Challenges and lessons learned in implementing climate and geospatial understanding in the K-16 curriculum and among diverse students

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Who am I?

- Faculty in Geography Department
- American Association of State Climatologists
  - Secretary
- American Association of Geographers
  - National Councillor
- American Meteorological Society
- NOAA Science Advisory Board
  - Climate Working Group
  - Portfolio Review Task Force
- NSF
  - panelist (10 programs)
  - Atmospheric Science Collaborations and Enriching NeTworks (ASCENT)
- National Climate Assessment – lead author Northeast
- NCAR & WMO
  - invited speaker
Who’s in the audience?

- media
- general public presentations
- K-16+ students (VT, NY)
- K-12 teachers
- my neighbors
- retired communities (UVM faculty, Wake Robin)
- life-long learners (Osher)
- VT State Agencies (ANR, DOH, DEMHS, VTrans) & municipalities
- atmospheric science colleagues / students
- other academe
“Speaking in code”

- vocabulary of the atmospheric sciences
- poor use of metaphors
  - “trapping heat” “bouncing back energy”
- “radiation”
- abstract concepts
- interconnectedness of land-ocean-air

"The source of this material is the COMET® Website at http://meted.ucar.edu/ of the University Corporation for Atmospheric Research (UCAR), sponsored in part through cooperative agreement(s) with the National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce (DOC). ©1997-2013 University Corporation for Atmospheric Research. All Rights Reserved."
Lessons learned from diverse audiences

- language of the climate sciences
- role of misconceptions
- where in the curriculum?
- importance of learning styles
- educators can make a difference
- role of life experience
“Through your presence here today, you come from a long line of giants whose shoulders you stand on, giants who graduated from this school and giants who never made it to school.”

“You cannot continue to succeed in the world or have a fulfilling life in the world unless you choose to use your life in service somehow to others and give back what you have been given.”

Oprah Winfrey - Commencement Speech at Howard University, 12 May 2007
D-ClimNet
Diversity Climate Network (D-ClimNet)
D-ClimNet’s programmatic elements

- goal = to stimulate interest and train the next generation of racially and gender diverse climate scientists

- Climatology as a viable career option
- mentoring by scientists of color

- high schools (grades 9-12)
- Community colleges
- universities, including Ph.D. granting institutions

- New York city, Los Angeles, Georgia, Burlington
Shaping the face of tomorrow's climate scientists

Stimulating interest and training the next generation of racially and gender diverse climate scientists...

D-ClimNet represents a new national partnership among the University of Vermont (UVM), the University of California - Los Angeles (UCLA) and the University of Georgia (UGA) to create a pipeline of under-represented students from the high school to graduate degree levels. The network is unique in its focus on the climate sciences as well as its commitment to training
Diversity Climate Network (D-ClimNet)

April 8, 2013

UCLA D-Climnet Student Jason Ward visited University of Georgia and University of Vermont recently as a part of a student share and exchange effort. Pictures from his visit to Vermont...

Diversity Climate Network (D-ClimNet)

April 8, 2013

UGA D-Climnet PhD student and USFS Scientist Marcus Williams in Liberia sharing knowledge on climate

Marshall Shepherd changed his profile picture.
May 29

Like · Comment · Share

29 people like this.

Sylvia Forsh Baker: Love this photo!
May 30 at 3:37pm · Like · 1
Our PI Dr. Shepard has pinned this piece at Ebony.com http://www.ebony.com/career-finance/why-african-americans-may-be-left-out-of-the-21st-century-job-market-498#axzz2QXE3XdxN

D-ClimNet Vermont and UCLA PIs with Dr. Warren Washington, Presidential Medal of Science winner and pioneering climate scientist.

More pics from Jason at Vermont. Presenting his work...
D-ClimNet scientists look up to Dr. Warren M. Washington
2014 AAG Honorary Geographer

Photos: AAG & L.-A. Dupigny-Giroux
Lessons learned from D-ClimNet

- climate and geosciences do not resonate
- “yes, we can”
- importance of mentoring
- importance of peer mentoring & networking
- choice of thesis and dissertation topic
SWAC
Satellites, Weather & Climate (SWAC)

Photos: L-A. Dupigny-Giroux & M. Fortney
SWAC is...

- teacher professional development
- in-service science, math & social science teachers
- elementary, middle and high schools
- inquiry & project based learning
- STEM content knowledge & skills
  - climate, weather
  - engineering
  - geospatial technologies
Tapping into a child’s curiosity

Photos: L-A. Dupigny-Giroux & J. AvRutick
Why do we need to start young?

- prevent misconceptions
- reduce angst
- Nature of Science discourse
- unevenness of elementary & secondary curriculum
- university/college course on weather & climate
Lessons learned from SWAC

• problem- and project-based learning
• importance of a safe, learning environment
• partnerships are key
• we are all teachers-learners
• varying challenges across grade levels

• encourage whole-school approach
• embed core principles in other subject areas
• crisis in the climate sciences & geosciences is global
Inter/intra/multi/trans-disciplinary

- Geoscientists use certain skill set
  - feedbacks, fieldwork, interdisciplinary problem-solving
  - “spatially challenged”
- Kolb’s learning style
- dominance of a given style
- implications for teaching style
  - linear course structure
  - 3-D concepts

http://serc.carleton.edu/introgeo/earthsystem/nutshell/index.html
The journey forward
Moving the conversation forward - students

- role models
- mentoring (at all levels)
- cultural sensitivity
  - family
  - new Americans
- school dynamics
- gender differences

- awareness & content knowledge
- misconceptions resistant to instructional remediation
- importance of textbook diagrams, verbal explanations, personal observations and the stories recounted to young children

- K-grey continuum
What is the source of your global warming/climate change knowledge?

Grade 11 students, 2008

University of Vermont Staff, 2008

Moving the conversation forward - educators

- teacher professional development and support for curricular reform
“The need for sufficient numbers of highly qualified Earth Science teachers in the K-12 workforce is a problem that has contributed to a lack of awareness of, and interest in, the geosciences among students.”
Moving the conversation forward - educators

- teacher professional development and support for curricular reform
- cutting-edge content, skills and inquiry-based experiences for students
- visualization in 3-D

- flexibility – “teachable moments”
- integrated science approach
- geosciences at all levels
Moving the conversation forward – other considerations

- meeting people where they are
- cognitive sciences
- cultural references
- accessibility – content & as scientists

- long-term process
- self-knowledge
- calling a spade a spade
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