

Unit 4 Joyce Lee

Unit #4: Exploring the Key Indicators

INTRODUCTION

This unit can be taught independently or can be taught after Unit #3: Exploring Climate Change through Math (linear regression). In Unit #3 students looked at graphs provided by NASA and calculated linear regression equations to interpret the data (through the concept of slope) and used their equations to predict future data. It is important for students to have a more elaborate and in depth investigation regarding the key indicators that point towards climate change. This unit will revolve heavily on the key indicators of climate change as dictated by NASA data (from the website <http://climate.nasa.gov/keyIndicators/>)

- For background information - Unit 3 explored the linear regression lines of data off this website, but it is important to learn the reasons behind climate change from a scientific standpoint
- 1. Why does the amount of carbon dioxide concentration matter? So what if it is increasing?
- 2. Why does the global surface temperature matter? What difference does a few degrees make? (Can incorporate phenology in here too)
- 3. Why does the level of Arctic Sea Ice matter? So what if it's decreasing?
- 4. Why does the amount of land ice matter? Why does it matter if it's decreasing?
- 5. Why does the sea level matter? What impact will it have?

Big ideas that will be focused on include:

- What evidence do we have of a changing climate and why does it matter?

LESSON DURATION – at least 380 minutes (about eight 45 minute class periods)

- Engage: 20 minutes
- Explore: about 225 minutes to watch movie and for research
- Explain: 135 minutes
- Extend/Elaborate: Optional

EXPECTATIONS

Students will use system models and representations to explain how human activities significantly impact: (1) the geosphere, (2) the hydrosphere, (3) the atmosphere, (4) the biosphere, and (5) global temperatures

ESS3.C: Human Impacts on Earth Systems

- **Humans have become one of the most significant agents of change in the near-surface Earth system. Human activities have significantly altered the biosphere, geosphere, hydrosphere, and atmosphere.**

ESS3.D: Global Climate Change

- Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature

Students will generate and revise qualitative explanations from data for the impacts on Earth's systems that result from increases in human population and rates of consumption

Constructing Explanations and Designing Solutions

- **Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by**

multiple sources of evidence consistent with scientific knowledge, principles, and theories.

- Apply scientific reasoning to show why the data are adequate for the explanation or conclusion

RESOURCES (there are many options for resources, decide what is best to use for your classroom)

- NASA data (from the website <http://climate.nasa.gov/keyIndicators/> and <http://climate.nasa.gov/evidence/>)
- Film Choices
 - An Inconvenient Truth (great source of graphs and easy to understand illustrations)
 - The 11th Hour
- Online Articles that can serve as evidence of climate change. Some examples include:
 - Article on how animals are moving away from the equator: <http://www.naharnet.com/stories/en/13406>
 - Article on how increase in diseases are linked to climate change

<http://scienceinthetriangle.org/2010/04/rtp-researchers-help-track-diseases-linked-to-climate-change/>

Instructional Objectives

Students will be able to:

- Reflect on evidence presented through various data/articles
- Calculate a linear regression equation on their own (continued from Unit #3) off a graph or table if necessary as evidence
- Compose and apply scientific reasoning to draw a conclusion
- Research and find 3-4 articles that show evidence for climate change
- Develop a Prezi Presentation to share their findings

Engage (repeat at the end of the unit to see if there are differences) (15-20 minutes)

- Prompt Questions – ask students to write down their thoughts in a journal on the following questions:

1. What is climate change? Be specific
2. How do we know the climate is changing? (indicators in the real world?)
3. Do you believe in climate change?

- Read the Article: More Americans believe in climate change: poll

http://www.google.com/hostednews/afp/article/ALeqM5hXv72I7nx7ZTg_QuI3Ix1c3i3uXw?docId=CNG.dca855da9e6c393c07dda475a1590504.e41

- Class discussion – share thoughts on each question
- Record how many people believe, don't believe, not sure based off a show of hands or collect their papers to do privately

EXPLORE (Five 45 minute class periods or two/three 90 period block periods)

- Show the film *An Inconvenient Truth* or *11th Hour* and have students reflect on the film in their journal. Did this film change their view? Why or why not? What questions did this film answer for you? What questions do you still have? Is this a convincing piece of science or is it political? Why do you think this film is controversial? What is the inconvenient truth?
- The main purpose is to hear about how climate change/global warming can affect the environment to give students an idea of what to search for in the online articles they need to find. For example, the film will explain how polar bear population is declining so students can find articles specifically on the current status

of polar bear populations.

- Introduce/review the NASA data and have students reflect on their observations. Have they noticed any observations about indicators or evidence such as more reports of extreme weather?
 - <http://climate.nasa.gov/keyIndicators/>
 - <http://climate.nasa.gov/evidence/>
- Share two examples of online journal articles that result from climate change
 - Article on how animals are moving away from the equator: <http://www.naharnet.com/stories/en/13406>
 - Article on how increase in diseases are linked to climate change

<http://scienceinthetriangle.org/2010/04/rtp-researchers-help-track-diseases-linked-to-climate-change/>

- Give students 2 class periods to research on their own to find 3-4 different journal articles of things happening in the world as a result of climate change. Examples:
 - What is happening with the polar bear population?
 - Any strange migration patterns of ocean creatures?
 - Mass animal ocean deaths? What was the cause?
 - Extreme weather – has there been an increase in the number of hurricanes or tornados?
 - Are other diseases making a comeback because it's getting too hot?
 - Reports of Malaria cases traveling further from the equator. Why?
- They need to write a reflection in their journal on each article and their findings. Things to include:
 - Summary of the article
 - What is the reason behind your event?
 - What happens if it continues (make a prediction)?
 - What can you do to help/stop?
 - How does this affect your opinion on climate change?

EXPLAIN(3, 45 minute class periods)

- Give students a class period to learn how to use Prezi and have them put their journal article information into a presentation
- Share presentations to the class
- Prompt Questions (repeat) – ask students to write down their thoughts in a journal on the following questions:
 1. What is climate change? Be specific
 2. How do we know the climate is changing? (indicators in the real world?)
 3. Do you believe in climate change?
 4. How has your opinion changed before conducting your research?

EXTEND/ELABORATE

- Have students put their journal articles/summaries on a tri-fold board and have an open house poster session where students can be available to the wider school community to share their findings

EVALUATE

- Prezi/Presentation of their findings