



MARINE BIOTECHNOLOGY & BIOINFORMATICS FOR TEACHERS
MOSS LANDING MARINE LABS NSF ITEST GRANT
TEACHER LESSON PLAN FOR CLASSROOM USE
GLOBAL WARMING USING WEBQUEST

Title of Lesson: Global Warming Using Webquest

Designed by

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Background

*** Write a brief description of the project, it's purposes and so forth and explain how it relates to bioinformatics and biotechnology ***

This lesson plan is designed to expose students to global warming in the form of learning online through interactive webquest activities. Global warming is an international concern for ours and future generations. This project is intended to bring awareness to Generation Y; the baby boomers children.

Using the Internet-based webquest activity, students will learn about climate change, energy use, and global warming, through role playing professionals in the fields of science, business leaders, and policy makers.

Description of Audience: This biotechnology/bioinformatics activity is designed for use by high school students in the age range of 14 to 18.

State Standards: This biotechnology/bioinformatics activity fulfills the following State of California Science Standards:

- ♦ **Content Standard A – Understanding about Scientific Inquiry**

“Students should develop understandings about **scientific inquiry, recognize and analyze alternative explanations and models and communicate and defend a scientific argument**”

Through the "use of empirical standards, logical argument and skepticism" students analyze the data presented, evaluate how the data were generated, and consider the validity and significance of the data in predicting potential global climate change. By using evidence to support and defend their positions in group presentations, students think logically and critically about potential future consequences of global climate change.

- ♦ **Content Standard B – Physical Science**

“Students should develop understandings of **chemical reactions, conservation of energy and the increase in disorder, and interactions, of energy and matter**”

Students explore the role of greenhouse gases in natural and amplified warming. Students also explore evidence of human impacts and changing CO2 levels and are required to apply their knowledge of dynamic systems, data analysis, and the interactions of matter and energy. Students look at methods of collecting evidence and ways of interpreting evidence. Students use computer models to apply knowledge of chemical interactions and the consequences of those interactions to forecast a changing but uncertain climatic future.

- ♦ **Content Standard C – The Cell**

“Students should develop understandings of **the interdependence of organisms, and matter, energy & organization in living systems**”

Students explore how the carbon cycle, cellular functions, chemical reactions, and human population size and activities affect the environment. Data from prehistoric climates allow students to apply their understanding of matter, energy, and organization in past living systems to think critically about the impacts of human behavior. Students use models to predict the effects of future climate change on health and disease, agriculture, changing water resources, and loss of biodiversity.

- ♦ **Content Standard D – Earth and Space Science**

“Students should develop understandings of **scientific inquiry, recognize and analyze alternative explanations and models and communicate and defend a scientific argument**”

All of the webquest activities give students a chance to work with scientific evidence regarding the effects of the Earth’s energy balance on climate. Students investigate evidence for global warming through deep time, collect data on past changes, and compare those data with more recent data and with changes in human population sizes and activities.

- ♦ **Content Standard E – Science and Technology**

“Students should develop understandings of **understandings about science and technology**”

All of the webquest activities provide opportunities for students to gather and analyze data developed by technological advances and modeling of systems. Students see how the amounts and forms of data increase as new technologies are developed and employed.

- ♦ **Content Standard F – Science in Personal and Social Perspectives**

“Students should develop understandings of **environmental quality, natural and human induced hazards, science and technology in local, national and global challenges**”

All of the webquest activities allow students to work in collaborative teams to collect data, think about the implications of the data, and consider potential future global challenges. After students understand the science, they have opportunities to discuss implications for public policy and economics.

- ♦ **Content Standard G – History and the Nature of Science**

“Students should develop understandings of **science as a human endeavor and nature of scientific knowledge**”

Students learn that scientists share their methods and data, review each other’s work, and come to differing conclusions about results. Working as scientists, students discuss the data provided, share their interpretations, pose additional questions, and debate the significance of climate uncertainties in the future.

National Standards: This biotechnology/bioinformatics activity fulfills the following National Science Standards:

- ♦ **Science and Technology**
Abilities of technological design
Understandings about scientific inquiry
- ♦ **Science As Inquiry**
Abilities necessary to do scientific inquiry
Understandings about scientific inquiry
- ♦ **Unifying Concepts and Processes**
Systems order and organization
- ♦ **History and Nature of Science**
Science as a human endeavor
Nature of scientific knowledge
Historical perspectives
- ♦ **Science in Personal and social Perspectives**
Personal and community health
Population growth
Natural resources
Environmental quality
Natural and human induced hazards
Science and technology in local, national, and global challenges.

STEM Connection.

The careers studied in this webquest will give students an idea of what a climate scientist, policy analyst, economist, energy expert, and urban planner do. All of these careers include content for students to learn the science, math, engineering, or financial aspects of what global warming effects.

Technology Integration.

The technology used in this lesson will include bioinformatics. The students will learn to use the NCBI website to Blast DNA sequences, and will then use cluslx to align DNA sequences and compare the differences.

Goals(s):

The goal of this lesson is to:

- ♦ Goal 1: Expose the students to the variety of careers associated with the study of Global Warming
- ♦ Goal 2: Bring awareness to the fact that human influences have an impact on the environment.
- ♦ Goal 3: To show that the environment is a web of life and that when one aspect of the environment is affected, many other aspects of the environment are also affected.

Learning Objective(s)

Upon completion of this lesson, students will be able to (Include process skills but be specific. What will the STUDENTS be able to do/demonstrate as a result of this lesson?):

- ♦ Objective 1: Research DNA sequencing
- ♦ Objective 2: Identify differences within a species based on DNA sequences
- ♦ Objective 3: Research STEM careers
- ♦ Objective 4: Identify global warming issues and relate them to causes in the environment
- ♦ Objective 5: Report findings on global warming based
- ♦ Objective 6: Report global warming issues in reference to a specific profession

Purpose/Rationale

I am teaching a lesson on global warming because my classroom does not include a unit on the environment and this is one area I have always wanted to add to my class. I am doing a webquest interactive role-playing curriculum, because this is a format I think the students will get a lot more out of than the Lecture/activity format, and I believe it will be more fun and enjoyable for the students. Additionally, they will get kinetic and share-pair instruction; and they will use their technology skills or they will build technological skills on the computer.

Another aspect of this lesson I like is that the STEM career role-playing will give the students more insight into how the different professions look at one subject. How when one profession act to the subject it impacts another profession or how they can work together to accomplish a common goal.

Finally, I like the fact that the student will have to report their findings in a format other than a power point presentation. Again, they will be a reporter or a scientist and they will be reporting their findings "on stage" as that profession in front of the rest of the class. Presentations will basically be as if the students were in drama and they were a different character putting on a show.

The specific National and California standards are listed above in the standards section of this document.

Materials/Resources

Introductory materials include poster sheets and a global warming video.

To complete this lesson, the students will need access to a computer with internet capabilities. They will also need the attached worksheets.

The following websites are to be used to complete the assignment.

<http://www.koshland-science-museum.org/teachers/webquest.jsp>

<http://www.koshland-science-museum.org/teachers/wq-dna-gd003.jsp>

<http://www.ncbi.nlm.nih.gov/genome/seq/BlastGen/BlastGen.cgi?taxid=9606>

<http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=OMIM>

Prior Teacher Preparation

Preparation for this project includes running through the curriculum on the site and making sure it all works. Worksheets will need to be printed and filled in. DNA analysis will need to be conducted and results will need to be analyzed.

The room environment will include making computers available for the students.

3-Step Procedure

#1 Introduction

- ♦ The introduction of the lesson will begin with a class discussion about the environment, with a lead into global warming.
- ♦ They will read an article on global warming and then get into groups to write down on poster paper what they think the main issues associated with global warming are.
- ♦ We will then go back into a class discussion and go over their poster boards. We will discuss any misconceptions they have and confirm any theories they bring up.
- ♦ Once we go over the discussion, I will show a global warming video.

- ♦ The next day I will go over the project with them, quickly run through the website, and put them in groups and assign their professional roles that they will be working from.

- ♦ Once that is done, the students will begin working on the project.

#2 Exploration

- ♦ The lesson is prepared so that the students will go on-line and look up their designated careers. They will be assigned one of five careers: a climate scientist, policy analyst, economist, energy expert, urban planner.
- ♦ They will fill out the worksheets found on the website: <http://www.koshland-science-museum.org/teachers/wq-gw-gdt004.jsp>.
- ♦ From their results the students will create a "play" or write a news report to present the effects of global warming, given the perspective of that specific profession, to the rest of the students.

#3 Application

To finalize the lesson, the students will have to assess what they learned and write a one to two page paper about how they can apply what they learned in their everyday life. These things can include recycling, turning down the heat in their houses, use fans instead of air conditioning, or even have discussions with their family members of the effects of global warming and what everyone can do to reduce CO₂, and other carbon emissions. Once I have these papers in hand I will make a chart of what the student said they would do to reduce global warming and I will post it in the classroom for the remainder of the year. This will be a constant reminder to all classes of what can be done and hopefully keep their thoughts in mind so that they do it.

Assessment

Assessment of the project will be done after the project is complete. It will include reports, and pictures of the presentations (shows) the students put on, with possibly video recording of reports. The final assessment will be done at the end of the year when I give another handout to the students asking them what they did from their list to reduce global warming.

Teachers' Self Evaluation

Self evaluation of the project will be conducted once all of the project sections are done, including the Student assessment as identified above.