Carbon Dioxide and the Greenhouse Effect: A Problem and a Challenge

The greenhouse effect is a natural process by which thermal radiation from the sun is absorbed by atmospheric greenhouse gases (such as carbon dioxide, CO₂) and is re-radiated in all directions. This process warms our planet, allowing all life forms to inhabit it.

Carbon sequestration technology is an emerging area of research that is rarely presented in the current middle and high school curriculum. This poster complements a concurrent lecture at HASTI (Kevin Ellett and Cristian Medina) and presents three objectives:

1. To introduce the topic of geologic carbon sequestration as a promising area of research for the mitigation of global warming;
2. To show how this technology draws from different science disciplines (e.g., earth science, physics, chemistry, and mathematics) and thus offers new opportunities for science education;
3. To present skills that students can learn by studying this technology, such as the use and display of quantitative data and the use of online resources to perform literature searches.

Possible Solutions

Energy efficiency is key to reducing energy use, and therefore reducing emissions and the effects of climate change. Energy efficiency can be achieved in many ways, including:

- **Renewable Energy**: Using solar, wind, and geothermal energy sources, which are renewable and do not produce greenhouse gases.
- **Energy Efficiency**: Improving the efficiency of existing energy systems, such as by installing more efficient lighting and appliances.
- **Carbon Sequestration**: Capturing and storing carbon dioxide from the atmosphere, which can be done through various methods, such as planting trees or using technology to capture CO₂ directly from the air.

Have you heard of Stabilization Wedges?

Stabilization Wedges are a conceptual tool for understanding the emissions cuts that can be made to slow global warming. They are based on the idea of a stabilization triangle, which is a graphical representation of the emissions cuts needed to keep global warming below a certain level. The triangle includes three wedges, each representing a different strategy for reducing emissions:

1. **Avoiding Emissions**: This wedge includes strategies for reducing emissions by avoiding the use of fossil fuels, such as by using renewable energy sources or improving energy efficiency.
2. **Enhancing Removal**: This wedge includes strategies for removing carbon dioxide from the atmosphere, such as through the use of carbon capture and storage technology.
3. **Enhancing Sequestration**: This wedge includes strategies for enhancing the natural processes that remove carbon dioxide from the atmosphere, such as by planting forests or using biotechnology.

Opportunities in the Classroom

- **Understand Carbon Cycle and Greenhouse Effect**
- **Read Critically (blogs, webpages, etc.)**
- **Interpret Graphs and Tables, Understand Physical and Chemical Processes, as well as dealing with Conversion of Units**
- **Relevance of Carbon Capture and Storage (CCS) helps promote Science Literacy and the ‘Big Ideas’**

**What is Earth Science Literacy?**

Earth Science Literacy is an understanding of Earth, Earth Science Literacy Principles are defined by the scientists who carry out active research in many areas of Earth science and explain the complexities of how our planet works.

For more information about Earth Science Literacy, please visit [EarthScienceLiteracy.org](http://www.earthscienceliteracy.org).

**Excellent opportunity for Integrated Units, including:**

- Social Studies (economics, sociology, government)
- English (speech and communication, composition)

**Useful Links:**

- Department of Energy, [http://www.energy.gov](http://www.energy.gov)
- National Energy Technology Lab (DOE/NETL), [http://www.netl.doe.gov](http://www.netl.doe.gov)
- Interagency Panel on Climate Change (IPCC), [http://www.ipcc.ch](http://www.ipcc.ch)