Climate Change Science for Northern Nevada Educators

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Introduction

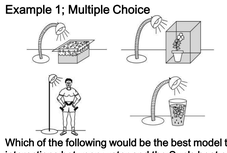
The EPSCoR Climate Change Education Component is a professional development program designed to facilitate Nevada middle school educators in implementing climate change science content and processes into their classrooms. A two-week summer institute provided the framework for the EPSCoR program. One institute was held in Las Vegas for Clark County School District teachers, and the second institute was held on the University of Nevada, Reno campus for Washoe County teachers. Institute focus comes directly from the original grant proposal. The essential question which directed the Summer 2009 Institute was:

How will climate change affect water resources and linked ecosystem resources and human systems?

Content Data

Content test items were taken from the question bank for the National Assessment of Educational Progress (NAEP). These items are used to collect national data on norm referenced tests. The NAEP items were used to gauge teacher expertise on science content and to measure growth over time due to the Summer Institute experiences. Items were hand selected to reflect climate change, ecosystem and earth science content.

Example 1; Multiple Choice



Which of the following would be the best model to show the interactions between water and the Sun's heat energy in cycles of precipitation?
A) A light shines on an aquarium covered with glass, and water droplets form on the inside of the glass.
B) A light shines on a closed cardboard box containing a plant.
C) A light shines on a man's face. Droplets of sweat form on his face as he exercises.
D) A light shines on a glass of iced tea. Droplets of water form on the outside of the glass.

Example 2; Open-ended Response

In a simplified model of the Solar System, the planets revolve around the Sun in circular orbits, all in the same plane. Each planet has a different period of revolution. Also, each planet is a sphere that rotates about an axis through its center, but with a different period of rotation. In this model the axis of rotation of each planet is perpendicular to the plane of the orbit. What extensions or modifications could be made to the simplified model of the Solar System to explain why the Northern Hemisphere is colder in January than July?

Example 3; Using a Data Table

	City 1	City 2	City 3	City 4
High Temperature	65° F	80° F	48° F	25° F
Low Temperature	56° F	66° F	38° F	10° F
Precipitation—Rain or Snow (inches)	2 in	0 in	1 in	1 in

In which city could children wear just T-shirts and shorts and be most comfortable playing outside all day?
City 3
City 1
City 2
City 4

Mean scores for the pre-test and post-test 1 were 36.42(5.24) and 39.67 (4.72). The one degree of freedom contrast was significant at the .05 level, $t(5)=3.15$, $p<.05$, $d=.18$. Mean scores for the pre-test and post-test 2 were 36.42(5.24) and 42.33(1.37), respectively. The one degree of freedom contrast was significant at the .05 level, $t(5)=3.36$, $p<.05$, $d=1.54$.

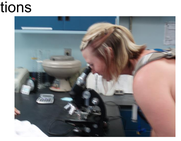
Summer Institute Experiences

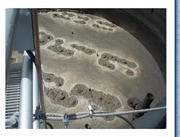
During the institute, participants received direct instruction from local and regional scientists currently working on climate change and water resource research. Participants traveled to several area labs to observe and discuss the water and climate change research occurring at the University of Nevada, Reno and the Desert Research Institute.

- Understanding the Dilemma of Atmospheric Commons & Game Theory
- Water Resource Management, Guzzlers & Runoff Experiments

- Incline Water Reclamation Plant
- Tahoe Environmental Center
- Water Rights, Water Law & History of Environmental Regulations

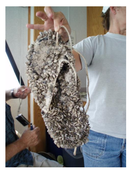
- Verdi Hydro Plant
- Truckee Meadows Water Authority (TMWA) Chalk Bluff Water Treatment Plant
- NV Energy & Nevada's Plan



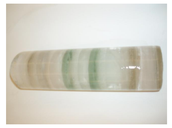


- Atmospheric and Diversion Modeling
- Climate Modeling and Society
- EcoCELL Laboratory
- Ice Core Lab

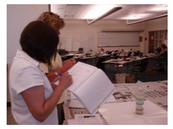
Learning experiences were also provided by local professionals working in areas of water management and sustainability. Participants visited several regional public utility facilities, studied aspects of the Truckee River watershed and learned about effects of water resource deficits in the area.



Standards, 5E & Inquiry



Three of the six participants teach in middle schools, the other three are elementary teachers. Standards were addressed according to which subjects the participants teach. The Nevada State Science Education Standards and National Science Education Standards (NSES) were studied and discussed in order to find Climate Change themes. Content Standards were then used to design original lesson plans aligned with Washoe County School District (WCSD) guidelines.



Participants were introduced to the 5E method of lesson design in order to enhance engagement and inquiry in each of the classrooms. 5E lesson plans have themed components: Engage, Explore, Explain, Elaborate & Evaluate. Several of the participants used this method when designing their climate change lesson.

In order for participants to become familiar with Science Inquiry, and to help them understand why some students are intimidated by science, these teachers had to experience an experimental inquiry lesson as learners. These teachers experienced a classroom ice core lab experiment. Teachers worked cooperatively to complete lab tasks.

Lesson Plans & Assessments

Many formative assessments were used during the Summer Institute 2009. These assessments included daily journal entries, Facebook discussion posts and Exit Tickets (above).

Participants kept science journals of their experiences, reflected daily on the content provided, took part in climate change learning activities and lectures, examined the Nevada State and National Science Education Standards, and designed and presented a lesson on climate change intended for implementation during the school year. In order to help inform their teaching, participants were required to submit a Teaching as Research Project in which they analyzed data collected during their Fall lesson implementation.

One participant, an elementary reading resource teacher, mentors a bike club on her campus. She took the initiative to create an original lesson with the theme: Reduce, Reuse, Recycle. She and her students had 20 bikes donated to their school which were then refurbished by a local bicycle shop. The Bike Club received a few of the bicycles for less fortunate students. The students felt they had helped their school and community while reducing, reusing and recycling.

The look ahead…

The second group of Nevada educators have already begun their Spring 2010 online course ENV 794 through the University of Nevada, Las Vegas, instructed by Dr. David Hassenzahl. This course will prepare participants for learning experiences this summer. Participants will complete the course in May, earning graduate credit from UNLV. UNLV and UNR Summer 2010 Institutes will be conducted July 26-30th and August 2-6th. Once these teachers have implemented Climate Change lessons in the Fall they will receive graduate credits from UNR. The use of researchers as climate change instructors made a large impact on 2009 participants. Soon, the Education Component will again be looking to again fill this role with local and regional researchers of climate change.

The 2010 Essential Question to guide Summer Institute experiences is:

How will climate change affect disturbance regimes and linked systems?

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