

Colleagues,

We are happy to announce this new free education resource.

Environmental Literacy and Inquiry (ELI) Climate Change: <http://www.ei.lehigh.edu/eli/cc/>

Climate Change is a technology-supported middle school science inquiry curriculum. This curriculum focuses on essential climate literacy principles with an emphasis on weather and climate, Earth system energy balance, greenhouse gases, paleoclimatology, and how human activities influence climate change. Students use geospatial information technology tools (Google Earth), Web-based tools (including an interactive carbon calculator and geologic timeline), and inquiry-based lab activities to investigate important climate change topics. Climate Change is aligned to the Essential Principles of Climate Literacy in addition to national science and environmental education standards.

ELI is sponsored in part by the Lehigh Environmental Initiative. This material is based upon work supported by the Toyota USA Foundation.

Assessments for each learning activity are available using the following login and password:

**Login: eliteacher**

**Password: 87dja92**

The curriculum begins with an investigation using Google Earth to explore global temperature changes during a recent 50 - 58 year period. Students explore, analyze, and interpret climate patterns of 13 different cities, and analyze differences between weather and climate patterns. Next, students are introduced to the four main Earth spheres (atmosphere, lithosphere, hydrosphere, and biosphere) and explore the structure and composition of the atmosphere with an emphasis on greenhouse gases and the role that ozone plays in the troposphere and stratosphere.

Students explore and investigate concepts pertaining to Earth system energy balance including albedo, and surface and atmospheric absorption and reflection. In the next learning activity, students use Google Earth to determine how latitude, elevation, proximity to bodies of water, and mountain ranges affect a location's climate.

Next, student learning activities focus on the carbon cycle and the importance of greenhouse gases in our atmosphere. Students also learn about paleoclimatology and complete a paleoclimate reconstruction lab in which they reconstruct past climates using lake varves as a proxy to interpret long-term climate patterns and understand annual sediment deposition and how it relates to weather and climate patterns. Students then use a Web-based geologic timeline to examine temperature, CO<sub>2</sub> concentration, and ice cover data to investigate how climate has changed during the last 715 million years.

Students use a Web-based carbon calculator to determine their carbon footprint and examine their personal and household habits and choices in relation to their carbon footprint. Next, students use Google Earth to investigate geographical areas and populations affected by recent changes in climate patterns.

In the culminating investigation, students use Google Earth to explore evidence of climate change during 1980 – 2010 including changes in Arctic Sea ice extent and changes in the distribution of coral reefs in the Caribbean Sea. They then use Google Earth to explore future world scenarios by examining the effects of a 2-meter rise in sea level on the existing landscape. Students then explore strategies at personal and societal levels to help reduce atmospheric carbon emissions levels.

Select learning activities with direct Web address links:

Investigating Weather and Climate with Google Earth

<http://www.ei.lehigh.edu/eli/cc/sequence/day2.html>

Students use Google Earth to explore global temperature changes. They use Google Earth to determine how the temperature of the Earth has changed during a recent 50 - 58 year period. They also explore, analyze, and interpret climate patterns of 13 different cities, and analyze differences between weather and climate patterns.

Atmospheric Gases

<http://www.ei.lehigh.edu/eli/cc/sequence/day4.html>

Students explore the variety and ratio of compounds and elements that make up the Earth's atmosphere. At the completion of this learning activity, students will understand volumetric measurements of gases in the atmosphere and visually depict the composition of the atmosphere.

Greenhouse Effect Lab

<http://www.ei.lehigh.edu/eli/cc/sequence/day11.html>

Students understand the importance of greenhouse gases in our atmosphere and that excess CO<sub>2</sub> intensifies the greenhouse effect.

Paleoclimate Reconstruction Lab

<http://www.ei.lehigh.edu/eli/cc/sequence/day13.html>

In this lab investigation, students reconstruct past climates using lake varves as a proxy. They explore the use of lake varves as climate proxy data to interpret long-term climate patterns and understand annual sediment deposition and how it relates to weather and climate patterns.

Interactive Geologic Timeline Activity

<http://www.ei.lehigh.edu/eli/cc/sequence/day15.html>

In this learning activity, students use a Web-based Geologic Timeline to understand how the climate has changed in the last 715 million years. They examine temperature, CO<sub>2</sub> concentration, and ice cover data to investigate how climate has changed during the last 715 million years; understand that long term climate patterns provide evidence for fluctuating CO<sub>2</sub> concentrations; and record and analyze a long-term global climate data set.

Carbon Calculator Activity

<http://www.ei.lehigh.edu/eli/cc/sequence/day16.html>

In this learning activity, students use a Web-based carbon calculator to determine their carbon footprint. Students examine their personal and household habits and choices in relation to their

carbon footprint; identify which personal activities and household choices produce the most CO2 emissions; compare their carbon footprint to the U.S. and global averages; and identify lifestyle changes they can make to reduce their footprint.

Investigating Climate Hot Spots with Google Earth

<http://www.ei.lehigh.edu/eli/cc/sequence/day17.html>

Students use Google Earth to investigate areas affected by climate change.

Investigating Future Worlds with Google Earth (Part 1)

<http://www.ei.lehigh.edu/eli/cc/sequence/day18.html>

Students use Google Earth to explore evidence of climate change during 1980 - 2010. They use Google Earth to explore changes in the extent of Arctic Sea ice over a recent 30-year period, explore changes in the distribution of coral reefs in the Caribbean Sea, and understand that climate change will continue to affect our planet into the future.

Investigating Future Worlds with Google Earth (Part 2)

<http://www.ei.lehigh.edu/eli/cc/sequence/day19.html>

Students will use Google Earth (version 5.2 or higher needed) to explore the effects of a 2-meter rise in sea level on the existing landscape. Students use the Google Earth elevation profile tool to understand the effects of sea level rise in 5 low lying coastal areas and explore changes in sea level in the Chesapeake Bay region.

Regards,

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