Feb 2nd, 8:30 AM - 9:15 AM

Climate Change Education for Nevada

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Presenters
David M. Hassenzahl, Michael Collopy, John W. Farley, Paul Buck, Jacque Ewing-Taylor, and Shama Perveen

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Nevada Infrastructure for Climate Change
Science, Education, and Outreach

Education Steering Committee
David Hassenzahl, UNLV
Michael Collopy, UNR
John Farley, UNLV
Paul Buck, NSC / DRI
Jacque Ewing-Taylor, UNR
Shama Perveen, UNLV

February 2, 2010
Project Components & Leads:

- **Education**
  Component Lead - [David Hassenzahl], UNLV

- **Cyberinfrastructure**
  Component Lead - [Sergiu Dascalu], UNR

- **Policy, Decision-Making and Outreach**
  Component Lead - [William Smith], UNLV

- **Ecological Change**
  Component Lead - [Franco Biondi], UNR

- **Water Resources**
  Component Lead - [Michael Young], DRI

- **Climate Modeling**
  Component Lead - [Darko Koracin], DRI

5 yr strategic plan
Five Year Strategic Plan

**Goal 6** - Create a scholarly environment to promote research skills and intellectual development for Nevada educators and students (K-12, undergraduate, and graduate)

**Primary Strategy** - Develop educational infrastructure to train students at all levels and provide public outreach in climate change issues

- Provide undergraduate and graduate awards, fellowships, and symposia
6. **Education**

**Goal:** Create a scholarly environment to promote research skills and intellectual development for Nevada educators and students (K–12, undergraduate, and graduate).

### Strategies
- Develop middle sch, training programs, curricular materials, courses.
- Provide UG/graduate awards, fellowships, symposia.
- Create CC education symposium.
- Research CC education praxis and opportunities.
- Create courses and curricula for graduate & undergraduate students.
- Provide Summer Fellowships for Community College Faculty.

### Activities

#### Year 1
- Plan 2010 CC Education Conference.
- Hire grad students, K–12 coordinator, Admin Asst.
- Inventory NV CC courses & CC ed. nationally.
- Intro. CC online course for middle school teachers.
- Develop middle school CC class plans.

#### Years 2 - 3
- Hire UNLV postdoc (climate change outreach/education).
- Submit GK12, REU grants.

#### Years 4 – 5
- Create certificate graduate program in CC.
- Create UG minor in CC.

### Ongoing
- Convene steering committee meetings biannually.
- Attend Tri-state collaboration annual meeting.

### Education Programs:
- UG research/symposium;
- College curriculum devel., competition;
- K–12 Summer Inst, Comm Coll Faculty Fellowships.

### Outputs
- Trained cohort of more qualified K–12 teachers.
- New classroom materials and resources for middle school.
- New UG minor and courses in CC.
- Replicable model of CC education for NV & other states
- Research papers, presentations, theses on CC education.

### Inputs
- Existing NSHE expertise and courses in climate change.
- NSHE UG research program.
- Previous NV K–12 NSF EPSCoR programs.

### Outcomes
- Peer reviewed publications (especially in prestigious journals)
- Proposals, new funding
- CC curricula (all levels) and programs;
- Standardized test scores in 8th grade
- Improved AYP for participating K–12 schools.

### Evaluation Metrics
- Teacher pedagogical content knowledge/skills
- # UG students graduating with minor
- # grad students with CC certificate
- # students taking CC courses
**Vision:**

“To stimulate research, education, and outreach on the effects of regional climate change on ecosystem services and support use of this knowledge by policy makers and stakeholders.”
Education Component

- **Curriculum in Higher Education**
  - Curriculum Survey, Conference and Development Grants
- **Undergraduate and Graduate Training**
  - Undergraduate Research Opportunities
  - Graduate Fellowships
- **K-12**
  - Training for Middle School Teachers
Trends in Climate Change Education in Nevada’s System of Higher Education

Amy Northrup
University of Nevada, Las Vegas
School of Environmental and Public Affairs

Initial Findings

Throughout the collection of data about all courses that all reference climate change in Nevada’s colleges and universities, an inventory was created. This inventory reflects the wide diversity of avenues in which students are exposed to the topic.

- The inventory includes over 200 unique course codes, including geography, agriculture, and emergency management studies.
- Climate change was touched on in courses across all disciplines and sub-disciplines.
- In total, 15 disciplines were found to be shared in courses spanning 15 disciplines.

Climate change courses are concentrated at research universities and are found in the urban centers of Nevada.

Next Steps

This research will inform the creation of new climate change courses to be taught in Nevada. By understanding the current state of climate change education, improvements can be made to foster a sense of learning about climate change issues.

- Where exactly should this topic be included in higher education curriculum?
- What topics about climate change should be taught?

This research fits in with a larger assessment of how climate change is being taught around the country. Are all courses, specifically about climate change, teaching the same things? This variability in curriculum content does not plague many disciplines, but the scientific and political milieu around climate change makes it an important consideration.

Research Goals

The teaching of climate change is a relatively new phenomenon in higher education. Since the issue of climate change first entered the public stage, professors have taught their students about it in a very ad hoc way. There has been little discussion of structure or standards involved in teaching the subject, until very recently. This haphazard nature of climate change education matched with the vital importance of the issue to our society has sparked questions about the trends and nature of climate change education. Perhaps most importantly, the question of how students’ ideas of climate change are crafted by their exposure to the topic in the curriculum of higher education.

- In what ways are students exposed to climate change?
- Is it simply through the limited enrollment in specific climate change courses?
- Where else does the topic show up through in a student’s education?

These questions were tackled by looking at Nevada’s system of higher education. The information will help form a picture of how Nevada’s students are learning about climate change. This big picture can illustrate how students are currently learning and most importantly indicate areas where new courses are needed or where improvement to existing courses is needed.

Nationally, Inventory of CCC courses and CCU courses presented at the 21st National NSW conference on Sustainability, Education and EPSCoR in October 2015 at Las Vegas.
CLIMATE EDUCATION CONFERENCE
May 24-25 at UNLV
• Organized under the Education Component of the grant

• Participants from diverse pool based on inventory (e.g., env, geology, geography, philosophy, engineering, chemistry, architecture, history, biology, journalism)

• Whole is more than the sum of it’s parts (interdisciplinarity of the subject)

• Develop a model for climate change education curriculum to be taught through minors, certificate programs, summer internships etc.

• Identify programs/institutions to receive funding for climate change education
Conference Program

- Each day includes a combination of:
  - *Presentations from Keynote Speakers (morning)*
    - Include researchers and managers from NSF EPSCoR, Federal land mgt agencies and academia
    - Will help bridge the gap between what is taught and the current “job skills/requirements” in CC.
- **Participatory Breakout Sessions (afternoon)**
  - Working groups of similar or related specialties.
  - Applied specialties (like psychology, history, philosophy, anthropology etc.) can form separate set of groups.
  - Participants will reflect on their own practice, exchange ideas and together develop and discuss questions/challenges/issues relevant for teaching climate change.
What has been done so far?

- Initial participant list finalized (suggestions incorporated)
- Invites printed
- Website to host the materials & reach the broader geo-science community
  [http://environment.unlv.edu/climate/](http://environment.unlv.edu/climate/)
- Registration site for participants
  [https://www.surveymonkey.com/s/KYSPBVY](https://www.surveymonkey.com/s/KYSPBVY)
The Climate Education Conference, to be held on May 24 and 25, 2010 at Stan Fulton Building, is open to academic faculty, education researchers, private/government officials, lecturers from teacher training colleges and universities with experience or interest in teaching climate change.

**The conference objectives are to:**

- Exchange, inspire and develop ‘Best Practices’ in climate change education
- Develop a database of climate education syllabi to identify a range of courses and topics being offered, at what institutions and programs and academic levels
- Develop a model for climate change education curriculum to be taught in schools
- Identify programs/institutions where funding in climate education will be best served according to the objectives of NSF EPSCoR program
- Facilitate cooperation, mentoring and networking between public, private sectors, university and community colleges in teaching climate change.
- Collect, qualify and help identify a repository for disseminating teaching materials, which will essentially be the website created for the purpose

**Conference Themes**

The focus of the conference is on the following themes:

- Presentations of few ‘state of the art’ examples (keynote sessions) of how climate change may be taught.
- Topics covered in inter-disciplinary teachings in climate change
- Methods in inter-disciplinary teaching in climate change
- Influence of scientific discussions on teaching climate change
Issues to Brainstorm - Breakout Sessions:

What are the current goals and challenges in teaching Climate Change courses?

- Many faculty teach “out of specialty” – How best can we facilitate the task of bringing diverse groups together?
- What teaching strategies are particularly effective?
- What content, topics and skills are essential?
- Have informal educational channels been underused as conduits for disseminating CC science?
- Linking CC science content (and scientific discussions) into effective teaching
- How best to find:
  - Classroom-ready activities
  - Thematic resource collections on CC topics
  - Networks — dialogue, support, forum for advice

- What Works?
  - Active learning
  - Using Data, Visualizations in class
  - Projects, case studies, research-like experiences

- Methods in Inter-disciplinary teachings in CC
- Teaching climate change policy
- Cooperation and networking between schools, private and federal organizations on teaching climate change
Open for Discussion:

- Moderators/facilitators for the Conference
  - EPSCoR team members – facilitators/moderators?
- Professional facilitators?
  - Strategic planning meeting in Las Vegas in Nov 2008
  - Facilitated by two professional facilitators, Rebecca Tuden and Peter Bluhon (CONCUR, Inc.)
  - CONCUR - San Francisco Bay area based firm that specializes in strategic planning & agreement focused-facilitation on complex natural resource issues.
Graduate Fellowship Program

Michael W. Collopy (UNR)
Graduate Fellowship Application

- Cover page
- Transcripts (undergrad, grad)
- Graduate Record Exam (GRE) Test Scores
- Statement of Interest
  - Personal statement (1 pg)
  - Specific research interests (2 pg)
- Biographical Sketch (2 pg)
- Letters of recommendation from at least two faculty mentors (from different disciplines in EPSCoR program)
Evaluation Process

• Review committee
  ▪ 3 institutional co-PIs: Mensing, Piechota, Lancaster
  ▪ Education Component Lead: Hassenzahl
  ▪ Graduate Fellowship Coordinator: Collopy

• Standardized evaluation form (12 questions, scored 1-5; strengths/weaknesses)

• Scores compiled, averaged and ranked

• Selected based on competitiveness and filling research needs of component areas
Graduate Fellowship Solicitations

• 2009 (Year 1) - Request for Proposals
  ▪ Application Deadline: January 15, 2009
  ▪ 22 applicants (17-UNR; 5-UNLV)
  ▪ 8 recipients (7-UNR; 1UNLV): both one year and multiyear awards

• 2010 (Year 2) - Request for Proposals
  ▪ Application Deadline: January 15, 2010
  ▪ 14 applicants (10-UNR; 4-UNLV)
  ▪ Review in process (4 awards available)
2009 Graduate Fellowships

- Confronted with climate change: Response of a small mammal to past and future environmental trends
- Climate change impacts to groundwater, spring hydrology and aquatic communities, Amargosa Desert and Death Valley National Park, Nevada and California
- Assessing the vulnerability of Walker Lake to climate change
- Climate change impacts on fire regimes and tree population dynamics at a desert springs complex
- Climate responses of two invasive annuals, cheatgrass and red brome
- In situ aerosol monitoring for ecology and climate modeling research
- Reducing cloud uncertainties in climate models
- Cyberinfrastructure Component-NSF EPSCoR Climate Change Graduate Fellowships
### NSF EPSCoR Climate Change Graduate Research Assistantships

<table>
<thead>
<tr>
<th>Year</th>
<th>Student</th>
<th>Component</th>
<th>Mentor</th>
<th>Institution</th>
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<td>2008-2009</td>
<td>Michael Dolloff</td>
<td>Climate Modeling</td>
<td>Scott Bassett</td>
<td>UNR</td>
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<td>Benjamin Hatchett</td>
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<td>Mackenzie Kilpatrick</td>
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<td>Jeremy Koonce</td>
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<td>Amy Northrup</td>
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<td>Alan Sanders</td>
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<td>Aubrey Shirck</td>
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<td>Melissa Slayden</td>
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*denotes half-time position
Undergraduate Research Opportunity Program (UROP)

Michael W. Collopy (UNR)
John Farley (UNLV)
Undergraduate Scholarship Application

- Cover page
- Project description (2 pg) and references
- Transcript(s)
- Endorsement/commitment letter from mentor
- Biographical sketch (2 pg) from student and mentor
Evaluation Criteria

- Climate change oriented (yes/no)
- Academic excellence (GPA) and appropriate coursework (30 pts)
- Other relevant background experience (20 pts)
- Clear articulation of motivation and reasons for seeking this research scholarship (30 pts)
- Letters of reference (20 pts)
Evaluation Process

- Faculty review committee (2-UNR; 2-UNLV; 1-DRI)
- Standardized evaluation form (using criteria and weighted scores shown previously)
- Scores compiled, averaged and ranked
- Selected based on competitiveness across evaluation criteria
UROP Solicitations

• **Annual 2008-2009 – RFP**
  - Application Deadline: October 27, 2008
  - 31 applicants (21-UNR; 10-UNLV)
  - 15 recipients (10-UNR; 5-UNLV)
  - Research completed: May 31, 2009

• **Annual 2009-2010 - RFP**
  - Application Deadline: October 9, 2009
  - 37 applicants (21-UNR; 12-UNLV; 4-GBC)
  - 15 recipients (10-UNR; 4-UNLV; 1-GBC)
  - Research completed: May 31, 2010
UROP Solicitations

- **Summer 2009 – RFP**
  - Application Deadline: March 9, 2009
  - 36 applicants (21-UNR; 11 UNLV; 4 GBC)
  - 16 recipients (13-UNR; 3-UNLV)
  - Research completed: August 14, 2009

- **Summer 2010 - RFP**
  - Application Deadline: March 1, 2010
  - Research completed: August 13, 2010
Nevada Undergraduate Research Symposium (NURS)

- Professional symposium held every April
- Venue alternates between UNLV and UNR
- All EPSCoR undergraduate researchers required to participate
- Two-day conference offers opportunities for undergraduate researchers to give oral or poster presentations to faculty and students
- 2010 Symposium: April 13-14, Joe Crowley Student Union, UNR
Funds Committed (2008-2010)

- Graduate Fellowships:
  - 12 fellowships
  - $445,000

- Undergraduate Scholarships:
  - 30 annual scholarships ($129,000)
  - 31 summer scholarships ($166,200)
Middle School Science Teacher
Climate Change Education Program

Paul Buck
Jacque Ewing-Taylor
Larry Rudd
From the 5 year strategic plan for middle school component

- Develop middle school training programs, curricular materials, courses
- Focus on middle school because many MS teachers of earth science have little formal training in any science esp. recent climate change science
- Using an integrated approach involving teachers of Earth science in teams with other teachers from the same school perhaps in other core disciplines (math, English, social studies)
Planned activities

• Year 1:
  ▪ Hire K-12 coordinator (Juan McAlister, NSC)
  ▪ Begin Introductory course in climate change science for middle school teachers.
  ▪ Using existing curricula, Develop middle school climate change lesson plans

• Year 2-3:
  • Submit proposals to supplement our activities, perhaps to NSF or State of Nevada NeCoTIP or NV Dept. of Education MSP Program
Expected Outputs

- Trained cohort of more qualified middle school teachers
- New classroom materials and resources for middle school
- Replicable model of climate change education for NV and other middle school teachers
- Research papers, presentations, theses on effective strategies for professional development of middle school Earth science teachers
Expected Outcomes

- Strengthened middle school education in CC.
- Increased number of better trained middle school teachers in STEM
- Strengthened relationships between middle school educators and researchers
- Nationally recognized middle school education programs in CC.
Accomplished so far

- Recruited 2 outstanding graduate students (Melissa Slayden UNR CTL program College of Education UNR and Aubrey Shirk UNLV Geoscience)
Accomplished so far

- 12 teachers took 2-week Summer Institute in summer 2009 (3 graduate credits awarded GEOG 691 from UNR); teachers increase in content knowledge although small was statistically significant
- All delivered climate change lesson plans in their classrooms fall 2009/spring 2010;
- Buck’s fall 2009 CBL400 (NSC) brought 2 hands-on activities to CCSD schools;
- All are currently enrolled in on-line climate change course (UNLV ENV 794)
Accomplished so far

- Proposal submitted to NSF Math Science Partnership program for 5 year $11.4 M award for math and science improvement in southern Nevada (pending)
Year 2 schedule

- Presentation made to teachers at the Southern Nevada Regional Math and Science Conference Jan. 24-25 and planned for Nevada State Science Teachers annual meeting (exact date TBD);
- 14 students enrolled in on-line ENV794 (Dr. D. Hassenzahl UNLV Instructor);
- 14 teachers to be enrolled in 2010 Summer Institute (UNR’s GEOG 691) scheduled for July 26-Aug. 6 (to run concurrently in Reno & Las Vegas)
Year 2 schedule

- Most teachers from year 1 will continue; available slots will be filled by new teachers with a preference for 6/7 grade teachers from currently participating schools;
- Theme of 2010 summer institute=research question #2 “disturbance regimes”;
- Lesson plans developed by summer institute participants to be delivered in 6/7 grade classes fall 2010