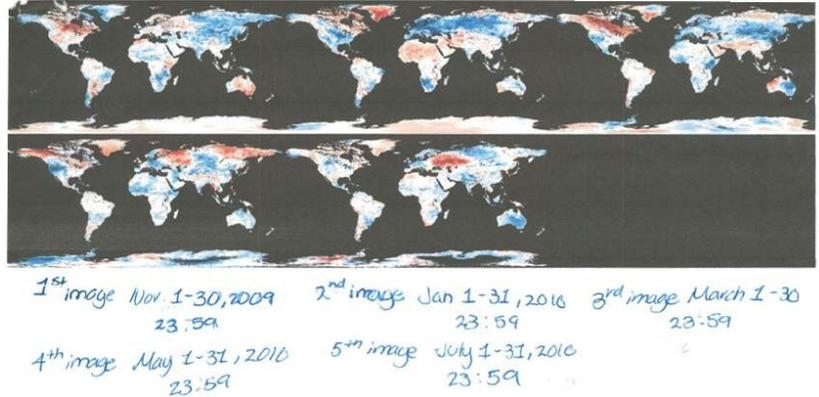


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Earth/Space Science secondary 8th grade

The goal of the Climate Change Unit is that by using NEO (NASA Earth Observations) satellite images and with the National Institute of Health's ImageJ software to animate these images, students will explore various aspects of climate change. From the montage of student selected images, students will write a report describing various areas of what they observe of climate change. From these individual student reports, student will discuss their findings. In teams the students will create a synthesis of the observed information, compare their findings to actual research and then develop a personal, community and global action plan relating to their areas of concern.



Materials

Internet access; Microsoft suite

1) NASA Earth Observations <http://neo.sci.gsfc.nasa.gov/Search.html>
NASA Earth Observations. The mission is to help individuals picture climate change and environmental changes happening on our home planet. You can search for and retrieve satellite images of Earth. Download them; export them to GoogleEarth; perform basic analysis. Tracking regional and global changes around the world just got easier

2) Image J <http://rsbweb.nih.gov/ij/download.html>
ImageJ is a public domain, Java-based image processing program developed at the National Institutes of Health. ImageJ was designed with an open architecture that provides extensibility via Java plugins and recordable macros. Custom acquisition, analysis and processing plugins can be developed using ImageJ's built-in editor and a Java compiler. User-written plugins make it possible to solve many image processing and analysis problems, from three-dimensional live-cell imaging to radiological image processing, and multiple imaging system data. ImageJ's plugin architecture and built in development environment has made it a popular platform for teaching image processing.

Problem

Since climate change is such an enigma without clearly define data parameters, the outcome is to have individual students investigate and discover for themselves changes in the global environment. By choosing one indicator students will gather satellite data, animate them, research specific areas observed based on their indicators, investigate what research is available and make a presentation about global climate change.

NOS STds

MS-ESS3-2. Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.

MS-ESS3-5. Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.

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.

MS-ESS2-5. Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.

MS-ESS2-6. Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

HS-PS3-1 Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.

ELA/Literacy -

WHST.6-8.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-ESS2-2)

SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-ESS2-2)

Cultural Relevance

Since climate change is such an enigma without clearly define data parameters, the outcome is to have individual students investigate and discover for themselves changes in the global environment. By choosing one indicator students will gather satellite data, animate them, research specific areas observed based on their indicators, investigate what research is available and make a presentation about global climate change.

Objectives:

- Examine data maps to look for patterns, relationships or differences that would explain variations in climate change.
- Use data maps of sea surface temperature, land surface temperature or sea & ice cover (various relationships of the spheres) to describe the driving factors behind climate change.
- Use online or productivity tools to recreate climate models and examine differences over time.
- Use real data to relate how various issues of climate change affect global health.
- Use real data to explain a research question of their choice.
- Learning with the technology means focusing on how the technology can be the means to learning ends across the curriculum. Technological literacy is required for learning with technologies to be possible, implying a two-step process in which students learn about the technologies before they can actually use them to learn. It is a blend of the traditional classroom enhanced with online materials.

Possible misconceptions (optional)

Have the students Think about the following and answer briefly:

1. What is climate?
2. How is climate studied?
3. What factors determine climate?
4. How has climate differed in the past?
5. What can cause climate to change?
6. Then Construct a concept map of their ideas about climate.

Design of Learning Environment

Using the blended learning model in which the traditional classroom is enhanced with online materials, students and teachers are able to pay a closer attention to the knowledge, skills, attitudes and beliefs that students bring with them to the classroom. This is a two-step process where students learn about the technologies and then use them to learn.

Lesson Section	Teacher and Student Activities (formative assessment throughout)	Key Questions
Engage	*Video collage of recent weather extremes *Video and audio collage of political people, scientists and general public making comments relative to these weather extremes and their causes.	<ol style="list-style-type: none"> 1. How do scientists know that recent climate change is largely caused by human activities? 2. CO2 is already in the

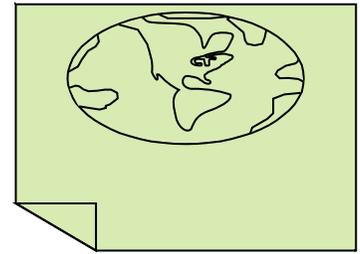
	<p>TEACHER</p> <p>Session 1: Introduce the students to NEO (NASA Earth Observations)</p> <p>Open the site: http://neo.sci.gsfc.nasa.gov/Search.html</p> <p>Demonstrate the various aspects of NEO</p> <p>How to choose a satellite image, data set, time period, how to save, view in Google Earth</p> <p>Show examples of change, demonstrate how to develop explanations</p>	<p>TEACHER:</p> <p>Session 2: Introduce the students to NIH ImageJ</p> <p>Download the site: http://rsbweb.nih.gov/ij/download.html</p> <p>Demonstrate the various aspects of ImageJ</p> <p>Demonstrate how to open save files (from NEO)</p> <p>Demonstrate how to stack the images and then animate</p> <p>Show examples of change, demonstrate how to develop explanations</p> <p>Demonstrate how to create a montage of the images</p>	<p>atmosphere naturally, so why are emissions from human activity significant?</p> <ol style="list-style-type: none"> 3. What role has the sun played in climate change in recent decades? 4. Is there a point at which adding more CO2 will not cause further warming? 5. Does the recent slowdown of warming mean that climate change is no longer happening? 6. If the world is warming, why are some winters and summers still very cold? 7. Why is Arctic sea ice decreasing while Antarctic sea ice is not?
Explore	<p>STUDENTS</p> <p>Allow students to work through NEO and begin to choose and save their images</p> <p>Requirements of the project: Choose at least 3 images (preferably 5) over a period of time. Ie: same month over 5 years, or several months in 1 year</p>	<p>STUDENTS</p> <p>Allow students to work through ImageJ and begin to animate and make a montage of their images.</p> <p>Requirements of the project: Animate image and then choose at least 5 major areas of the world and through conversation develop ideas and theories about the changes observed.</p>	<ol style="list-style-type: none"> 8. How fast is sea level rising? 9. Are climate changes of a few degrees a cause for concern?

	<p>Work on project</p> <ul style="list-style-type: none"> ◆ Using NEO decide on the data set desired to work on. ◆ Using NEO find and save the images ◆ Animate images and write notes of global changes ◆ Create a montage using ImageJ ◆ Rough draft out the global changes from the images ◆ Bring printed images and rough draft to class 	
<p>Explain</p>	<p>Using the animation, each group will share with the whole class their noted global changes related to the data set (images). (IE: Sea Surface Temperature changes in specific areas over a time period)</p> <p>Explain in a verbal then written form the change depending on the data set of the image.</p> <p>Related changes to the key questions.</p>	
<p>Elaborate</p>	<p>Each group creates a research paper and a multimedia or power point using the best images and research findings</p> <p>Develop a conclusion based on their findings and what the scientific community reports about the specific climate change (whether positive or negative impact).</p> <p>Final Requirements: After deciding on what changes are occurring globally based on the data set (images), students will research current various aspects of climate change as related to their data set (pros & cons).</p> <p>As part of their final research paper and multimedia presentation, each group needs to develop an action plan, design a mitigation project or any action to counteract the global climate changes they have found. Design something locally as well a globally. Relate back to the key questions</p>	
<p>Evaluate</p>	<p>Presentations</p> <p>In groups with similar data set of images</p> <p>Each member will take a part and share</p> <ul style="list-style-type: none"> The data set Global changes (positive and negative) What research states Their conclusion <p>The action plan or design</p> <p>The implementation of pre/post tests on knowledge of changes in climate. Students are assessed on performance such as</p>	<p>Have the students re-Think about the following and answer briefly:</p> <ol style="list-style-type: none"> 1. What is climate? 2. How is climate studied? 3. What factors determine climate? 4. How has climate differed in the past? 5. What can cause climate to change? 6. Then Construct a concept map of their ideas about

	<p>student-created products and/or construction of a response that demonstrates a skill or an understanding.</p> <p>Rubric Rubrics are designed for each aspect of the Unit.</p>	<p>climate.</p>
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Climate Change Report

SCORING GUIDE Research Paper



Student _____ Date _____

	TOTAL VALUE	PEER EVAL	TEACHER EVAL
CONTENT			
• 3-5 Images from NEO	5		
• Consistent data sets	5		
• Montage of images	5		
• 3-5 global areas change observed	5		
CREATION OF REPORT			
• Title (data set & time period)	3		
• Authorship information	3		
• Paragraphs for each global area	10		
• Key Questions addressed	5		
• Relevant / current research	10		
• Action Plan or Design	10		
ORGANIZATION			
• Text well written and ideas are presented in an organized manner	10		
• Logically presented	5		
• Presentation attractive	10		
• Writing convention followed	5		
QUESTIONS ANSWERED			
• Is information presented so anyone	5		

can understand it?			
<ul style="list-style-type: none">Does information change a person's point of view?	4		
TOTAL POINTS	100		
Grade			

