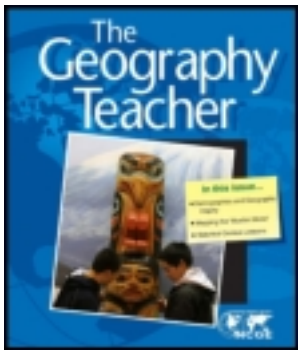

The Geography Teacher
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/rget20

Teaching About Global Climate Change

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Available online: 31 May 2011

To cite this article: Susan Gallagher Heffron & Kharra Valmond (2011): Teaching About Global Climate Change, The Geography Teacher, 8:2, 91-95

To link to this article: http://dx.doi.org/10.1080/19338341.2011.571154

The Geography Teacher 8 (2): 91–95, 2011

ISSN: 1933-8341 print/1752-6884 online
DOI: 10.1080/19338341.2011.571154

ARTICLE

Teaching About Global Climate Change

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Students are exposed to many different media reports about global climate change. Movies such as *The Day After Tomorrow* and *Ice Age* are examples of instances when movie producers have sought to capture the attention of audiences by augmenting the challenges that climate change poses. Students may receive information from a wide range of media sources since climate change is currently a popular topic. Some of these are sensationalized without documentation or evidence. Some are based solely on the imaginations of screenwriters. This can easily leave students, as well as the general public, wondering what the truth is about global climate change. Average global temperatures on Earth are increasing. Sea level is rising. Sea ice in the Arctic is decreasing. Sea surface temperatures are increasing and contributing to more intense tropical storms. Is it time to panic? No. Is it time to educate and plan? Yes.

Cut through the hype and get straight to the facts about global climate change.

The media messages are varied and can be confusing to students. The facts and evidence do not have to paint a grim future for students, however, and teachers will play an important role in helping students understand the basic climate and Earth science that informs the study of climate change. A new online professional development resource, *Teaching About Global Climate Change*, is now available to help teachers prepare for teaching this material in their classrooms.

''The facts and evidence do not have to paint a grim future for students [. . .] and teachers will play an important role in helping students understand the basic climate and Earth science that informs the study of climate change.''

The Association of American Geographers (AAG) received a National Aeronautics and Space Administration (NASA)-sponsored Global Climate Change Education grant to produce two online professional development modules. The modules are designed to provide background knowledge about global climate change to K–12 in-service and undergraduate pre-service teachers to assist them in preparing to teach the topic. This project, developed in partnership with Denver Public Schools, seeks to enhance classroom instruction and student learning by providing a range of online resources. There are two modules, one focusing on Antarctic and Arctic regions for middle school teachers and a second focusing on climate change evidence and informed decision-making for high school teachers (see Figure 1). After completing a brief registration, teachers may decide to use one or both of these online modules to support their professional development.

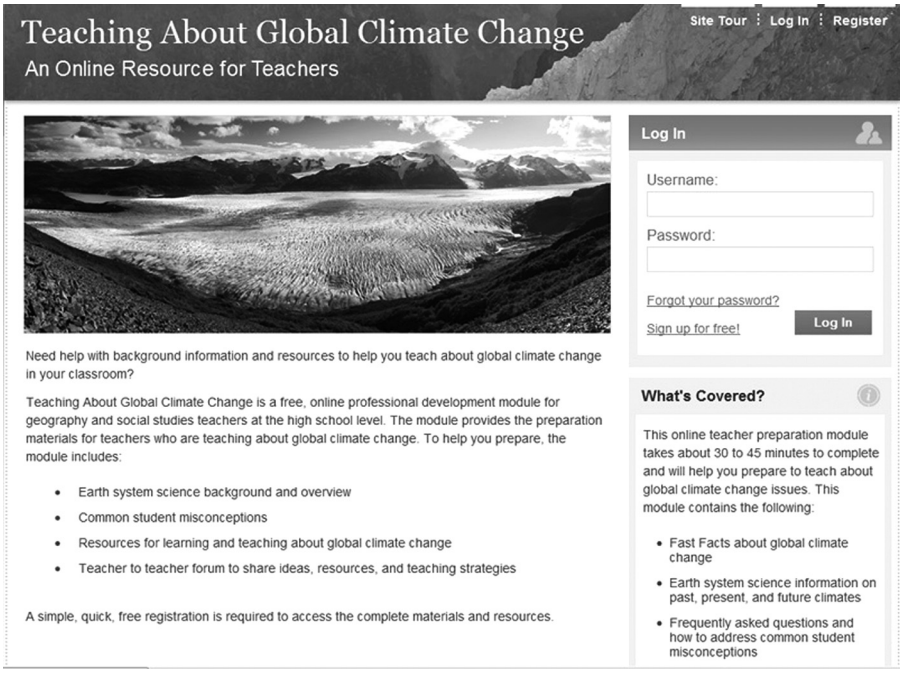

Figure 1. High school module.

On the first visit to the site, teachers are asked to complete a "fast facts quiz" which consists of ten questions related to the current research findings in climate change. If teachers only answer the ten questions and review the feedback provided by the module, they will get a great overview of the issues and topics in the study of global climate change today. The online resource includes necessary background information on climate and Earth systems science to help teachers better understand the current research findings in this field. Online resources include interactive NASA and the National Oceanic and Atmospheric Administration (NOAA) Web sites that demonstrate scientific findings of melting Antarctic ice sheets and the warming of oceans, in addition to a wealth of material on paleoclimatology, Intergovernmental Panel on Climate Change (IPCC) Reports, and on reducing human carbon footprints using mitigation and adaptation strategies.

Dr. Margret LeMone, Senior Scientist Emerita at the National Center for Atmospheric Research currently serves as the project's scientist advisor. Her contributions include review of the materials presented as well as answers in the FAQs and Common Student Misconceptions sections of the modules. Teachers can "shop" for other online resources in the "Resource Portal" and have their selected "resource shopping list" e-mailed directly to their inbox for future access. The resources include visualizations, animations, images, and information from reliable climate-related Web sites such as NASA, NOAA, and Climate Central. Teachers can share ideas, teaching strategies, and resources with other teachers in the "Teacher-to-Teacher Forum." All of these components are designed to support teachers in their efforts to teach about global climate change in the classroom.

WHY TEACH GLOBAL CLIMATE CHANGE?

Global climate change has implications for both physical geography (landscapes, water cycle, coastlines, etc.) and human geography (food security, migrations, health, etc.).

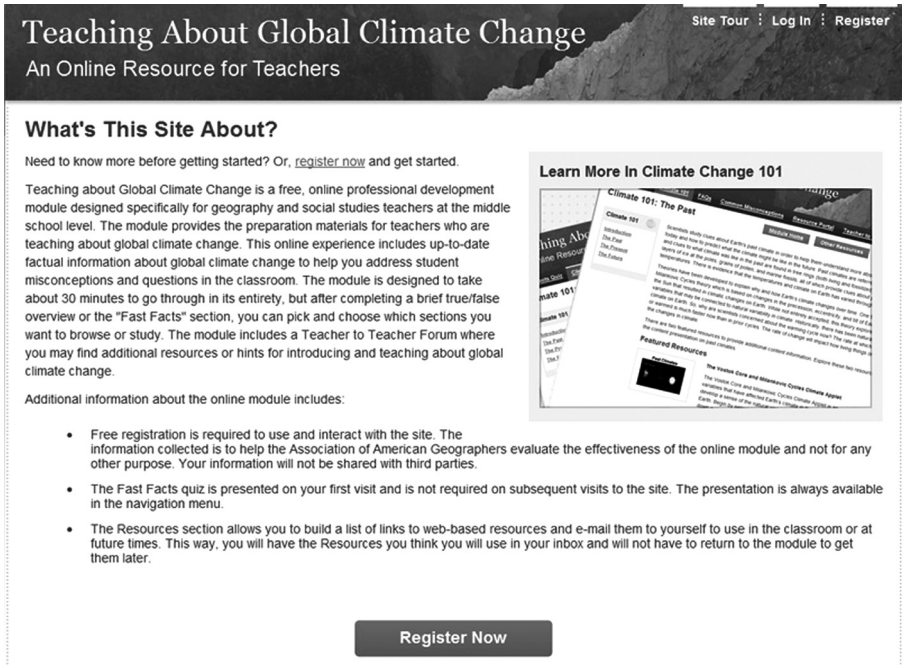

Figure 2. Registration window.

The topic is connected specifically to five of the National Geography Standards in *Geography for Life*. Standards 7, 8, 14, 15, and 18 provide the basis for geographic questions which may address the global climate change content. Scientists have found that the planet is warming at a faster rate than at any other period in the last 650,000 years, but what are the implications for its inhabitants? Discussing current issues and events in a classroom setting can be quite stimulating, and key to raising students' awareness of the challenges and benefits that may result from a changing climate. It can however, be a daunting task considering that some topics may be accompanied by controversy and questions. Teaching about global climate change in your school may be a "hot" topic (pardon the pun). How can teachers effectively teach about global climate change and avoid the controversy that abounds in the media?

''How can teachers effectively teach about global climate change and avoid the controversy that abounds in the media?''

- Teachers can help steer students away from overreacting to alarmist positions by using current evidence or fact-based information. Students may need help in remembering that science fiction, or fictional movies or films are produced for entertainment purposes and are not factual documentaries.
- Teachers can challenge students to be critical consumers of information by teaching them how to differentiate statements of fact from opinions and then to "fact check" these statements to see if there is valid and reliable evidence or research supporting certain claims and statements.
- Teachers can explain the nature of the scientific method in studying Earth systems and can help parents and students understand that there are many variables that are considered in climate change research.

Occasionally, students can get caught up in the doom and gloom media reports on climate change and express fears or worries at home. These reports often form the basis for emotionally charged debates about whether or not teachers should teach this topic in their classrooms. Parents who are not prepared to answer their child's questions or explain the science of climate change may try to avoid having their student exposed to the topic in school. Concern expressed by just a few parents can

''Addressing student questions and concerns from an evidence-supported and nonemotional position is an effective way of responding in the classroom''

result in teachers and administrators making decisions about whether or not to include the topic in lessons or discussions in their schools. Addressing student questions and concerns from an evidence-supported and nonemotional position is an effective way of responding in the classroom. In the event that situations like this arise, teachers can rely on the scientific evidence for climate change to present both the benefits as well as the challenges that may impact different places and regions.

Change: To become different; to undergo a modification of; to undergo transformation, transition, or substitution (Merriam-Webster 2011). These definitions of change remind us that change does not denote or imply any sense of good or bad outcomes, but merely that things will be different. It is helpful when teaching about global climate change to keep this in mind. Change in many forms is a constant for the dynamic planet on which we live. Global climate change will be different in various places and regions throughout the world. Some areas on the planet could benefit greatly from a changing climate. Others may find new challenges and different locations have differing abilities to mitigate or adapt to these changes which influences their perceptions of the seriousness of the consequences of the changes. The predictive climate models most often address the uncertainty in the model by showing the outputs in a range of possible outcomes and identifying variables that may impact the results. Consensus among climate scientists involves looking at many different climate models to predict future patterns rather than only one model. The variability in possible impacts provides an excellent opportunity for inquiry-based studies by students. They can conduct "place-based" analyses of changes in climate at their location over time to develop a sense of both physical and human changes that are evident at the location today.

Teaching about global climate change provides an excellent opportunity for an interdisciplinary approach since the subject involves study by researchers from almost every scientific field. A Denver Public School teacher provided the following observation as a part of the module review, "I also like that the links make information available for science, math, and social studies—great for interdisciplinary units." Students therefore, have to employ their critical thinking skills based on their knowledge of geography, math, chemistry, physics, biology, economics, history, and much more. In addition to the physical impacts of climate change, study of the impacts on people is also important. Teachers should challenge students to think about what possible changes in different world regions might mean. A changing climate may mean different shipping and trade routes that will increase availability or time required for moving materials and finished products. Some regions may experience a longer or different growing season which will allow them to produce new food or cash crops. The development of new agricultural products and techniques may be one response to changes in climate over time.

Students can also identify the most vulnerable populations, countries, and regions that may be affected by global climate change. Examples might include island populations affected by sea level rise and people living with changes in precipitation patterns that might result in drought or flooding. Scientists and researchers from organizations such as the IPCC, NASA, and NOAA have identified and are researching mitigation and adaptation strategies. In addition there will undoubtedly be research and development of new technologies which may influence the degree of impact in various locations.

There are many Web sites and online sources electronically publishing information about global climate change. There can sometimes truly be "too much of a good thing"! Teachers may not have disposable time to do extensive searches and sorting of the potential resources that are available while preparing for their classes. One of the Denver Public Schools teachers described the online module as being, "Very helpful in building background information for the instructor." *Teaching About Global Climate Change* is a resource that does some of the background work for the teacher in that resources and materials are reliable and reviewed. Geography and social studies teachers who are preparing to teach about global climate change in their classrooms

are sure to find many helpful facts and resources available in the *Teaching About Global Climate Change* online professional development modules.

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Susan Gallagher Heffron serves as the Senior Project Manager for Geography Education at the Association of American Geographers, Washington, DC, USA. Her work includes facilitating the dissemination of research to inform classroom and online instructional strategies as well as effective teacher professional development experiences. Gallagher Heffron has twenty years experience in education and presenting teacher professional development workshops for both K–12 and university faculty audiences. Her project experiences include developing and facilitating online courses, online learning objects, working with course management software, and designing online professional development for teachers.

Kharra Valmond received a Bachelor's degree in geography from Rutgers University in 2010 where she completed coursework on global climate change. She is currently completing an internship at the Association of American Geographers in Washington, DC, USA, where she has worked on the *Teaching About Global Climate Change* project team. Kharra's interests lie in medical geography and its applications to International Development in Latin America and the Caribbean. Her future plans are to pursue a Master's degree in public health while specializing in global health and epidemiology.