

# **A Cry from the Climate: The Glacier is Talking**

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## **Overview**

Global warming is a controversial problem facing the world today. For years, politicians and big industry have publicly denounced former Vice President's Al Gore's 2006 warning delivered in the documentary "*An Inconvenient Truth*" in which he narrates research done by scientist that looked at patterns occurring concerning climate changes. Unfortunately, since its release the world as a whole has experienced many natural disasters that have destroyed cities and towns worldwide. In the past 16 years' extreme weather has caused devastation worldwide with at least one event occurring each year since 2000.

Ecologists currently state that global warming and climate change are results of the greenhouse gases (methane and carbon dioxide) becoming trapped in the tropospheric level of the earth. Because it takes at least 10 years for methane and 100 years for carbon dioxide to diffuse back out of the atmosphere, current belief is that these gases are the main cause. This unit will explore environmental events from natural disasters to the melting glaciers that may be a direct result of the Earth's current climate changes. This unit is designed to help students who have little scientific knowledge of the Earth gain a higher level of understanding of human impact on the earth's stability. Students will explore the following topics: the atmosphere, biosphere, geosphere, lithosphere, hydrosphere and the effects that greenhouse gases have on the world's glaciers due to our carbon footprint.

In this unit I will outline global warming and the effects that small climate changes have on the glaciers of the world. Using a project-base model, students will investigate the atmosphere in order to explain trapped greenhouse gases to predict future effects on the climate of the world. Students will illustrate the level of organization from species to the biosphere. Students will create models of the mountains to learn about the layers of the lithosphere in order to explain the formation of the earth and its atmospheric layers. Students will explore the hydrosphere from past and present to describe the impact of recent climate changes have had on glaciers around the world.

## Rationale

The earth is crying out by exhibiting drastic changes in its climates stability. The glaciers of the world are receding at astronomical rate. As a result, more natural disasters involving water have taken place. Since the turn of the millennium the United States has witnessed 28 catastrophic events from cyclones in 2001 to the Blizzard of 2016 (Wikipedia, 2016). These events are on a rise and student's environmental awareness is paramount in order to figure out a solution or how to weather the storm.

In order to increase comprehension and enhance environmental awareness in students with varying learning disabilities will require a multitude of activities that increases their overall understanding and skillsets. Traditionally a movie or story would have been enough in providing an overview of Global Warming and its effects on earth. However, with an influx of students leaving elementary school lacking the reading skillsets needed to navigate high school makes this task harder to accomplish. Teachers must use a variety of instructional strategies' which allow students to become free thinkers. These strategies must foster environmental awareness.

Teachers must use differentiated instruction to meets the needs of all children when planning for this unit. According to Pashler and McDaniel et al. in their 2008 article on learning styles mentions how a teacher should assess their students and adapt their classroom methodologies to best fit each students learning style (Pashler, 2008). To accomplish teaching students about global warming the use of audial visual materials as well as activities that will enhance their writing capabilities may be a good place to start. To extend the learning experience students should be encouraged to construct a model of a mountain with a glacier. This hands on experience will help students better understand the relationship shared between rock and ice. The models can be either one that represents a time period in the past or one that represents a glacier of today's time. This activity will give students an excellent hands-on experience of the impact global warming has had on the glaciers that are in recession today.

## Objectives

This unit is intended for high school environmental students in 9<sup>th</sup> and 12<sup>th</sup> Grade. It can be utilized for students on a basic or below basic reading level. This can be used as a supplemental enrichment unit to the School Districts environmental science curriculum. Students have a 54-minute class period 4 days a week and a 43 min class period on Wednesdays. This unit can be included with unit 4 of the environmental science class curriculum. This unit will take 10 -18 class periods to complete depending on student's skill sets. Students will cover the following objectives:

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- **SWBAT** explore the impact of natural disasters such as Katrina or Sandy on human communities **IOT** make conclusions about the effectiveness of government policies on the health of humans and the communities where they live.
- **SWBAT**: look at the land globally **IOT** make predictions about the spread of disease as the result of changes brought by climate change.

- **SWBAT:** compare the relationships between environmental pollution and poor health **IOT** make conclusions about state and local policies regarding industrial development and zoning.
- **SWBAT:** describe some of the effects of natural and manmade pollution **IOT** understand the costs and risks of pollution.
- **SWBAT:** investigate the health of the communities they live in **IOT** look for patterns of differences in health and diseases due to an unstable environment.
- **SWBAT:** describe the goals of various national and international policies and treaties **IOT** outline human roles and responsibilities towards the environment.
- **SWBAT:** describe major national and international policies, agreements, and treaties **IOT** understand global coordinated efforts to improve environmental problems.
- **SWBAT:** to investigate specific environmental problems **IOT** plan how they might change their behavior and their community's behavior to mitigate it.

## Background

In order to prepare myself to write this unit I will conduct research to support the rationale of teaching students about the human impact, both past and present as the cause of environmental changes. Based on current evidence, every student will be encouraged to make predictions of possible future natural events as a result of climate changes. Students will engage in a variety of activities designed to foster a firm understanding of global warming and its effects on the world's glaciers. As suggested by the School District of Philadelphia's state standards, students will evaluate our humanitarian duty as environmental stewards and the human impact on the environment. Students will analyze historic events (both natural and manmade) to make conclusions and predictions concerning the health and welfare for the human population. They will look at how culture and worldview influence lifestyle choices, economics, and ethics. They will also explore how our lifestyles yield a collective "ecological footprint". They will describe and explain environmental policy and the purpose of the EPA as well as international environmental policies, treaties and programs. Students will also construct a model of a glacier in which one shows a past glacier and the other show the glaciers current state.

A major complaint of many teachers today is that students lack the motivation to be information seekers. Leading research proposes that the use of meaningful problem based learning coupled with hands-on activities is a good start to motivate students into thinking. According to Pfaff and Weinberg in a case study in 2009, Hands-on activities helped increase student engagement and they saw small advances in students' scores overall. Student engagement helps to peek students' curiosity to want to know more about a particular subject whether its science, math, or reading (Pfaff and Weinberg, 2009). In 2013, Resource Area for Teaching (RAFT) identified five major benefits for students who learn from the use of hands on activities in the classroom that helps to close the engagement gap. According to RAFT hands-on activities help to develop students critical thinking skill by allowing students to learn both content and thinking strategies through investigation and problem solving. Another benefit is, students learn how to communicate with one another while building better language skills(Hmelo-Silver). This process also help student to focus and sparks engagement, while providing a pathway for success disadvantage students. Lastly hands-on problem based learning teaches students to work in teams which is a major skillset needed for the workforce today (RAFT, 2013). In conclusion, student engagement can be increased in classrooms by presenting real life problems followed by

activities in which students have to think, summarize, construct models, draw illustrations, draw conclusions and collaborate with one another help to increase their overall comprehension of a body of information.

## **Strategies**

### **Classroom Discussions**

Classroom discussions, that begins with the teacher describing the student learning objective or purpose of the discussion. Sometimes discussions may be initiated by the posing of an open-ended question. Teachers can use a number of techniques to encourage students to participate in discussions, including calling on specific people, or assigning students to be an "expert" or leader for various parts of the discussion. Many cooperative activities include a "small group" discussion as teams work together.

### **Activating Prior Knowledge (APK)**

The teacher will activate student prior knowledge during each lesson. Through the use of this strategy teachers help students make connections to the task at hand to what the student already knows from prior lessons.

### **Directed Reading Thinking Activity (DRTA) /Linking prior knowledge**

Throughout reading, questions are used to activate students' existing knowledge. Students are encouraged to make predictions.

### **Explicit teaching**

Instruction used to meet the needs of students by engaging them using clearly stated learning objectives. Teachers should focus instruction on identified curriculum content and activate prior knowledge and skills at the beginning of the unit. Lessons are designed to build student skillsets as they move forward with the unit. Goals and expectations should be clearly stated throughout each lesson.

### **Scaffolding**

Using this strategy, the teacher provides temporary support until help is no longer needed. Can take many forms (examples, explanations, organizers, etc.) but needs to build on student's existing knowledge.

### **Use of visuals**

The use of Power-point presentations, animations, and models and video's will serve as good visual aids and help students form better connections to the effects of global warming.

### **Think/Pair/Share**

Students think individually, then pair (discuss with partner), and then share ideas with class.

## Lesson Plans

### Lesson 1

#### Introduction to the World around You Posters

During this lesson the teacher should introduce the levels of Organization from smallest to largest for each of the following terms: Species, Population, Community, Ecosystem, Biome, and Biosphere. 1 class period

#### *Materials:*

Power-point presentation on Levels of Organization  
Poster board for each group  
Markers or coloring pencils

#### Objective:

Students will be able to (SWBAT): design a poster that depicts the correct Level of organization from smallest to largest.

#### *Strategies:*

Scaffolding  
Use of visuals  
Explicit teaching  
Think/Pair/Share

#### Procedures:

Teachers will present power-point presentation to students and allow for them to record notes in a journal for later use.  
The teacher will show visuals that display how each level fits into the next.  
Students will create a poster that clearly show how each level is a part of a whole from smallest to largest for the following levels: Species, Population, Community, Ecosystem, Biome, and Biosphere.  
Posters will be reviewed corrected (if necessary) and displayed around the room to remind students of the levels of Organization throughout this unit.

### Lesson 2

#### The Air Out There (Appendix A)

During these lesson students will learn about the atmospheric levels, the distance, average temperature of each layer and the air composition of the Troposphere. 2 or 3 class periods

#### *Materials:*

1. Illustrations of the levels of the atmosphere. note: illustration should have distance of each level in kilometers (km)

2. Power-point presentation of the atmospheric layer (slide player or slide share is a good site)
3. Internet connection
4. Laptop cart
5. Ruler

*Objectives:*

- SWBAT: Describe how the temperature of the atmosphere changes with altitude IOT identify difference to the Troposphere.
- Explain the role of the ozone layer in the stratosphere IOT describe how the ozone layer protects the earth from radiation.
- Describe conditions in the mesosphere.
- Explain how the sun affects the thermosphere IOT describe the temperature of each layer.
- Identify the exosphere.

*Strategies:*

- Jigsaw
- Use of visuals
- Explicit teaching
- Think/Pair/Share

Day 1.

Do Now:

Students practices metric conversion problems for distance (5-15 minutes) Kilometers-centimeters and kilometers-miles. Examples should be placed on the board. Problems are reviewed on board.

Direct/Guided instruction:

Teacher will present power-point presentation on the Atmosphere.

Independent practice:

Teacher will post a picture (See Appendix C) of the atmosphere layers on board or give a picture to each group of four students. Students will use a ruler to calculate the distance from centimeter to kilometers then to miles. Students should be encouraged to use the metric table found at the back of their journals or an online metric converter. Teacher will have students to calculate the distance of each layer of the atmosphere. Distances should be shared with groups and reviewed with the class.

Day 2

Students should share out groups finding from day 1 and record the information on the chart. The teacher should also redirect on all incorrect answers. Students should compare distance in vertical miles for each layer to distance in miles

horizontally this will give students a better understanding of how far away vertically each layer is. The Teacher should be prepared to give a nearby city or state as a comparison.

*Strategies:*

Scaffolding  
Use of visuals  
Explicit teaching  
Direct instruction  
Think/Pair/Share

*Materials:*

Chart Paper  
Markers  
Pencil or pens  
World Map for students  
Atlas

*Objectives:*

**SWBAT:** calculate the distance IOT visualize how far away from Philadelphia is each layer in miles.

*Independent Practice:*

Student will draw or color an illustration of the earth and its' atmospheric layers and add their calculations in miles to each layer. (Note: Teacher can also obtain an atmosphere coloring sheet from the internet).

Lesson 3

An Inconvenient Truth (See appendix A)

During this lesson the students will follow a detailed questionnaire to help them keep track of important information and details for class discussion. Class discussion should follow every 6-10 questions to allow students to make predictions and help with comprehension. Teacher can decide to show the whole documentary or small parts it's up to the teacher.

*Materials:*

Teachers should have a detailed questionnaire for each video. Questionnaire for most of the documentaries listed in this unit can obtained by using the website [Biologymoviesheet.com](http://Biologymoviesheet.com) or you can make up your own

*Objectives:*

- **SWBAT:** compare the relationships between environmental pollution and poor health **IOT** make conclusions about state and local policies regarding industrial development and zoning.
- **SWBAT:** describe some of the effects of natural and manmade pollution **IOT** understand the costs and risks of pollution.
- **SWBAT:** describe the goals of various national and international policies and treaties **IOT** outline human roles and responsibilities towards the environment.

- **SWBAT:** to investigate specific environmental problems **IOT** plan how they might change their behavior and their community's behavior to mitigate it.

Strategies:

Group or whole class discussions

Lesson 4

Chasing Ice (see Appendix A)

During this lesson the students will follow a detailed questionnaire to help them keep track of important information and details for class discussion. Class discussion should follow every 6-10 questions to allow students to make predictions and help with comprehension.

*Materials:*

Teachers should have a detailed questionnaire for each video. Questionnaire for most of the documentaries listed in this unit can be obtained by using the website [Biologymoviesheet.com](http://Biologymoviesheet.com), [moviesheet.com](http://moviesheet.com) or you can make up your own

Objectives:

- **SWBAT** explore the impact of natural disasters such as Katrina or Sandy on human communities **IOT** make conclusions about the effectiveness of government policies on the health of humans and the communities where they live.
- **SWBAT:** look at the land globally **IOT** make predictions about the spread of disease as the result of changes brought by climate change.
- **SWBAT:** to investigate specific environmental problems **IOT** plan how they might change their behavior and their community's behavior to mitigate it.

Strategies:

Group or whole class discussions  
Activating prior knowledge

Lesson 5

Making of North America (see Appendix A)

During this lesson the students will follow a detailed questionnaire to help them keep track of important information and details for class discussion. Class discussion should follow every 6-10 questions to allow students to make predictions and help with comprehension.

*Materials:*

Teachers should have a detailed questionnaire for each video. Questionnaire for most of the documentaries listed in this unit can be obtained by using the website [Biologymoviesheet.com](http://Biologymoviesheet.com), [moviesheet.com](http://moviesheet.com) or you can make up your own

Objectives:

- **SWBAT:** look at the land globally **IOT** make predictions of human behaviors that will bring about climate change.



- **SWBAT:** compare the relationships between environmental pollution and poor health **IOT** make conclusions about state and local policies regarding industrial development and zoning.
- **SWBAT:** describe major national and international policies, agreements, and treaties **IOT** understand global coordinated efforts to improve environmental problems.
- **SWBAT:** to investigate specific environmental problems **IOT** plan how they might change their behavior and their community's behavior to mitigate it.

Strategies:

Group or whole class discussions  
Activating prior knowledge

Lesson 6

### The Global Warming War (Appendix A)

During this lesson the students will follow a detailed questionnaire to help them keep track of important information and details for class discussion. Class discussion should follow every 6-10 questions to allow students to make predictions and help with comprehension.

*Materials:*

Teachers should have a detailed questionnaire for each video. Questionnaire for most of the documentaries listed in this unit can be obtained by using the website [Biologymoviesheet.com](http://Biologymoviesheet.com), [moviesheet.com](http://moviesheet.com) or you can make up your own.

Objectives:

- **SWBAT** explore the impact of natural disasters such as Katrina or Sandy on human communities **IOT** make conclusions about the effectiveness of government policies on the health of humans and the communities where they live.
- **SWBAT:** look at the land globally **IOT** make predictions about the spread of disease as the result of changes brought by climate change.
- **SWBAT:** compare the relationships between environmental pollution and poor health **IOT** make conclusions about state and local policies regarding industrial development and zoning.
- **SWBAT:** describe some of the effects of natural and manmade pollution **IOT** understand the costs and risks of pollution.

Strategies:

Small Group or whole class discussions  
Activating prior knowledge

Lesson 7

### The Core (see Appendix A)

During this lesson the students will follow a detailed questionnaire to help them keep track of important information and details for class discussion. Class discussion should follow every 6-10 questions to allow students to make

predictions and help with comprehension. Note to the Teacher: at the end of this movie express to students the fiction of the movie the questionnaire comes with a fact sheet be sure to review with student's aspects of the movie that is true and false.

*Materials:*

Teachers should have a detailed questionnaire for each video. Questionnaire for most of the documentaries listed in this unit can be obtained by using the website [Biologymoviesheet.com](http://Biologymoviesheet.com), [moviesheet.com](http://moviesheet.com) or you can make up your own.

Objectives:

- SWBAT explore the impact of natural disasters such as Katrina or Sandy on human communities **IOT** make conclusions about the effectiveness of government policies on the health of humans and the communities where they live.
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- SWBAT: to investigate specific environmental problems **IOT** plan how they might change their behavior and their community's behavior to mitigate it.

Strategies:

Group or whole class discussions  
Activating prior knowledge

At the end of this documentary the teacher should have a class discussion to help student form an opinion.

Lesson 8

The Day After Tomorrow (Appendix A)

During this lesson the students will follow a detailed questionnaire to help them keep track of important information and details for class discussion. Class discussion should follow every 6-10 questions to allow students to make predictions and help with comprehension. Note: the myths section of this questionnaire to eliminate things that are not true.

*Materials:*

Teachers should have a detailed questionnaire for each video. Questionnaire for most of the documentaries listed in this unit can be obtained by using the website [Biologymoviesheet.com](http://Biologymoviesheet.com), [moviesheet.com](http://moviesheet.com) or you can make up your own.

Objectives:

- SWBAT explore the impact of natural disasters such as Katrina or Sandy on human communities **IOT** make conclusions about the effectiveness of government policies on the health of humans and the communities where they live.
- SWBAT: investigate the health of the communities they live in **IOT** look for patterns of differences in health and diseases due to an unstable environment.
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- SWBAT: describe major national and international policies, agreements, and treaties **IOT** understand global coordinated efforts to improve environmental problems.
- SWBAT: to investigate specific environmental problems **IOT** plan how they might change their behavior and their community's behavior to mitigate it.

Strategies:

Group or whole class discussions  
Activating prior knowledge

Rationale for viewing:

This movie will give students a firmer understanding of the effect global warming can have on the world.

Lesson 9.

2012 (see Appendix A)

During this lesson the students will follow a detailed questionnaire to help them keep track of important information and details for class discussion. Class discussion should follow every 6-10 questions to allow students to make predictions and to help with comprehension.

*Materials:*

Teachers should have a detailed questionnaire for each video. Questionnaire for most of the documentaries listed in this unit can be obtained by using the website [Biologymoviesheet.com](http://Biologymoviesheet.com), [moviesheet.com](http://moviesheet.com) or you can make up your own.

Objectives:

- SWBAT explore the impact of natural disasters such as Katrina or Sandy on human communities **IOT** make conclusions about the effectiveness of government policies on the health of humans and the communities where they live.
- SWBAT: investigate the health of the communities they live in **IOT** look for patterns of differences in health and diseases due to an unstable environment.
- SWBAT: describe the goals of various national and international policies and treaties **IOT** outline human roles and responsibilities towards the environment.

- SWBAT: describe major national and international policies, agreements, and treaties **IOT** understand global coordinated efforts to improve environmental problems.
- SWBAT: to investigate specific environmental problems **IOT** plan how they might change their behavior and their community's behavior to mitigate it.

Strategies:

Group or whole class discussions  
Activating prior knowledge

Lesson 10-13.

Other Documentaries and movies good for helping students gain a better understanding of the impact of Global Warming and how it can affect the climate especially for struggling students:

1. Global Warming: The signs and the science.
2. Planet in Perils (CNN)
3. Global Warming: What's up with the weather

Lesson 1.

Day 1

### Making a Volcano/Paper Mache Mountain

During this hands-on project the student will learn through creating art. Students will construct models of mountains with attached glaciers are a great way to help students understand the plates tectonic (must give a lesson on the earth's crust first) and how many of the earth's great wonder were formed such as the Grand Canyon for example.

Materials:

- Big piece of cardboard for each student or group
- 16oz-1-liter plastic bottle (if they are making eruptible volcanos)
- Newspaper
- A mixing bowl
- 1-2 cup of flour for each students
- ½ cup of cornstarch per project
- glue
- 1 bag of cotton balls
- scissors
- 2 tablespoons each of salt
- paint
- 16 Oz of water
- mixing utensils
- plastic bags for each student

procedures:

Teacher should display picture of intact glaciers and melting glaciers around the classroom. Teacher should demonstrate how to blend flour, salt, cornstarch and

water. The key is to have the consistency of pancake batter not too thin not too thick. Follow the step outlined below.

1. Pour  $\frac{1}{2}$  cup of flour in the bowl
2. Add 2 tablespoons of salt
3. Add  $\frac{1}{4}$  cup of cornstarch
4. Slowly add water while mixing to avoid lumps

Blend all ingredients until smooth and lump free as possible. **DO NOT** Use all the water you have enough for 2 batches. Once batter is made students will cut the top off of bottle and stick the bottle in the center of their cardboard using tape or glue (glue is easier). Then have students will make 15-20 balls out of newspaper sheets one sheet of newspaper can make up to 4 balls. Dip each ball in batter and rub it around the entire ball (see appendix B) Next students will stack the balls around the bottle all the way up to the top (more paper balls may be need depending on the desired shape). Students can secure shape by using tape (see photos) set in a safe place (if your school has mice make sure the place is high up) and allow it to dry overnight. Cover any remaining batter with a plastic bag.

Day 2

Depending on shape students may need to add more balls of paper (allow to dry overnight in this case). If desired shape is obtained student will next cut newspaper into strips, then wet each strip with batter and adhere it loosely around the paper balls. Students do not have to pull tight rock is not smooth. Once the entire mountain/volcano is wrapped including the mouth of the bottle allow to dry overnight.

Day 3.

Have student check for any holes and make any repairs. Students will use paint to paint the paper Mache' and the cardboard. Allow to dry overnight.

Day 4.

Students will use cotton balls and glue (use thin lines) to attach cotton balls to mountains. Students will use whole cotton balls closely placed or pulled cotton balls depending on what type of glacier (intact or melting).

Day 5

Have students write a story about their mountain/volcano as an extension lesson. The Teacher can choose what to have students include in the story: Name, history, location, last eruption, devastation etc.

Day 6.

Have Students present their projects to classmates or display to school.

## Annotated Bibliography

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(CK-12 is a good electronic source that allows teachers to assign whole class assignments on all science topics students can access this site through student net/schoolnet.)
3. Dillard, L. (Director). (2014). The Global Warming War man or Myth [Motion picture on DVD]. USA: South House Entertainment.  
(Great resource for climate changes and its relationship to global warming)
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5. Earth Science. (n.d.). Retrieved May 16, 2016, from <https://phet.colorado.edu/en/simulations/category/earth-science>  
(Great source for teachers and students to view simulations on Glaciers and the greenhouse effect.)
6. Earth Science simulations. (n.d.). Retrieved May 16, 2016, from <https://phet.colorado.edu/en/simulations/category/earth-science>  
(Great resource for visual simulations for students to view the greenhouse effect and glaciers.)
7. Emerich, R. (Director). (2004). The Day After Tomorrow [Motion picture on DVD]. USA: Twentieth Century Films.  
(Perfect movie to show students how climate changes could trigger the onset of an ice age)
8. Emmerich, R. (Director). (2010) *2012* [Motion picture on DVD]. USA: Sony pictures home entertainment.  
(Excellent movie for getting students to understand the destruction global warming could cause.)

9. Guggenheim, D. (Director), & David, L., Bender, L., & Burns, S. Z. (Producers). (2006). *An Inconvenient Truth* [Motion picture on DVD]. United States: Paramount Pictures Corp.  
(An excellent resource to use as an introduction to global warming, it will help establish a reference point for students)
10. Hmelo-Silver, C. E. (2004, September). Problem-Based Learning: What and How Do Students Learn? *Educational Psychology Review*, 16(3), 235-266.  
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(article on problem based learning good source for teachers to gain a better understanding of the benefits of PBL)
11. List of natural disasters in the United States. (2016, February 3). In Wikipedia, the Free Encyclopedia. Retrieved 13:49, February 23, 2016, from [https://en.wikipedia.org/w/index.php?title=List\\_of\\_natural\\_disasters\\_in\\_the\\_United\\_States&oldid=703016637](https://en.wikipedia.org/w/index.php?title=List_of_natural_disasters_in_the_United_States&oldid=703016637) ( This resource gives a detailed list of all natural disasters that have occurred in the USA since 1816)
12. Oxley, P., & Williams, G. (Directors). (2015). NOVA: Making North America [Motion picture on DVD]. USA: WGBH Foundation.  
(Great documentary that gives students insight of how North America was created).
13. Palfreman, J. (Director). (2007, 2008). Global Warming: What's up with the Weather [Motion picture on DVD].  
(Documentary that looks at global warming from the weather stand point)
14. Pashler, H.; McDaniel, M.; Rohrer, D.; Bjork, R. (2008). "Learning styles: Concepts and evidence" (PDF). *Psychological Science in the Public Interest* 9: 105–119.  
(A great source to begin understanding what learning style is and the argument behind the use in educational settings)
15. Taylor, M. (Director). (2005). Global Warming: The signs and the science [Motion picture on DVD]. USA. PBS HOME VIDEO.  
(Good source to use to help students understand the impact of Global warming)

## Appendices

### Appendix A

Will include picture of each DVD's and pictures of glaciers and natural disasters





## Appendix B: Pictures of Student Glacier projects



pictures description:

- 1 Beginning to build mountain/volcano model
- 2 Completed model of a mountain and glacier
- 3 Completed student models with background stories created by students (healthy Glaciers)
- 4 Melting Glacier Models
- 5 Homemade report stand
- 6 Close-up of student projects

## Appendix C Representation of melting Glaciers



Appendix D.  
Worksheets for above lesson adapted from Lesson Planet. All movie worksheets can be found on [movieworksheets.com](http://movieworksheets.com).

**Layers of the Atmosphere Activity**

Name \_\_\_\_\_ Block \_\_\_\_\_

**DIRECTIONS:** Write the labels for each layer of the atmosphere on the diagram. Add the pictures at the correct altitude. Use red and blue to color the temperature of each layer. Put an X where you live.

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 11 km	 6 km	 600 km	 400 km
 coldest layer	 3 km	 -1 km	 80 km
 hottest layer	 20 km	 surface	 80 km
Troposphere	Tropopause	Stratosphere	Stratopause
Mesosphere	Mesopause	Thermosphere	Thermopause
Exosphere	Ozonsphere	Ionosphere	

 11 km	 6 km	 600 km	 400 km
 coldest layer	 3 km	 -1 km	 80 km
 hottest layer	 20 km	 surface	 80 km
Troposphere	Tropopause	Stratosphere	Stratopause
Mesosphere	Mesopause	Thermosphere	Thermopause
Exosphere	Ozonsphere	Ionosphere	

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**Questions:**

- List the four main layers(\*) of the atmosphere and calculate their thicknesses:  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_
- Which of the four main layers is the thickest? \_\_\_\_\_  
 The thinnest? \_\_\_\_\_
- The four main layers(\*) of the atmosphere are separated by thinner layers called "Pauses." Describe the change that occurs in the pattern of atmospheric temperatures at the "Pauses." \_\_\_\_\_  
 \_\_\_\_\_
- At what elevation does the coldest temperature occur? \_\_\_\_\_  
 What name is given to this point in the atmosphere? \_\_\_\_\_  
 What is the temperature of this region? \_\_\_\_\_
- At what elevation does the hottest temperature occur? \_\_\_\_\_  
 What name is given to this point in the atmosphere? \_\_\_\_\_  
 What is the temperature of this region? \_\_\_\_\_
- Why are clouds generally observed to form only in the troposphere?  
 \_\_\_\_\_  
 \_\_\_\_\_

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## **Content Standards**

### **Next Generation Standards:**

HS-ESS2-2 Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.

HS-ESS2-4 Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.

HS-ESS3-1 Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

HS-ESS3-5 Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.

HS-ESS3-6 Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.

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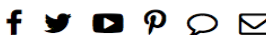
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English

**From:** Nichole Boyd [northwest232@icloud.com](mailto:northwest232@icloud.com)  
**Subject:** Re: Copyright Permission Request Letter  
**Date:** July 3, 2016 at 10:17 AM  
**To:** Aaron Weinberg [aweinberg@ithaca.edu](mailto:aweinberg@ithaca.edu)

NB

On Jun 17, 2016, at 11:25 AM, Aaron Weinberg <[aweinberg@ithaca.edu](mailto:aweinberg@ithaca.edu)> wrote:

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Please let us know if we can help in any other way.

Aaron

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Sincerely,  
Nichole S Boyd  
Science teacher  
John Bartram High School

Sent from my iPhone