degrees north. The same as Saskatoon's!

Next display this statement: Both London, England and Saskatoon, Saskatchewan are located at 51 degrees north latitude. As you can see from your graph however, their temperatures are quite different. What makes London so much warmer than other cities at the same latitude?

Hand out the globes so students can locate London, Charlotte, and Saskatoon to see where they are truly located in relation to each other. Then, give students a blank outline map that includes the eastern coast of the North and South America as well as the Western coast of Africa and Europe. Using the globe, have students mark and label the following locations: Bay of Biscay, Cape San Roque in Brazil, Caribbean Sea, Newfoundland, Davis Strait (near Newfoundland), 43<sup>rd</sup> line of longitude (approx.), the Azores islands, Ireland, Norway, and Spitzbergen (this island is north of Scandinavia).

As students look at the globes give a short explanation of the Gulf Stream current explaining that this ocean current brings up the warm waters from the Caribbean Sea to the shores of England creating a heat source that warms England's temperatures, as well as other coastal areas of Europe.

To conclude the lesson students will map the Gulf Stream current on a map as you read a description of it to them from the novel *20,000 Leagues Under the Sea* by Jules Verne. The passage is in part two, chapter nineteen entitled "Gulf Stream". The relevant passage is paragraph seven which begins, "The true source of the Gulf Stream..."<sup>2</sup> Continue reading through the rest of that paragraph. As you read students should use a colored pencil to map the Gulf Stream as its route is tracked in the reading of the passage.

## Lesson 2: The Little Ice Age

### *Objective*

Students will create a graphic organizer of past climate changes and their effects on societies. Students will also identify the effectiveness with which societies adapted.

### *Teacher Background*

Through recent advances in the area of climatology scientists have been studying tree ring samples and ice core samples as well as anecdotal and commercial records to create a clearer picture of what climate has been like in Europe from about 800 AD to the present. This time period can be broken down into three distinct climate eras: The Medieval Warm Period, The Little Ice Age, and the present era of Global Warming. All information presented to students in this lesson was obtained from Brian Fagan's book, *The Little Ice Age: How Climate Made History 1300-1850*. I highly recommend this book particularly to teachers who teach European exploration of the Americas or European history not only as a resource for increasing your own background knowledge on this topic, but for understanding issues of immigration to the New World. *The Little Ice Age* helps explain events from the Norse's colonization of Greenland and exploration of Canada to the immigration of the Irish to America during the great potato famine.

### *Procedure*

Split students into seven groups. Each group will be presented with a topic and a set of notes taken from the above mentioned book. Depending on age and competence students can rely solely on these notes or can be allowed to do further research on their assigned topic on the Internet. In fifth grade we will use these notes only as a starting point. Students can use the concepts to do further research. At the bottom of each topic I have put at least one website that would be appropriate for groups to look at while creating their presentations, but there are many other good sites available.

Each group will put together a presentation to teach the rest of the class about their topic. This can take the form of PowerPoint or SMARTBoard slides if such presentation technology is available. Students can also put together posters on chart paper of their information to use to help them present. The advantage of this option is that the posters can then be put together as a single bulletin board that could be displayed in the hall to help inform others in the school.

Require presentations to include an organizational system for the information. Students could use a timeline to organize the information or they could categorize information into two categories such as "helpful to society" and "harmful to society". Also have students include pictures that are printed or hand drawn of items they believe classmates will be unfamiliar with. For example, hops are mentioned as a crop. Most students probably do not know what that plant is, what it looks like, or what it is used for. Groups that have hops in their presentation should include a graphic of a hops plant to aid in their presentation and explain that hops are used in the making of beer.

When students present, have them go in the order that the notes are arranged below. This will create a sequential presentation that will make more sense to the audience.



#### Notes for Medieval Warm Period 800–1300 AD

- Warmest 4 centuries in 8,000 years
- Warm climate allowed the Norse (Vikings) to explore from Iceland to Greenland and even to modern day Canada. Greenland at this time was warm enough to grow crops and sustain dairy farming.
- In Europe vineyards were grown 180-300 miles further north than they could be grown in the 1900s.
- In the 1200s grain could be grown at higher altitudes in England than it can be grown today.
- Oats could be grown as far north as 62.5 degrees north. That is only about 280 miles from the Arctic Circle.
- Forests expanded into previously treeless areas.
- For five centuries Europe had a warm and relatively stable climate
- Populations grew with the abundant food. England's population went from about 1.4 million to about 5 million by 1300. France's population grew from 6.2 million to about 17.6 million.
- <http://www2.sunysuffolk.edu/mandias/ia/index.html>

#### Notes for Little Ice Age 1300-1850

- Crops failed- people starved
- Melting glacial ice and increased rains brought intense spring flooding
- Throughout the Little Ice Age yearly temperature averages varied. Several years of good harvests would be followed by several years of bad harvests. The weather was very unpredictable. Summers were often very hot and dry while winters were colder and spring and fall were wetter.
- Increased swampy conditions bred more mosquitoes leading to malaria known in Europe as the ague. The term Malaria means "bad air" and was named for the foul smell produced by the stagnant swampy areas where malaria was common.
- Glaciers grew larger in mountain areas of Europe. The ice covered areas that used to be farmland and even encased entire villages and churches in ice.
- These conditions were caused by average temperatures that were only 0.5 degrees to 2 degrees Celsius cooler than average temperatures in the 1900s.
- Add to this a large volcanic eruption and you get 1816 the year commonly referred to as the year without a summer. In 1816 it snowed in June in the northeastern US.
- [http://www.windows.ucar.edu/tour/link=/earth/climate/little\\_ice\\_age.html](http://www.windows.ucar.edu/tour/link=/earth/climate/little_ice_age.html)

#### Notes on the Dutch

- The Dutch adapted much better than most other European societies during the Little Ice Age.

- They developed windmills to drain swampy land. This gave them additional farmland and helped control diseases such as malaria.
- Dutch developed dikes to hold back storm surges and prevent fields from flooding with salt water.
- Livestock at this time were generally put out to graze on pastures and forests that were not planted by farmers and given hay in winter. The Dutch planted field peas and clover in special fields to graze their livestock in. This made the fields more fertile for grain production in the future and made livestock more numerous and healthier.
- When hay crops failed they planted turnips to feed livestock with in winter. Turnips grow well in cold climates and grow quickly.
- They grew not only plants to feed themselves, but grew commercial crops, or crops to be sold to others, such as flax, mustard seed, and hops. Hops are the grain that you make beer from.
- When they drained swamps they sold the peat moss as fuel.
- By being willing to change their traditional way of farming and adapt to the changing climate the Dutch people prospered at this time and ended up using the Little Ice Age to their advantage. They were one of the first European societies to develop a modern economy.
- [http://www.eh-resources.org/timeline/timeline\\_lia.html](http://www.eh-resources.org/timeline/timeline_lia.html) (scroll down to “Agricultural Revolution” and “Land Reclamation”)

#### Notes on England

- Hesitant to try new foods or ways of farming.
- Many Europeans blamed years of bad weather on sinning and witches. In England the worst years such as the winters of 1587 and 1588 were when the largest number of people were accused of and burned as witches.
- Trading for goods with the Asians at Constantinople brings the Bubonic Plague to Europe. It is more difficult to fight of disease during times of famine.
- When potatoes are brought over from the New World in the 1500s people do not think potatoes are fit to eat. Some people even think they are poisonous. They are rarely planted. Eventually they tried potatoes in order to feed the poor people such as the ones in work houses and orphanages.
- As scientists in the 1600s began to look for scientific explanations for weather patterns accusations of witchcraft decline.
- In the late 1600s farmers finally start adapting by:
  1. Planting in community-enclosed farms
  2. Planting grazing fields of clover or field peas for livestock
  3. Growing more root crops such as turnips and potatoes
  4. Growing faster-maturing crops like cabbage
  5. Begin favoring beer over wine—beer is made from hops which grows better than grapes in cold climates.

- <http://www.pbs.org/saf/1505/features/lia.htm> (look at pages 1 and 2)

#### Notes on France

- Slowest to adapt to new ways of life
- Starvation lasts 100-200 years longer than in other areas
- Refuse to give up bread for root crops like potatoes and turnips. In one area of France it was illegal to grow potatoes because they believed they caused leprosy.
- 90% of the French people are subsistence farmers, meaning they live on what they grow from one harvest to the next, and they do not grow crops to sell for a profit.
- The wide spread starvation of so many of the French is one of the causes that leads to the French Revolution.
- People also suffer from diseases such as cholera and Bubonic Plague. Often farmers abandoned their farms at times of Plague and fields went unplanted leading to more starvation.
- One French landowner did try several successful innovations. Realizing the more his peasants drank water the more likely they were to die he grew apples and made cider keeping the price of cider down and his peasants healthier.
- He also tried growing different crops to see if he could get larger harvests.
- <http://www.pbs.org/saf/1505/features/lia.htm> (look at pages 1 and 2)

#### Notes on the End of the Little Ice Age

- The world has been warming from about 1850 to today with one exception.
- 1940 to about 1980 the high and low pressure systems in the Atlantic switched the ocean currents and winds into cold weather mode.
- 1971/72 was the coldest recorded winter in Europe for 200 years.
- 1977 the record low temperatures experienced in the mid west and eastern United States of this year caused people to believe the earth might be entering another ice age.
- Humans have been affecting the levels of carbon dioxide in our atmosphere for about 150 years.
  1. Started with massive deforestation
  2. Moved to coal burning for warmth and to run factories
  3. Coal burning became so common that there was a constant haze over cities such as London until about 1960
  4. In the early 1900s the burning of gasoline in automobiles became a contributing factor to carbon dioxide levels.
- In 1988 James Hansen presented data on a century-long warming trend we now call global warming. Although changes in climate have been happening for as long as the Earth has been around, this is the first climate change thought to be influenced by human action.

- <http://exploratorium.edu/climate/index.html> (look at the tabs for Home, Atmosphere, and Global Effects)

Notes on Causes of Fluctuations in Climate and Techniques Used to Study Climate Change -This section could be split in two if you needed eight groups for your class.

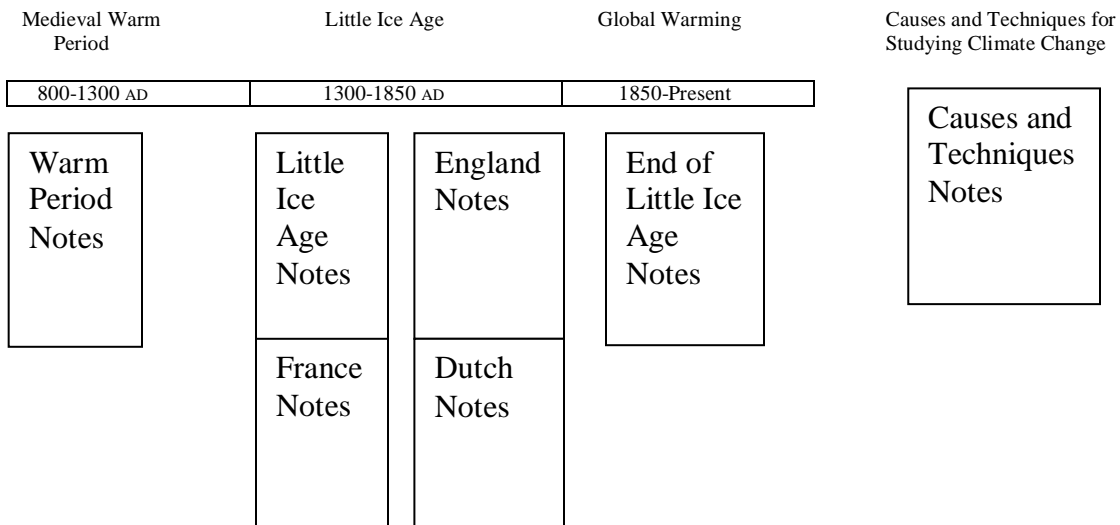
- Accurate instruments for recording temperature have only been around and in use for about 200 years.
- Ice core samples can tell us about both carbon dioxide levels in the atmosphere and about the changes in temperatures.
- Tree ring samples can also give us data about temperature and precipitation.
- Historical records about particularly bad storms, harvest yields, and where crops were planted can help give a more complete picture of the effects of the temperature on societies.
- There are many things that effect climate and we do not understand them all.
  1. The amount of carbon dioxide in the atmosphere- this is one factor humans affect by clearing forests and burning fossil fuels.
  2. The ocean currents and winds which seem to be controlled by high and low pressure zones that move around. This is known as the North Atlantic Oscillation (NAO). When these pressure zones move, temperatures in Europe become warmer or colder. It probably affects weather in other parts of the world too.
  3. Sun spots- The sun goes through periods of higher and lower solar activity. It seems to be on an eleven year cycle, but even this pattern is not completely predictable. Between 1645 and 1715 sunspot activity was very low.
  4. Volcanic activity- Volcanic ash prevents much of the sun's rays from reaching the earth, but does not act as a good insulator to hold in heat. This leads to cold periods that can affect temperatures all over the world.
- <http://www.pbs.org/saf/1505/features/lia.htm> (scroll down and click on "The Year Without a Summer")
- 5. Why focus so much on Europe instead of the entire globe? It is the best data we have at the moment. We are only beginning to understand how climate works and what affects it. There is still much to learn.
- [http://www.eh-resources.org/timeline/timeline\\_lia.html](http://www.eh-resources.org/timeline/timeline_lia.html) (scroll down to "What Caused the Little Ice Age")

After students present, discuss with the class some of the effects the climate had on the population by exploring the following questions:

1. How did climate bring new diseases to people or make familiar diseases worse?
2. How did tradition affect people's survival?
3. Which societies fared the best and why?

Be sure students identify the Dutch as having a unique experience. While other societies suffer, the Netherlands begin to prosper through the use of experimentation and scientific advances. France, however, ends up suffering more severely and for much longer due to their refusal to give up their traditional ways of farming, diet, and social structure.

Below is an example of the way presentations could be arranged to make a display.



### Lesson 3: Seminar

#### *Strategy: Seminar*

The next lesson in this unit will be an art and literature seminar. The questions for this seminar were developed using the Paideia method as put forth by the National Paideia Center. This strategy for teaching was developed by Mortimer Adler along with other scholars and educators in 1982. In my school we take extensive in-service on this method of teaching, and it is more involved than can be gone into in this paper. Interested parties can learn more about this teaching style by going to the National Paideia Center’s website at [www.paideia.org](http://www.paideia.org). However, you do not need to strictly use this style of seminar to use this unit. Most teachers are more familiar with the terms “Socratic Seminar” or “Seminar discussion”. The important thing to remember is that these discussions are for students to share their ideas. Teachers should refrain from sharing their views as these will most likely be taken as gospel and squelch any contradictory opinions from students. The teacher’s role is to pose the questions and correct any misconceptions, but never to share views. It is one of the more challenging things I do in my profession because I do love my own opinions, but it is also the most rewarding as students start taking ownership of their own learning and look to me less to be the provider of answers.

I considered having a seminar on the presentations in the second lesson, but determined it would be inappropriate because there were specific realizations I wanted them to reach. When your goal is to lead students to a specific understanding and not a deeper understanding based on individual interpretation then seminar is not an appropriate means of instruction. In the last lesson I wanted students to reach the conclusion that societies that used science provided a better quality of life for their people. In this lesson I want them to look at ways literature and art inform us about life in past societies, and I want them to interpret for themselves what kind of information can be found within the pieces of art and literature I am exposing them to. Because my goal is to have students interpret and evaluate these pieces for themselves, and multiple interpretations are desirable, seminar is an appropriate strategy to use in this lesson.

When I hold seminar I have students sit in a circle, and they share in an adult style dialogue where we forego raising hands. I try to split my class with another seminar facilitator such as our talent development teacher or literacy facilitator so we each have about 12 students in the discussion circle. If your class is not trained to hold seminars in this style then any format for class discussion you are comfortable with will work as well.

To develop questions for seminar I use the Paideia model. The first question in a seminar is called an opening question. It will have to do with the major themes and ideas in the piece. The next 3-5 questions will be core questions. These questions will be text specific and are meant to make students refer to the text or art work to support their answers. However they must be ambiguous enough to have multiple interpretations. If they are not then the students will quickly identify the “right” answer and no further dialogue will develop. The final question in a seminar is a closing question. Closing questions are personal and help relate the text to the individual.

Prior to holding a seminar there are pre-seminar activities. These activities require students to have read the text at least twice. We do one reading together as a class, and the second reading will be in a small group or independently. Other activities will relate to comprehension such as categorizing events or character traits, or understanding vocabulary. After seminar students participate in a post-seminar activity that requires students to create a product in response to the text. This could take the form of a letter, visual art piece or drama.

### *Objective*

Students will investigate the way art and literature inform us of life in the past and analyze the lives of 19<sup>th</sup> century Europeans by viewing art and literature produced in that time period.

### *Teacher Background*

Putting together clues as to the causes and conditions of the Little Ice Age is a recent event made possible by advances in science and the collection of data such as ice core and tree ring samples. But how did scientists know the Little Ice Age occurred so they could go looking for answers? One way was through art and literature. Looking at winter landscapes produced by artists during the Little Ice Age and reading literature written at this time shows a Europe much colder than current day. Art and literature also give us a look into what life was like for people as they lived through the conditions imposed upon them by the climate.

In this seminar I will use an excerpt from the novel *Oliver Twist* by Charles Dickens. We will read chapter 23 from the beginning of the chapter through the sentence, “That’s the way with these people, ma’am; give ‘em a apron full of coals to-day, and they’ll come back for another, the day after to-morrow, as brazen as alabaster.”<sup>3</sup> This excerpt shows the impact of weather on different social classes in the 1880s. You can find *Oliver Twist* printed online at <http://www.online-literature.com/dickens/olivertwist/>. The menu on the left will pull up specific chapters.

For art pieces to accompany this literature I projected paintings from a website featuring art from this time period (<http://rita314.wordpress.com/2009/01/11/more-cold-dogs/>). These paintings are in a format where each painting can be pulled up and viewed independently. There is also a zoom feature that allows you to enlarge the pictures to better see the details. Be sure to preview these in advance because not all of the paintings on this site are school-appropriate. Another good source for paintings is the art teacher in your school. They often have prints you can use and are likely to have landscapes of Europe during this time period. I have created the seminar to be generic enough to go with any painting from this time period. Just remember you are looking for winter landscapes in Europe painted from the 1600s to the 1800s.

### *Procedure*

*Pre-seminar-* To prepare students for reading the excerpt from *Oliver Twist* you must first make them familiar with some of the vocabulary used in the passage. This is not an attempt to present them with every word they may be unfamiliar with, but only the terms necessary to facilitate comprehension of the passage. To go over vocabulary I have chosen 12 words from the passage. Assign one word to every two to three students. Have students look up the words, on the computer or in a dictionary, and bring back a definition of the word and if possible a picture that would help students understand it better. Pictures can be computer-generated or hand-drawn. If they are to be hand-drawn give the students chart paper so they can draw a picture large enough to be viewed by all. Computer-generated pictures can be shown from a projector. Obviously some words have more than one meaning. I have put the definition as the term is used in the passage by each word for your convenience.

**Beadle**- minor official of the Church of England  
**Eddies**-current of air, leaves, snow etc. that flows in a spinning motion  
**Draw**- to move in a particular direction by a pulling force  
**Aspect**-appearance or nature of something  
**Complacency**- a feeling of quiet pleasure or security  
**Deploring**-to disapprove of  
**Pauper**-a very poor person in need of charity  
**Equanimity**-calmness, emotional stability  
**Hob**-a shelf at the back or side of a fireplace used to keep food warm  
**Amiss**-out of place, wrong  
**Impropriety**- inappropriate, not the right thing to do  
**Quartern**-a quarter or  $\frac{1}{4}$  of something

After you have gone over these terms read the passage aloud to them. Even with the vocabulary that was already gone over students need to hear this passage aloud to get a feel for how the sentences are structured. I often read a sentence and then have a student read it aloud trying to imitate me. This helps them get used to more complex sentence styles.

After reading the passage have a general discussion about it. Be sure to point out how Mrs. Corney's view of life changes after she is scalded by the tea. Make sure students understand that Mr. Bumble and Mrs. Corney are both employed by the parish to aid the poor people. Mrs. Corney is in charge of the workhouse which is where poor people go when they have no way of supporting themselves. Mr. Bumble as the Beadle is in charge of distributing charity to the poor and checking on the conditions of the workhouse and orphanages in the parish. Talk about Mrs. Corney and Mr. Bumble's view of the poor people they are in charge of. They both have very negative views of them.

During the next class period have students reread the passage again. As they read have students find words or phrases in the passage that show Mr. Bumble and Mrs. Corney's opinions of the poor in their charge.

During the days when students are reading be sure the art print or prints you have chosen to use are available for them to look at. If you have prints, hang them in the room. If you are using the computer be sure they are pulled up for students to view. You do not need to do any discussion on the prints until seminar.

### *Seminar*

Opening Question: What one word or phrase best describes the art work and passage we read for today?



### Core Questions:

1. What do these works tell you about life at this time?
2. How does weather impact the different classes in the selections?
3. What are the dominant colors used in the art work?
4. What similarities are there in the art work?
5. What do you think was the most powerful phrase in the passage and why?

Closing Question: If you were to write a story or paint a picture that depicted poor people today how would it be similar to or different from these works?

### *Post -seminar*

For post-seminar students will paint a picture of how climate affects people. The art teacher in our school has water color pencils available for loan, but regular colored pencils, markers, or crayons could be used as well. Students can choose a group they have researched in the Little Ice Age lesson such as the Vikings, Dutch, French, etc, or they can do a group from today like homeless in America, or drought stricken areas of Africa. The picture must be captioned with a statement of how climate is affecting the people in their painting.

### Lesson 4: Evaluation

#### *Strategy: Hot Seat*

To aid in the students' ability to see the duality of an issue and see the reasoning behind a two-sided issue, I will use a strategy called Hot Seat. After reading several articles each student is given a handout with a statement relating to a two-sided issue written at the top. In this lesson it will be "I believe humans are affecting the climate of our planet". Each student must read the statement and determine if they agree or disagree with the statement, and indicate their stance by circling "agree" or "disagree" beneath the statement. Next, the students must consider the reasons for their belief and write a short statement explaining why they agree or disagree with the statement. Encourage students to include all the reasons they have for their belief, whether personal, emotional, or factual-based. One at a time, each student sits in the "hot seat," the seat of speaking power. Only the student in the hot seat may speak, and he/she is only permitted to read from their sheet, so no one student is allowed to change their statement based on what another student has said. This ensures that each student's turn is fair, no matter what order they speak. Students can also be instructed to tally mark next to "agree" or "disagree" the number of students with the respective response as well as some reasons they find convincing. After all students have shared their opinions, each student returns to their original response and decides if they still think the same way as at the beginning of the exercise. Students write a short statement about their stance at this point and explain

if the statements of any of their classmates strengthened their stance, weakened their stance, mildly changed their stance, or changed their stance completely. One of the main reasons I use this strategy is to show students that there are two sides to each issue, and that there are rational and intelligent reasons on both sides. Therefore, it is part of a rational thinker's process to change one's mind when new information is presented. Students of this age and even older are often resistant to changing their opinion, believing that doing so admits a lack of intelligence or that they were "wrong," and many are more likely to hold on to a poorly-supported idea than revise their thinking due to this misconception. If the issue is one that students have a personal emotional connection to, such as bullies, friends, sibling relationships, etc., then it is much harder to persuade those students away from their original stance. This is an important concept for the students to understand—decisions are often emotion-based and not intellect-based, and this is why arguments can become so heated. This is a great strategy for discussing any content area from science to literature. Many students have difficulty taking a stance on issues that they feel are far removed from them, and this activity forces them to think about what they know and believe about an issue and to listen to both sides. It also allows them to change their position, showing them that they can be persuasive or persuaded and that it is sometimes acceptable to change your stance, as long as you have good reason for it. This strategy is an excellent precursor to debate since it shows the duality of issues as well as the types of reasons that lead to a persuasive argument.

### *Teacher Background*

Another goal I have for students is for them to realize that they have to evaluate what they read to decide for themselves what they believe and choose what they will and will not act on. Students often believe that if it is in writing it is true. They do not think critically about what they read because in school we condition them to accept everything we say to them or have them read as factual and indisputable. In a free society students have to be taught to think critically about what they read because anyone can publish their view on any topic. Climate is a complex phenomenon and scientists have only recently begun to develop methods to understand it. This has led to many opposing views on what our future may be like. Some view carbon emissions as a dominant factor and consider solar output as a negligible influence and predict dooms day scenarios of uncontrollable warming while others believe solar output is the dominant factor and predict the return of the Little Ice Age. There are of course more moderate views everywhere in between.

### *Procedure*

To help them look at these varying opinions I will divide the class into four teams. Each team will be assigned an article by me, and will also choose another article from the articles I provide to read and evaluate. Everyone on the team must read the same two articles. Students will then choose a third article independent of their team. They will

read the two articles their team chose together with their team. The third article they chose independently they will read with anyone in the class who also chose that article. I will have the articles separated into *for* and *against* global warming. Another criterion for choosing their articles is that at least one article must be for and one must be against global warming. This way each child is reading articles with opposing views. I will also encourage them to read one or all three of their articles at home with a parent. Recommended articles are included in the Bibliography.

To evaluate each of the articles they will use the checklist below. If they would like, they can also have their parent fill out the checklist. I am involving parents in this assignment because I feel this is a good topic for discussion in the home, and I want to promote students going to their parents with weighty issues.

1. Where did the article come from? Is this a source you have heard of before? Is it a source you trust? In the upper right hand corner of the article code it with the following key.
  - **T** if you trust this source
  - **M** for maybe if you have heard of it but are not sure if you trust it
  - **N** if you have never heard of the source
  - **D** for do not trust it if you know and distrust this source.
2. How old is the source? Look for the date of the article and circle it.
3. Highlight opinions in the articles in yellow and highlight facts in another color. Were there more facts or opinions in your article?
4. If an opinion was supported by a fact or facts draw an arrow from the opinion to the fact. Put an S by it if you feel the fact strongly supports the opinion and a W if you think it weakly supports it.

After students have read and filled out their checklist sheets students will respond to the statement, "I believe humans are affecting the climate of our planet" by circling agree or disagree. Then students will sit in the "hot seat" and go through the procedure for the hot seat strategy as outlined above.

## Lesson 5: Leading the Future

My ultimate objective, as stated in the rationale, is to empower students with a belief that they are in control of the future. With conscionable action and good evaluative practices, they can lead their generation into a bright future full of possibilities, much as the Dutch

did during the Little Ice Age. To give them this sense of empowerment, they need to take action.

### *Strategy: Invention*

In this lesson I am borrowing an idea from a summer science camp program called Camp Invention. The common theme in all Camp Invention camps is a module called I Can Invent. In this module campers bring in old appliances and recyclable materials to use to create an invention that solves a problem. In this lesson students will use this building and inventing strategy to solve problems that scientists predict we may face in the future due to climate change. Although these will be fictitious models of inventions they have value because they cause the students to begin thinking about what their generation may need to do and what they can contribute. Many of our current technologies were born in the minds of science fiction writers like Jules Verne as well as scientists and artists such as Da Vinci who dreamed up technologies that later generations perfected.

To have materials for building models ask students to bring in washed out, non-glass items from their recycling bins at home. Set up a recycling area in the classroom where students can go to get items for their invention.

In the case of these inventions students will set up their invention with a display board as you would see in a traditional science fair. When displays are completed locate an area of the school where students can display them and invite other classrooms in the school to come to an “Exposition of Future Technologies.”

### *Materials*

It will be helpful to the students when building if you supply glue, duct tape, masking tape, string, and/or other items for attaching parts together on their inventions.

### *Objective*

Students will brainstorm problems societies may face due to changes in climate and will invent solutions to solve those problems.

### *Procedure*

To begin thinking about the possible problems that societies may face we will brainstorm a list. Students should be able to generate a list fairly quickly based on the articles they have read and their presentations on The Little Ice Age.

Some examples may be:

- Crop failure

- Poor drinking water
- Increased hurricane strength
- Disease
- Increased carbon emissions
- Destruction of forests
- Coastal flooding-rising sea levels

Put children into pairs to work on this project. Every pair of children should have a special journal that they make or you provide for them to keep notes and make sketches of their invention in. The journals need to be special and inspiring in some way. Inexpensive three prong folders could be used or booklets with construction paper covers. Printing labels with scientific icons on them will help make them look more inspirational. Students could also print and paste pictures or draw pictures on the cover.

The partners will choose an issue from the brainstormed list and research that topic. For example, they could look at what areas of the world are likely to experience issues with poor drinking water. They should identify how poor drinking water makes people and livestock ill and come up with a solution for the problem. Because this is a problem likely to affect coastal areas they may decide to build a machine to desalinate drinking water for people and animals. They may decide to make a hand-held personal device like a water bottle or a larger device that could be used for villages. As they are researching notes about the problem they have chosen should be kept in their journal.

Once they have decided what needs to be invented the next step is to invent it. They may or may not at this point need to do a little research on the science behind their technology. In the case of my example they may need to do a little research on desalination. In such an invention I would expect to see an understanding of evaporation and condensation and how these processes can desalinate water. These notes should also be kept in their journal. Before building a model of their invention they must draw at least two sketches of their invention: an inside view and an outside view. Each should be labeled with parts and explanations of how it works.

After they have sketched out the invention they should go to the recycling area and collect items for building. Encourage students to think not only about the outside structure, but the internal working parts of their invention as well.

When the inventions are completed students should write up paragraphs to display on their boards. Each of the paragraphs should go through the procedures in your room for publishing writing before being put on the display boards. Students should also make sketches for the display board or include pictures that represent the problem they are trying to solve. Sections should include:

- A title that gets across the problem being solved
- Information on why scientists believe this will be a problem
- Information on the suffering this problem can cause for people
- Pictures or graphics of the problem
- An explanation of how their invention will solve this problem
- An explanation and diagram of how their invention works

Lastly students should write a short little script of what they will say to students as they come to view their display. They should pair up with other groups and practice their short presentation before they share with other classes. When you have classes come to view the presentations explain to the teachers bringing the other students that they should walk around freely in small groups rather than travelling through as a large group. This will create a smaller more intimate experience. Parents and PTA members could be invited to attend the expo as well. If you do not have a space available to set your entire class another option is to ask teachers if your students could come and present to their classes. In this scenario different classrooms in your school would invite one or two groups from your class into their room to present.

The culminating project in this unit is an important piece because it focuses back on my main goal for students which is for them to view science as a way to make a better future for us all. Although I have my own beliefs about global warming it is not my goal—or my job—to foster those beliefs onto my students. It is also unconscionable to frighten them into despair or cause them to harbor ill will towards their parents for their lifestyle, or even for causing them guilt for how they live or desire to live. Instead I want to give them the ability to think through the issues, sort through the propaganda, and come up with their own conclusions. I also want to make them aware that like all generations, their generation will have challenges to face, but through conscionable action and continued scientific progress they will be able to face those challenges and in the tradition of America build a better world for themselves and their posterity.

## Notes

1. Kelly Knauer, *Time: Great Discoveries* (New York: Time Books, 2001), 137
2. Jules Verne, *20,000 Leagues Under the Sea* (Reprint, New York: New American Library, 1969) 408-409.
3. Charles Dickens, *Oliver Twist* (The Literature Network, <http://www.online-literature.com/dickens/olivertwist/>)

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