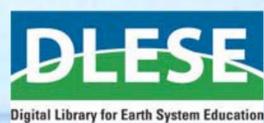


Development and Gap Analysis of Climate Change Educational Resources Collection for K-12



Overview

Creating premier digital collections for specific scientific topics is a challenge. The issue is important because teachers are increasingly supplementing traditional classroom materials such as textbooks with information, lesson plans and activities from the World Wide Web. Unlike texts and other edited materials, resources found on the web may not go through rigorous editing procedures. Moreover, the sheer number of available sites makes it time consuming and often frustrating for teachers to find scientifically accurate materials that are usable in a classroom.

The DLESE Climate Change project, funded through NSF grant EAR-0435645, brought together three middle school teachers, an atmospheric scientist and a cognitive scientist to create a tool for evaluating and selecting digital resources. The team members then applied this tool (called a rubric and nicknamed "scorecard" by review team) to select materials.

The DLESE Climate Change project found that evaluating resources with this tool involved a time commitment incommensurate with the goals of the project. A simplified rubric allowed reviewers to cover more material and resulted in a collection that embodied high quality and usable resources.

Issues raised by this selection model include the transferability of the rubric to other reviewers and the role of differential expertise in the review process. Simplifying the rubric involves a trade-off. An easier to use rubric allows community members with limited time to review a greater number of resources. However, simplified rubrics provide only limited information about the exact basis of quality judgments to others wishing to participate in the review process independently. The basis for making judgments about what is, and is not a good resource, while shared among the team members through discussions during meetings, may not be evident to those outside of the team.

Differential expertise and experience was also an issue because of the importance of assuring that resources are scientifically accurate and usable in the classroom. While many resources fit both of these important criteria, the climate scientist on the project performed double duty reviewing each resource for accuracy.

F. Niepold,
NOAA, Climate Program Office
M. McCaffrey,
CIRES, University of Colorado



<http://serc.carleton.edu/climatechange/>

Steps in Developing the Climate Change Collection

- 1) Recruit the interdisciplinary review team (Climate scientist, teachers, learning researcher, evaluator)
- 2) Review prior collection efforts, including scope statements and rubrics
- 3) Develop scope statement and rubric (scorecard); test and fine tune scorecard
- 4) Develop framework of key concepts relating to climate change and variability
- 5) Identify and review high quality resources relating to climate change
- 6) Review reviews with team and agree on what to include in collection
- 7) Compile reviews in summary and link to Climate Change Collection homepage (in progress)
- 8) Publicize and Market Climate Change Collection

Key Lessons Learned

- 1) Fully analytic rubrics (e.g. CRS) may be burdensome for reviews to use because they are time-consuming and difficult to fill out. More holistic rubrics than the CCC scorecard can be used but the results may produce a less transferable and reliable assessment system.
- 2) Getting teachers and scientists together to search and rate resources is a good model because they are a captive (and compensated) audience.
- 3) Scientific accuracy is the most important criterion for judging resources. In the future, at least two scientists should be involved in the review teams.
- 4) The searching and rating functions should be separated
- 5) High standards should be set from the outset.

Filling The Climate Knowledge Gap

- 1) Initiate a comprehensive review of all new products not represented in the Climate Change Collection using the revised collection process.
- 2) Align the Climate Change Collection with National Standards and Project 2061 Benchmarks for Science Literacy
 - Misconceptions & General Information
 - Timescales of Weather and Climate, Climate Variability, Greenhouse Effect, Energy Balance, & Abrupt Climate Change
 - Carbon & Carbon Calculator
 - Regional Impacts, Social Impacts, Health & Policy
- 3) Expand the Climate Change Collection process to the Climate Literacy efforts currently underway by NOAA's Climate Program Office and National Standards and Project 2061 Benchmarks for Science Literacy's Weather and Climate Next Generation of Curriculum and Assessment Material.

IDENTIFY RESOURCE

The screenshot shows a Firefox browser window with the URL http://www.ucar.edu/learn/1_3_2_131.htm. The page title is "Activity 13 Teacher Guide: What Factors Impact a Greenhouse?". The page content includes a navigation menu with "Background", "Learning Goals", "Standards", "Procedure", "Assessment Ideas", and "Alternative Learners". The main heading is "What Factors Impact a Greenhouse?". Below the heading, there is a paragraph of text and a "Background" section that begins with "The earth's atmospheric 'greenhouse effect' is much more complex than the simple greenhouse experiment described in Activity 12. While the earth's temperature is dependent upon the greenhouse-like action of the atmosphere, the amount of heating and cooling are strongly influenced by several factors."

SWIKI USED TO COORDINATE REVIEWS

The screenshot shows a Swiki page with the URL <http://cybele.colorado.edu:8080/ClimateChange/1/>. The page title is "Resources that will be included in collection". The content is organized into sections: "Misconceptions" (listing "Children's Misconceptions about Weather: A Review of the Literature"), "Sites covering many topic areas" (listing "NOAA Paleo Perspective on Global Warming", "UN Vital Climate Graphics", "BBC Planet Under Pressure", "Kornland Science Museum Global Warming Exhibit"), "Natural Climate System" (with sub-sections "1A) Difference between weather and climate", "1B) Sun's Energy and Earth's Energy Balance", and "1C) Greenhouse Effect").

Carrie Morrill is a climate research scientist at NCAR



CLIMATE CHANGE COLLECTION SCORECARD

The screenshot shows a "CLIMATE CHANGE COLLECTION SCORECARD" for the resource "What Factors Impact a Greenhouse?". The reviewer is Carrie Morrill. The scorecard includes fields for "Name of resource", "Sponsoring Organization", "Overall Recommendation", "Average Review Ratings", "Description", "Intended use", "Summary of Reviews", "Comments", "Intended audience", "Summary of Reviews", "Comments", "Intended audience", "Summary of Reviews", "Comments", "Intended audience". The "Overall Recommendation" is "Yes with some reservations" and the "Average Review Ratings" are "★★★★☆". The "Description" states: "This activity has students use a model to investigate factors in greenhouse heating and cooling. Forests, grasslands, ocean surfaces, ice caps, deserts, and cities all absorb, reflect, and radiate radiation differently affecting the heat-trapping ability of a greenhouse, explain the factors important in the atmosphere temperature." The "Intended use" is "Non-computer activity" and the "Intended audience" is "Educator and Learner".

SCORECARD RUBRIC USED BY REVIEWERS

SUMMARY REVIEW COMPILED

Reviewer: Kirsten Butcher
Comments: Well-made graphics illustrating experimental design. VISUAL APPEAL (WEAK TO STRONG) 1 2 3 4 COMMENTS: Nothing fancy, but it has a clean design and appealing graphics. TEACHING TIPS: RECOMMENDATION: Correct statements about albedo influencing the heat-trapping ability of a greenhouse.

FINALIZE COLLECTION

The screenshot shows the "Climate Change Collection" website. The page title is "Climate Change Collection" and the URL is <http://serc.carleton.edu/dev/climatechange/resour>. The page content includes a "Browse Top Resources" section with a list of resources: "1. Natural Climate System", "1. Sun's Energy", "2. Energy Balance (including albedo)", "3. Greenhouse Effect (Basic physics involved)", "4. Abrupt Climate Change", "5. Carbon Cycle", "2. Human Impacts (Anthropogenic Forcing)", "1. Causes", "1. Burning fossil (buried solar) energy (70%)", "2. Land cover changes (30%)", "2. Potential Impacts", "1. Temperature", "2. Sea Levels", "3. Vegetation", "4. Other and unknowns", "3. Calculators (measuring/modeling impacts)", "4. Policy".



Robert Croft is a science teacher at Broomfield Middle School

Contact:
frank.niepold@noaa.gov or
mark.mccaffrey@colorado.edu