Innovative Working Group Report

Using Climate Data in the Classroom

Submitted to New Mexico EPSCoR

By

IWG Conveners

Matthew Nyman
Amy Ellwein
Selena Connealy

Introduction

The "Using Climate Data in the Classroom" Innovation Working Group was convened June 5-8, 2011 at the Valles Caldera Science and Education Center to investigate various aspects of using climate data in K-12 science classrooms. A significant influence on the focus and goals of the IWG was the publication "Using Data in University Classrooms" (Manduca and Mogk, 2002) that provided context and background about the importance, outcomes and pedagogy behind data-rich instruction at the university level. In the broadest sense, the intent of the IWG was to start a discussion between scientists, data providers, teacher preparers and middle and high school science teachers about using climate data in classrooms to increase both climate and data literacy for New Mexico students.

IWG participants represented a broad spectrum of professionals interested in addressing data and climate literacy for students at all levels. Participants included a leading climate scientist, hydrologist, IHE faculty, most of who are involved with teacher preparation, a computer science professor who works on visualization and issues related to data dissemination, middle and high school science teachers, and earth science and computer science graduate students.

The schedule for the workshop can best be described as "focused yet flexible." Goals were identified early in the workshop but the specific outcomes were more open and partially left to how the workshop progressed and the specific interests of the IWG participants. The schedule and participant list is included in the appendix to the report.

Key Efforts of Workshop

The key efforts and the steps that were employed in support of these efforts were as follows:

1. Climate Change and Water Resources in New Mexico: Defining the climate and water resources landscape using data.

   Dr. David Gutzler, a climatologist from Earth and Planetary Sciences at the University of New Mexico presented a talk, "An Overview of Observed and Projected Climate Change," on the evening of the first day. On the second day, Dr. Daniel Stephens, a hydrologist, founder of Daniel B. Stephens & Associates and a regional expert on surface and groundwater resources and policy presented a talk on New Mexico water resources. Each talk lasted nearly 2 hours and involved significant discussion.

2. Climate Change and Water Resource Data Portals: Identifying and evaluating several web-hosted climate data resources.

   Dr. James Acker, NASA Goddard Space Flight Center presented a talk on the afternoon of the second day on the development of the Giovanni website, a comprehensive portal that contains numerous satellite datasets and that can produce both map and time series products. The second part of the data portal effort was to investigate and evaluate a total of 14 websites and data portals that contained either visualizations and/or data related to water resources or climate change. Teams of two participants surveyed two websites, rated each website and developed and identified a specific science question that could be investigated using the website or data portal.

A follow-up discussion focused on rating the websites based on three questions and identifying general features of the most popular and useful websites.

3. Using Data in Middle and High School Classrooms and in Teacher Preparation: Methods that work.

Mr. Nick Haddad (TERC, Inc., Cambridge, MA) presented a talk on using authentic data in science classrooms. Mr. Haddad is a former classroom teacher (20 years) and now curriculum developer and science teacher professional development provider with a focus on using data in science classrooms. He was the program manager for the very successful Earth Exploration Toolbook (http://serc.carleton.edu/eet/) in addition to other projects. Mr. Haddad's talk was followed by a panel discussion that involved presentations by four IWG participants: Ivy Graham-Dewers, Bosque School; Leighanna Hedderman, Cimarron High School; Mel Strong, UNM; and Lorie Liebrock, NM Tech. Two panelists focused on instructional strategies for middle and high school classrooms, a third examined using meteorological and climate data in sixth grade science classrooms and with pre-service elementary teachers and the final panelist looked at development and use of different types of data visualization including 2-D and 3-D plots, maps and animations. The panel discussion was followed by small group work on identifying key aspects of successful implementation of data-rich science instruction in middle and high school classes and pre-service teacher training.

4. Identifying Areas for Future Work.

The final IWG sessions were dedicated to brainstorming ideas and developing specific work plans, addressed below in Key Outcomes and Actions of the IWG.

.

Key Outcomes and Actions of the IWG

There are two categories of outcomes from the IWG meeting: items that resulted in immediate action and are actively being worked on by IWG participants and items that were important parts of discussion and will inform future work.

Current Actions

There are three action items that are currently being worked on by IWG participants

1. 9th grade physical science curriculum:

Ivy Graham-Dewers and Lorie Liebrock are collaborating on development of climate change modules that can be used in a ninth grade physical science class. Preliminary investigation of web resources indicates there are currently available modules that integrate climate and physics concepts. The current action will seek to employ using climate data in this effort, consistent with the focus of the IWG.

2. Data literacy and skill inventory:

Amy Ellwein, Nick Haddad and Matthew Nyman are developing a data literacy and skill inventory that can be used to focus and guide future efforts in getting authentic scientific data into 6-12 classrooms and teacher preparation and professional

development. Part of group discussions during the IWG focused on the challenges many students face when working with real data including basic skills such as graph construction and interpretation. In order to address issues of using climate and water resources data, instructors must first establish the facility of students with basic data literacy. The data literacy and skill inventory will also be informed by a literature inventory on student efficacy and outcomes (did using data increase student achievement and learning?) on using data as part of their learning.

3. Recommendations for data providers:

A group of 6 IWG participants headed up by Mary Jo Daniel and Amy Ellwein began development of criteria that define characteristics of a data-rich website or data portal that would be useful for educators. Some characteristics include visual representations of data that encourage visitors to manipulate data without needing advanced skills or additional software, examples and contextual help for users to generate their own visualizations from raw data, different layers of tools and products for different user types (from simple to complex), and translation of metadata for a general audience.

Future Directions and Actions

IWG participants identified the following items as potential future directions or actions.

1. NMSTA workshop (Leader: Matthew Nyman)

IWG participants found the process of examining current websites and data portals related to climate change and water resources useful for their own teaching and learning. This led to the idea of submitting a proposal to the NMSTA fall 2011 meeting in Farmington to run a workshop to bring to the attention the availability and use of data-rich websites and portals, especially related to climate change and water resources. During this session we could also collect survey data about the current use of data in the classroom (see next item)

2. Survey on Data Literacy (Leader: Amy Ellwein)

Gathering data about the current state of data-rich instruction, including climate change and water resource data, in 6-12 New Mexico classrooms is vital to moving forward with any effort to stimulate changes in classroom practice. As part of the preparation for this IWG, we developed draft survey questions to gauge middle and high school instructional practices around data, investigate avenues to work with teachers to increase the use of data-rich experiences, and determine the extent to which and in which courses climate change and water resource topics are addressed in middle and high school science classes. We will investigate the potential to collaborate with other tri-state EPSCoR researchers that have conducted climate science literacy surveys (e.g. Dr. William Smith, Jr. at UNLV) as well as other organizations investigating data literacy and classroom data use (e.g. Dr. Sam Donovan at the University of Pittsburgh, Amy Ellwein at the Rocky Mountain Biological Laboratory).

3. Pre-service teacher courses and in-service teacher professional development (Leaders: Susan Brown, Amy Ellwein, Matthew Nyman)

Nearly one-half of the IWG participants work with pre-service teachers and/or conduct professional development with in-service teachers. A solid outcome from the IWG was development of good working relationships between these individuals with the goal of developing data-rich, climate-change-focused curriculum and modules for teacher training and professional development. As a first step, we will develop a data literacy and skill inventory (above – under current actions). The second step is to gather data through surveys (above). With these products, interested IHE faculty participants will seek funding to 1) develop new modules or even new courses to improve data literacy skills and climate science literacy of pre-service elementary teachers and 2) develop new professional development opportunities for in-service teachers around accessing and using data, building data literacy skills, and understanding the data behind climate science.

4. White paper (Leaders: Selena Connealy, Amy Ellwein, Matthew Nyman)

An important outcome from the IWG and continued work between participants will be production of a white paper about using data and teaching climate change and water resource concepts in 6-12 classrooms. The white paper will provide details on data collected from the survey of New Mexico teachers (and possibly other states), issues related to data literacy for K-12 students and teachers, and criteria for effective data portals and data-rich websites. Part of the white paper will also have policy recommendations for the New Mexico Public Education Department to facilitate teaching with data about climate change. We anticipate this white paper will be delivered through a variety of websites (EPSCoR, Science Education Institute of the Southwest, UNM Natural Science Program, NMSU Curriculum and Teaching Program, New Mexico Tech MST Program, etc.) and will potentially have state, regional and national distribution.

5. Data Portal Conference (Leaders: Mary Jo Daniel)

An outcome of the final day was first steps towards development of criteria for a useful and effective data portal for 6-12 teachers. Part of the discussions was the potential to convene a data portal conference to expand these criteria and assemble a teacher advisory board to help guide development of the NM EPSCoR data portal, in particular and potentially other data sites.

6. Future Innovative Working Group meeting (Leaders: Selena Connealy, Amy Ellwein, Matthew Nyman)

By many measures the "Using Climate Data in the Classroom" Innovation Working Group was successful and an excellent venue to start important discussions and work towards improving STEM education in New Mexico. As the group's work continues there is a strong possibility that this would lead to a second IWG proposal that would contribute to and expand ongoing efforts.

APPENDIX

- Participant List
- Summary of Gallery Walk Ice Breaker
- Summary of Website Evaluation
- Survey Results

Nyman Innovation Working Group Participants 2011

First Name	Last Name	Program/Employment	Institution
Jim	Acker	Giovanni	NASA Goddard Space Flight Center
Susan	Brown	STEM Outreach Center	NMSU
Selena	Connealy	Science Education Institute of the Southwest	UNM
Mary Jo	Daniel	NM EPSCoR	UNM
Jan	Dillingham	Juvenile Detention Center	ABQ Public Schools
Susie	Dunnum	Truman Middle School	ABQ Public Schools
Amy	Ellwein	Digital RMBL Science Education Institute of the Southwest	Rocky Mountain Biological Lab Western State College of Colorado
Ivy	Graham-Dewers	High School Science Teacher	Bosque School
David	Gutzler	Earth and Planetary Sciences	UNM
Nick	Haddad	Center for Science Teaching and Learning	TERC
Leighanna	Hedderman	Cimarron High School/ EPSCoR	Cimarron Municipal Schools
Cindy	Hess	Bernalillo Elementary School	Bernalillo Public Schools
Lorie	Liebrock	Computer Science and Engineering	NM Tech
Nico	Marrero	NM EPSCoR Education Outreach	NM Tech
Matt	Nyman	SEIS/Natural Sciences Program	UNM
Daniel	Stephens	Hydrologist	Daniel B. Stephens and Associates
Mel	Strong	Natural Sciences Program	UNM

Summary of Gallery Walk

Gallery Walk is a team building activity that allows groups to synthesize and discuss important concepts and ideas related to a specific topic. In gallery walk teams rotate between pertinent questions that are posted on large sheets of papers, provide answers to the questions and read other groups responses. Each team is then responsible for reporting out on one of the questions as well as providing some written summary. The ideal end product of the activity is a set of responses to the questions that encompasses the group's ideas as well as developing a sense of community and purpose. A very good summary of gallery walk process can be found at the following website: http://serc.carleton.edu/introgeo/gallerywalk/

A gallery walk was completed on the first evening of the IWG around questions related to using data in the classroom as well as what climate concepts students should become familiar. The specific questions were:

- How does using data improve student learning?
- How do we engage students with data?
- What are some of the important ideas that students need to understand about climate and climate science?
- What are some of the challenges of using authentic data in the classroom?
- Why do we engage students with data?

Summaries of the group's ideas on these questions follow either as bulleted list or expository text.

(How) Does Using Data Improve Student Learning?

Summarized by Susan Brown, Jan Dillingham, Dave Gutzler and Nick Haddad

Using actual data in the classroom should improve student learning, if data analysis is incorporated in a thoughtful way that promotes critical thinking.

* Students can learn to appreciate scientific thinking and data reliability issues in a tangible way

* Real-world data, especially data pertinent to local conditions, are relevant to student interests

* Data analysis can help students learn the importance of making personal decisions based on actual data

* Students should be expected to critically assess their data and draw appropriate conclusions

* An important component of data analysis is the effective description and explanation of results and conclusions to others

* Students need to learn critical data assessment skills in order to pass standardized tests

* Data analysis promotes direct student engagement with content

* Data must be sufficient in quantity, quality and reliability in order to address a question or hypothesis

* Real-world data sets can be "messy" and "noisy", and thereby difficult to analyze

* With the previous two points in mind, a potential conclusion drawn from data analysis could be that data are insufficient to address the question at hand

* Data analysis needs to be kept manageable in order to be effective in the classroom, and requires considerable guidance from the instructor to promote critical thinking

* Are there conclusive studies that demonstrate increased student learning from data analysis?

How do we engage students with data?

Summarized by Mary Jo Daniel, Suzy Dunnum and, Mel Strong

Engaging students with data needs to be done as a learning progression in which students begin with direct experiences with data collection that form the conceptual foundation for later, more complex interactions with data. At the beginning stages, students should collect data that is of relevance and interest to them, based on their prior experiences. The type of data must be appropriate to their skills, but lead them to develop more advanced skills with measurement and data representation. Multiple types of data—numerical, spatial and qualitative—should be collected in a variety of contexts and throughout the curriculum. Using a variety of data, especially spatial, can be especially effective for differentiation in an inclusive learning environment. Once students have had experiences in data collection that provide a foundation, they should be given data collected by others that can be analyzed or "mined" to answer appropriate questions. Ideally, students will be introduced to different types of measurement tools and technology and will use cyber-related tools for data collection, analysis and representation.

Classroom experiences can model many of the data collection processes that occur in research, including quality control issues, using data to predict future changes (basis of modeling), limitations of data and ways to use data to develop new questions.

What are some of the important ideas that students need to understand about climate and climate science?

Summarized by Cindy Hess, Lorie Liebrock and, Matthew Nyman

There are three main categories of ideas in this category: fundamentals of climate and weather, causation versus correlation, and the feedback and role of social and political systems that influence the study of climate and climate science.

Fundamentals of climate, weather, and water resources

First, middle and high school students need to understand the fundamental difference between climate and weather. This includes the parameters of climate and weather, how they are measured and how the data is displayed. Issues of spatial and temporal scale related to climate change are also important concepts; this includes differentiating between the causes of extreme weather events such as heat waves, tornado occurrences and hurricanes and climate change. Students also need to understand past vs. present climate change, the time scale of changes in atmospheric CO_2 content and how climate change may have different impacts on local, regional and global scales. The causes of climate change are also an important content area and should include geological and astronomical factors, the greenhouse effect, energy balances and, different radiative force effects.

Data and Models

Students need to understand the many uses and meanings of the term "data". From that basis they can learn to collect, analyze, and visualize data in the presence of errors and uncertainty. This requires fundamentals in mathematics including, for example, basics of statistics, error measurement and analysis, and handling of uncertainty. Students need the opportunity to understand, through examples, that just because there is correlation between two data sets does not mean that either causes the other. Further, students need to learn how to determine when a variable actually does cause a change in another variable or outcome.

For young students, simple models with easy to modify parameters can be used to illustrate concepts. For more mature students, beginning with simple data sets, students should learn how to build simple models, e.g., fit a line to a data set. Very simple examples like this would help students understand the limits of models, see the errors in predictions, and understand how errors and uncertainty in data lead to errors and uncertainty in models and their predictions. Building on this foundation, students should build more complex models based on more complex and/or multiple data sets. Finally, students need to learn how to validate models using additional data and understand comparisons between different models, leading to an understanding of when to use different models, the limitations of their predictions, and the ability to estimate the possible errors in model predictions.

Feedback and the role of social and political systems

In theory, science is not political. This holds true for all scientific studying including the investigation of climate and water resource changes. Science, however, can be and is influenced by the political arena and general society concerns, biases, and misunderstandings. These influences can be caused by lack of understanding on issues

such as ozone, sunspots, feedbacks, and timescales and how these issues do or do not relate to climate and water resource change.

What are some of the challenges of using authentic data in the classroom?

Summarized by Selena Connealy, Ivy Graham-Dewers and Nico Marrero

---

Working with data is messy. We've divided the challenges into four categories:

Nature of Data

The nature of climate data is such that students and teachers are faced with incomplete or conflicting data which can confuse learners. Data, especially long term data like climate change data, can overwhelm students with its size and/or complexity. Additionally, the lack of a precise answers and need for abstract thinking and analysis is not appropriate or possible for all ages.

Acquiring data

Though climate data is readily available to the public, teachers may not be aware of the many locations where data can be accessed. Choosing between multiple sources of data can also prove challenging if teachers are not already familiar with the data they are seeking. Not all sources of data are user-friendly – many data portals require a technical understanding or a comprehension of the dataset to find the data being sought. Once data has been retrieved, it can still require substantial time and effort on behalf of the student and teacher to manipulate into a form ready for analysis, if the appropriate software is already installed.

Processing the data

After going to the effort of acquiring and pre-processing climate data, teachers may find that the data has no statistical significance. Additionally, the results of analyzing the data may not fit the model that has been taught to students. Students may also have to be taught to use the analysis/visualization software, which takes time away from focusing on the data itself.

Student and Teacher issues/ Human Aspect (time and materials)

Climate change occurs over long periods of time, resulting in copious amounts of data. This requires a great deal of work beforehand for teachers to plan the investigation and familiarize themselves with the data and analysis tools before presenting the data to the students, particularly if the lesson is delivered as an open-ended inquiry. Students are required to invest more time in learning about climate through direct engagement with real data versus learning from a textbook. The different paces among student progress, student skill sets, student learning styles, and student interests will also require extra management investment from teachers.

Forces External to Classroom

Currently, federal and state mandated learning outcomes do not include climate change making it difficult to justify the amount of time required to deal with climate change data. Teachers will also need to be aware of conflicting political and social values that may present themselves when teaching climate change. Manipulating real climate data is often an entirely new skill set for students who may not identify with the stylized “scientist” and feel that there is no place in science for them or may not have the aptitude or experience to deal with the data and ideas presented.

Why do we engage students with data?

Summarized by Jim Acker, Amy Ellwein and Leigh Hedderman

A fundamental reason to engage students with data is to develop scientific literacy. Scientific literacy involves, in part, understanding and having experience with the process of science, developing scientific habits of mind and, understanding the nature of scientific data. In using data, students can gain experience with doing science and realizing that science is a creative endeavor as well as one that frequently includes times of failure and uncertainty. Scientific habits of mind include discerning the difference between facts, interpretation and opinion; data-rich experiences can highlight these important differences. Easing students into using data can also reduce the tension and anxiety that students frequently exhibit in science (and math) classes. Other habits of mind that can be fostered include objectivity, patience, perseverance, determination and recognizing bias. Understanding and interpreting data is vital for all citizens not only related to issues such as climate change and water resources but in their personal life and decision making. Understanding the nature of scientific data therefore has the potential to develop useful skills for a range of conditions. Specifically, data-rich experiences can help students understand the limitations of data, sources of error, uncertainty, the difference between precision and accuracy and the various tools use to collect, manipulate and interpret data. Finally, there are important practical classroom aspects that data-rich learning and instruction can facilitate. Data-rich learning can help develop applied math and technology skills that are useful outside of science and math, can provide opportunities for collaborative learning through concrete and applicable hands-on learning projects, can motivate students to investigate and examine connections across and within disciplines and can provide an opportunity for self-directed work and investigation.

Web Site and Data Portal Final Evaluation

Website name	*Website URL*	*Q1*	*Q2*	*Q3*	*Ave*
USGS Surface Water	http://waterwatch.usgs.gov/new/	10	9	9	9.3
Raccoon - Rocky Mountain Regional Atmospheric Continuous CO2 Network	http://www.eol.ucar.edu/~stephens/RACCOON/	8	9	8	8.3
Sea Ice Index - National Snow and Ice Data Center	http://nsidc.org/data/seaice_index/	8	8	8	8.0
NEO - NASA Earth Observations	http://neo.sci.gsfc.nasa.gov/Search.html	8	9	6.5	7.8
Giovanni, Data Enhanced Investigations for Climate Change Education	http://gdata1-ts1.sci.gsfc.nasa.gov/daac-bin/G3/gui.cgi?instance_id=DICCE-G	7	7	7	7.0
Vostok Ice Core Data	http://www.ncdc.noaa.gov/paleo/icecore/antarctica/vostok/vostok_data.html	6	7	7	6.7
Western Regional Climate	http://www.wrcc.dri.edu/	3.5	7	4	4.8
Earth Observatory	http://earthobservatory.nasa.gov/	8	2	4	4.7
Paleoclimatology	http://www.ncdc.noaa.gov/paleo/data.html	1	2	6	3.0
Enviro Facts	http://www.epa.gov/enviro/	3	1	5	3.0
NM EPSCoR Data Portal	http://nmepscor.org/dataportal/browse	1	2	2	1.7
Forest Inventory and Analysis National Program	http://www.fia.fs.fed.us/	1	1	3	1.7
Old Weather	http://www.oldweather.org/	2	1	1	1.3
The Global Drifter Program	http://www.aoml.noaa.gov/phod/dac/gdp_information.php	1	1	1	1.0

Q1 – I will use this website in my future teaching or recommend the website to teachers. (10 strongly agree to 1 strongly disagree)
Q2 – Data from the website was easy to access and use. (10 strongly agree to 1 strongly disagree)
Q3 – What is your overall rating of the website or data portal? (10 excellent to 1 poor)

Survey Results

The IWG organizers administered a web-based survey to IWG participants at the conclusion of the meeting on the morning of June 8. Ten of the 17 participants answered the survey (the three workshop organizers and four participants who left before the conclusion of the meeting did not answer the survey).

Participants reported high levels of satisfaction with the meeting, with 100% either strongly agreeing or agreeing to positive statements about the meeting. The highest rated element of the meeting was Dave Gutzler's talk about climate change (9 strongly agreed and 1 agreed with the statement "Dave Gutzler's talk about climate change was informative and useful"). Participants also strongly agreed (9) or agreed (1) that they will "use information from this workshop in my work."

Please answer the following questions about the IWG meeting.

Answer Options	Strongly agree	Agree	Disagree	Strongly disagree	Not applicable	Rating Average	Response Count
The smoke from the wildfires made the meeting environment uncomfortable.	1	2	3	4	0	3.00	10
The goals of the IWG meeting were clear.	3	7	0	0	0	1.70	10
The scope of topics covered was comprehensive.	7	3	0	0	0	1.30	10
The scope of topics covered was manageable.	7	3	0	0	0	1.30	10
Schedule pacing was appropriate.	8	2	0	0	0	1.20	10
The objectives of the IWG were met.	6	3	0	0	1	1.70	10
I learned more about using climate change science in my teaching or professional activities.	8	2	0	0	0	1.20	10
Attending the IWG was useful to my professional growth.	8	2	0	0	0	1.20	10
I will use information from this workshop in my work.	9	1	0	0	0	1.10	10
I was able to contribute to this working group.	6	4	0	0	0	1.40	10
I am interested in working with this group in the future	7	3	0	0	0	1.30	10
Dave Gutzler's talk on climate change was informative and useful.	9	1	0	0	0	1.10	10
Dan Stephen's talk on water resources was informative and useful.	8	2	0	0	0	1.20	10
						answered question	10
						skipped question	0

Participants were also very positive in their response to the question "In your opinion, what was the most useful parts of this IWG?" The science talks by Dr. Gutzler and Dr. Stephens were cited by several participants, as was the opportunity to interact in small group settings, and the diversity of the participants.

Both of the talks- Dave and Dan- were excellent. I liked the small group and then present to the large group- we seemed to be able to accomplish a great deal this way.

The diversity of the group contributed to a very rich meeting in that we were able to talk about all aspects with "experts" in the room. I look forward to working with all of the members of this group and I have the strong feeling that the work will continue. So many workshops we just walk out and it is over. This is not the case with our group. We will continue this mission!

The pace of the workshop was perfect. We had informative presentations and then we worked in small groups and actually had concrete tasks to complete. I liked this!

The leaders of this workshop did an excellent job organizing us before we even met. This website was wonderful and we had a very good article to read in order to get us thinking about the topic before we arrived. All of the instructions were clear and the leaders kept us in contact so that we felt very welcomed.

Overall, a good use of my time - this workshop made me think about data as the language of science and how we must implement lessons in the classroom that use relevant data. The connection with EPSCOR is very valuable and I feel this program will be a contributing member of the group from this day forward.

THANK YOU!!! I look forward to working with the wonderful people I met!
Climate change and water resource talks, although climate change talk was a bit over my head. This issue, however, may not have been so much of an issue for others.

Small group work.

Mixing up different participants in the different groupings!
Keynote lectures and opportunity for extensive discussion afterwards. Presentation on TERC curriculum. Exploration/discussion of climate data websites. Collaboration between researchers and educators.
It was great to work with a mix of dedicated people with expertise in a range of areas. The leadership was effective in planning the meeting and moving the agenda forward.
The discussions that took place-learning about the views & needs of data literacy from educators working with varying levels of students. In our schools, we tend to only collaborate horizontally. It was very beneficial to collaborate vertically.

Learning about the resources available on the web - especially TERC's site (that's such a great site & seems completely useful.)

Being reminded of the available data. Thinking about what kind of lesson plans could help students become data literate.
I found the breakout session where we split up into cohorts very useful. Dave Gutzler's talk was also very informative; I hadn't realized that the anthropogenic cause of climate change was definite. Additionally, I believe the laid-back approach to everything made this a more effective meeting than many conferences/meetings I have been to in the past.

Hearing from teachers what they really need and would use.

The collaborative discussions as well as the science presentations. It was a good mix.

Most participants did not have any meaningful feedback about the least useful parts of the workshop. Only one remarked that the meeting should have lasted longer--"I wish that we had one more day to really nail down a timetable of what our next steps will be."—and no one reported that the meeting was too long. Another suggested that the "proposed outcomes could have been better articulated and the schedule and activities more clearly defined in advance." It is difficult to discern whether the participant was suggesting that the goals, outcomes, schedule and activities needed to be better planned or better communicated ahead of time.

I did not think anything was unuseful.

The time - I wish that we had one more day to really nail down a timetable of what our next steps will be.

?

Doing surveys? I found it all useful!

na

All parts were useful and informative. The lectures on the data were informative but not necessary to answer the question about getting this data into the classroom. It seems like most folks here were literate enough in climate change and groundwater to do the work. However, the lectures were well done.

One of the presentations on Tuesday was a little long and slow. It would have been nice for a bit more "to the point" in that talk. Also - no hot springs! :-)

The proposed outcomes could have been better articulated and the schedule and activities more clearly defined in advance.

Nothing

In answer to the question "what should have been covered but wasn't," few participants responded. One response "Clear, visible statement of the main goals of the meeting would help keep me on task and focused" provides useful feedback for the planning of future meetings. Another person wanted climate-change-specific resources/curriculum on how to respond to skeptics.

Can't think of anything.

The workshop's agenda was excellent and the amount of time we had was very well planned.

?

Specific discussion on common fallacies regarding climate change and how to address these with students. How do we respond to climate change skeptics?

Clear, visible statement of the main goals of the meeting would help keep me on task and focused.

Can't think of anything

Additional feedback ranged from positive comments about the facility and food to a hope that the group could work together in the future with more representation from Colleges of Education, PED, and district-level personnel. One comment referred to a product that is in process (the data portal reviews) and will be shared with participants soon.

The facility and the food was really good. It is a great meeting place despite the smoke - which would have been a problem almost any where we went in NM. I hope that this group can meet again- all of the members were great to work with.

Excellent workshop! I commend all of the leaders and welcome the opportunity to continue this work!

?

I wonder if it would have been helpful to have people from state or district education agencies in attendance, mostly to observe and listen.
I was a bit unclear about the vision of the final product in the beginning but, by the end, it all came together nicely.

This was really fun to be a part of. I hope that the momentum can continue so we can make a change in the classrooms state-wide, and then nation-wide. It would have been beneficial to have a representative from the College of Ed from each higher-ed institution in NM here as well, since they create the pre-service programs for our teachers. It would also have been nice to have someone from PED to help us coordinate a state-wide effort (ha!).

Id love to have a list of the data websites, what data they provide, and a teacher usefullness rating.

It would be nice if the snacks were closer to the conference room, like at the happy hour.

I found the discussions valuable and informative.