

Effective climate change professional development for in-service secondary science teachers

3rd Annual Tri-State Western Consortium Meeting

April 6-8, 2011

Paul Buck

Desert Research Institute & Nevada State College



Who is involved in NV program?

- Paul Buck, DRI/NSC (1 month/yr)
- Jacque Ewing-Taylor, STEM Raggio Venter UNR (1.5 month/yr.) and Kelley Cannon WCSD science specialist
- Larry Rudd, School of Education NSC (1.5 mo/yr.)
- Juan McAlister, Asst. Program Manager NSC (0.5 FTE)
- Aubrey Shirk, Ph.D student in geosciences UNLV
- (½ time GRA UNLV)
- Melissa Slayden, MA student in school of education UNR (1/2 time GRA UNR)

Outline

- Current approach in Nevada (yrs 1-3)
- Recommendations of the ERTAB
- Open discussion



Elements of the program

- Recruit ~ 14 6-8th grade teachers schools in Washoe and Clark Counties (the 2 largest school districts in NV)
- All teachers participate in two (2-week long) summer institutes for two consecutive summer focused on one of two overarching research questions forming the basis of the award
- Each teacher/school has access to a disciplinary GRA (a “GK-12”-like grad student) who assists teachers in developing climate change science content and lesson plans
- School year field trips, mentoring, and assistance with development and implementation at least one lesson plan in class
- Provide on-line lower division college class in climate change science fundamentals

Recruitment

- Seeking 12-14 6-8th grade (earth) in-service science teachers; in CCSD this is 7th grade; in WCSD this is 6th grade
- Originally looking for "team teaching" approach but very difficult to find more than one teacher from a school willing to participate so now looking for individual teachers
- Due to high teacher and administrator turnover, we have same teachers only about ½ the time, from year to year
- High school science teachers are admissible if insufficient number of quality 6-8th grade teachers
- **Bottom line**: even though there are hundreds of 6-8th grade science teachers, and even with the incentive of \$1,000/yr plus 6 free grad credits it's difficult to find teachers

Summer Institute

- Each teacher takes (1 or 2) 2 week summer institute(s) (Las Vegas or Reno) to learn some climate change science content coupled with effective pedagogy to develop lesson plans/units specific to their teaching fields
- 9 of 14 teachers in 2011 SI will have already taken the on-line class
- 3 graduate credits will be given for each Institute (GEOG 691 through UNR); value \$800/teacher
- Lesson plans/units will be inquiry-based and meet Nevada State science teaching framework guidelines and school district curriculum requirements
- No new curricula will be developed—rather, will use existing curricula to create effective lesson plans
- Follow-up activities (2 weekend meetings) during school year; teachers deliver at least one lesson plan in their classroom with classroom visit by staff during lesson plan delivery
- Each teacher earns a \$1,000 stipend per summer institute
- [Class website \(constructed by GRA Aubrey Shirk\)](#)
- <http://sites.google.com/site/geog691/>

On-line class

- Many (most?) middle school teachers—even the ones teaching earth science—have little formal preparation in fundamentals of climate change science
- UNLV provides an on-line course (ENV 794, 3 cr.) with lower division content to provide a baseline of content for teachers
- The course is NOT required to participate in the summer institute although strongly encouraged (we found teachers would not participate if it was required to do both although some do)
- Textbook is “Global Climate Change” by Arnold Bloom (2010)
- Teachers have all tuition and fees paid by the program (valued at about \$900/person); we have 11 teachers currently in the class (4 of them have already taken at least one summer Institute)

Middle School Climate Change GRA

- A disciplinary graduate research assistant (GRA) in Reno and Las Vegas modeled on the NSF's GK-12 Fellowship program will assist local teachers
- They act as an intermediary between NSHE climate change science faculty and the classroom teachers relaying current research content and methods
- Insure age appropriate content in inquiry-based activities

School year activities

- Teachers must implement lessons plans during the school year at appropriate places in their curricula during visit by GRA
- Two weekend meetings between classroom teacher, GRA, and Climate change faculty/staff to adjust curricular or pedagogy to improve instruction



Outputs (from proposal)

- Increase the number of better trained middle school teachers
- Create new locally relevant lesson plans integrating climate change science, ELA, math and other core disciplines following State of Nevada and school district requirements
- Provide guidance to Policy group about museum exhibits, traveling science boxes and other informal science education opportunities
- Pre and post evaluations of teacher pedagogical content knowledge and use of knowledge gained the classroom
- Publication of lesson plans on data portal for teachers across the state to use
- Evidence of effectiveness of the “team teaching” approach to middle school climate change science (**team teaching abandoned since unable to consistently recruit teams**)

Outcomes (from Proposal)

- Create replicable professional development model of middle school climate change science delivery to be used in Nevada and adapted for use by other institutions
- Strengthened relationships between middle school teachers and climate change researchers in the NSHE—expansion of the K-16 scientific research community
- greater teacher content knowledge and pedagogical content knowledge in climate change science and greater confidence in ability to teach effectively
- Sustainable “Sumer Institute” program based on “taxing” future proposals for climate change research

Timeline

- 2009 1st Summer Institute LV & Reno (GEOG 691 UNR)
- 2010 Spring semester on line class ENV 794 UNLV
- 2010 2nd summer Institute LV & Reno (GEOG 691 UNR)
- 2011 Spring semester on-line class ENV 794 UNLV
- 2011 3rd Summer Institute LV and Reno (GEOG 691 UNR)
 - July 25-Aug. 5
- 2012 Spring semester on line class ENV 794 UNLV
- 2012 4th Summer Institute LV and Reno (GEOG 691 UNR)
- 2013 Spring semester on line class ENV 794 UNLV

Program evaluation—does it work?

- Summer Institute--pre and post content test and overall evaluation of SI
 - Pre-and-post content tests showed a slight but statistically significant increase in understanding of climate change
 - Overall quality of the institute was rated at 4.8/5.0 by the teachers in 2010
- ENV794 and GEOG 691—student evaluations (at discretion of course instructor); none so far
- Classroom visits by staff suggest productive engagement of students and teachers with climate change content and inquiry based activities
- No quantitative data were collected about improvements in understanding of (middle school) students since there is no assessment of that

Recent Suggestion of the ERTAB

- “The K-12 Summer Institute, which reaches a small number of teachers, has a very limited reach. It could be partially or entirely repurposed to engage educators in developing education and outreach strategies for the data portal site, including activities and tutorials on the use of data in classrooms and other educational environments, and as a focus group to provide feedback on the portal site’s usability and utility for non-technical audiences. The Summer Institute might also help develop strategies for marketing the portal to appropriate parties.”

OPEN DISCUSSION

- Should we switch from extensive professional development of teachers to using them to prepare materials for our data portal?
- Should in-service teachers serve as a “focus group” to evaluate the effectiveness of the data portal for non-technical audiences?
- Should teachers be asked to develop strategies to “market” the data portal to others—such as teachers?
- Would the ERTAB suggestions “broaden the reach of the project” or simply duplicate other climate change websites such as from USGS, AGU, and others?