EXPLORING GLOBAL CLIMATE CHANGE THROUGH PROBLEM-BASED LEARNING

Laurie F. Ruberg, Ph.D., PI
Manetta Calinger, Curriculum Writer
Chuck Wood, Ph.D., Lead Scientist,
Cassie Lightfritz, Graphic Designer

Center for Educational Technologies
Wheeling Jesuit University, Wheeling, WV
Goals and Objectives

1. Build on existing Exploring the Environment problem-based learning (PBL) modules.
2. Recruit from a large body of teachers who are interested in this topic and approach.
3. Apply the recommendations from evaluation of previous projects and related research to the development of the new climate change PBL modules.
4. Organize a team with complementary skills and experience to design and develop effective resources for teaching and learning about global climate change.
5. Use existing NASA as well as other scientifically valid resources to support the study of global change.
Content

- Global Temperatures
- Drought
- Human Health Effects
- Ice Caps and Sea Levels
- Volcanoes
- Biodiversity
Map of project features on the web

- Scenario
- Overview
- Scaffolding
- Satellite Images
- Featured Data
- Related Links
- Physical Evidence
Scaffolding

- A structure added to support learning
- An introduction to the relevant global climate concepts with annotated links to data sources for further research
- Guidance for using the Earth system science process of analysis as part of the problem-solving process

For example, in Ice Caps and Sea Levels, students have access to a presentation titled, The Connection Between Ice Sheets, Sea Levels, and Climate Change, and exemplary data such as the chart shown below, Small Glacier and Ice Cap Contribution to Sea Levels.

![Small Glacier and Ice Cap Contribution to Sea Levels](chart.png)

Reference: The National Snow and Ice Data Center [http://nsidc.org/sea_level.html](http://nsidc.org/sea_level.html)
Global Temperature Trends

The record of global average temperatures compiled by NASA's Goddard Institute for Space Studies. The "zero" on this graph corresponds to the mean temperature from 1961-1990, as directed by the Intergovernmental Panel on Climate Change (IPCC).

Credits

Image created by Robert A. Rohde/ Global Warming Art.


Designing Cognitive Scaffolds for Web-based Problem-based Learning

**Inputs**
- Ill-structured problem

**Five functional characteristics:**
- Triggers interest
- Stimulates critical reasoning
- Promotes self-directed learning
- Stimulates elaboration
- Promotes teamwork

**Five feature characteristics:**
- Problem format
- Clarity
- Familiarity
- Relevance
- Learning issues

**Cognitive Support**
- Question Prompts
  - Expert Scaffolding via Technology Tools
    - Peer Review
  - Reflections and Revisions
  - Self-regulation and Transfer

**Outputs**
1. Read and analyze the problem scenario.
2. List hypotheses, ideas, or hunches.
3. List what you already know.
4. List what is unknown.
5. List what needs to be done.
6. Develop a problem statement.
7. Gather information.
8. Present findings.
Modifications based on pilot testing

Built-in support for teachers based on teacher requests and to reinforce instructional goals:

**Teacher Resources**
- Overview
- Teacher introduction
- Prep checklist
- The PBL model
- Learning in teams
- Developing rubrics
- Assessment

- Assessing behaviors
- Planning and facilitating
- Comparing approaches
- Table of environmental effects
- Classroom options
- Making it local

**Additional Module: Biodiversity**

**Registration** – required for access to teacher pages for each module
# Web Analytics

![Graph](image)

## Extended Time Stats
- **Unique visitors**: 795,030
- **Page views**: 1,306,851
- **Pages per visit**: 1.64
- **Bounce rate**: 69%
- **Avg. Visit duration**: 2:31
- **New Visitors**: 86%
- **Demographics**: 49% (US)

## Extended Time Stats
- **Unique visitors**: 72,290
- **Page views**: 211,134
- **Pages per visit**: 2.50
- **Bounce rate**: 39%
- **Avg. Visit duration**: 10:28
- **New Visitors**: 43%
- **Demographics**: 89% (US)

## Initial Stats
- **Unique visitors**: 316
- **Page views**: 6,166
- **Pages per visit**: 8.45
- **Bounce rate**: 80%
- **Avg. Visit duration**: 1:31
- **New Visitors**: 91%
- **Demographics**: 92% (US)

## Most recent Stats
- **Unique visitors**: 23,864
- **Page views**: 45,881
- **Pages per visit**: 1.73
- **Bounce rate**: 62%
- **Avg. Visit duration**: 1:32
- **New Visitors**: 93%
- **Demographics**: 87% (US)

## Peak Day Stats
- **Unique visitors**: 707
- **Page views**: 1,683
- **Pages per visit**: 2.28
- **Bounce rate**: 73%
- **Avg. Visit duration**: 2:31
- **New Visitors**: 93%
- **Demographics**: 93% (US)

## Peak Day Stats
- **Unique visitors**: 496
- **Page views**: 1,539
- **Pages per visit**: 2.59
- **Bounce rate**: 73%
- **Avg. Visit duration**: 2:31
- **New Visitors**: 79%
- **Demographics**: 90% (US)
Teacher Registrations: 511 from 46 states

Schools participating in ETE-GCC

- 20-45 Registrations
- 10-19 Registrations
- 0 Registrations
Partnerships

• NASA Innovations in Climate Education (NICE)
• Tri-Agency Climate Education Catalog (TrACE)
• Trillium Associates – Evaluator
• GLOBE – Certified as GLOBE teacher trainer
• Earth System Science Education Alliance (ESSEA) associate member
• USGS Climate Education resources and training activities
• Green Schools Initiative
• Sustainable Learning Systems
• Wheeling Area Community Energy Program
Chuck Wood, Ph.D.
Executive Director
Center for Educational Technologies
Wheeling Jesuit University, Wheeling, WV 26003
Email: chuckwood@cet.edu

Contact Us on NASA TALK

Exploring Global Climate Change
Collaborative and Blog at:
http://www.nasatalk.com/blog/list/bylines/133-eteglobal-climate-change.html OR
Email: ETE-GCC@cet.edu

Laurie Ruberg, Ph.D.
ETE-GCC, PI & Associate Director
Center for Educational Technologies
Wheeling Jesuit University, Wheeling, WV 26003
Email: lruberg@cet.edu
Tel: 304-243-2480

Manetta Calinger
Curriculum Writer II
Global Climate Change
Center for Educational Technologies
Wheeling Jesuit University
Wheeling, WV 26003
mcalinger@cet.edu
(304) 243-4323