Energy, climate and water in the 21st century – Texas and Florida share a strong connection with future challenges in the Earth sciences

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Energy, Climate and Water in the 21st Century – Texas and Florida Share a Strong Connection with Future Challenges in the Earth Sciences

by Hilary Clement Olson, Kathy Ellins, Jon Olson and Katherine Romanak
(The University of Texas at Austin)

Drs. Katherine Romanak (Bureau of Economic Geology), Kathy Ellins (Institute for Geophysics), Hilary Olson (Institute for Geophysics) and Jon Olson (Department of Petroleum and Geosystems Engineering) were part of a team of scientists and engineers from The University of Texas at Austin at the recent FAST meeting.

A partnership between two federally funded programs at The University of Texas at Austin was privileged to provide numerous activities for teachers at the **2011 Florida Association of Science Teachers Annual Conference in Orlando, Florida**. The Alliance for Sequestration Training, Outreach, Research and Education (STORE) and the TeXas Earth and Space Science (TXESS) Revolution provided keynote speakers and workshops for teachers on energy, climate and water. Texans and Floridians share a common interest in these 21st century challenges with their energy-intensive lifestyles, high carbon dioxide emissions levels, vulnerable coastal land areas and water resource management issues. In addition to teacher workshops, principal investigators of the TXESS Revolution program shared insights on Earth Science education in Texas and strategies for successful teacher professional development.

Dr. Kathy Ellins discusses the TXESS Revolution with members of the Florida Association of Science Supervisors.

In Texas, educators, scientists and citizens have shown a strong commitment to earth science over the past decade through: participation in education planning at state and national levels, involvement in federal- and state-funded projects to both develop earth science curriculum and provide earth science teacher professional development, and the creation of a model senior level capstone Earth and Space Science course offered for the first time in 2010-2011. The Texas state standards (Texas Essential Knowledge and Skills or TEKS) for Earth and Space Science demonstrate a shift to the rigorous content, career relevant skills

Teachers analyze data on Titanium to interpret periods of drought and increased runoff as part of the activity on climate change and the Mayan civilization.

and use of 21st century technologies called for in the report, "Blueprint for Change: Report from the National Conference on the Revolution in Earth and Space Science Education" (Barstow and Geary, 2002). These same TEKS also align with the new Earth Science, Climate, and Ocean Literacy framework documents, which identify the fundamental concepts that all Americans should understand about Earth, its climate and oceans and are intended to guide K-12 earth science teaching at the national level.

Following the adoption of the new course state standards, the State Board for Educator Certification eliminated Texas' secondary earth science teacher certification in 2009, thus, making *any* teacher with a composite teacher certification (i.e., biology, physics and chemistry) eligible to teach Earth and Space Science, even if they lack an earth science background. In addition, there are no Earth Science textbooks nor State-Board-of-Education-approved online earth science resources in Texas.

The population of Texas teachers who are well prepared to teach Earth and Space Science is now growing in large part due to the success of projects such as the TXESS Revolution and partnerships between this Earth Science teacher professional development program, other research initiatives (e.g., STORE) and teacher networks (e.g., the Texas Regional Collaboratives for Excellence in Science and Mathematics Teaching). Through their combined professional development efforts, these groups have directly served several hundred teachers, ultimately impacting thousands of teachers (through a train-the-trainer model) and hundreds of thousands of students throughout the state of Texas. These collaborative efforts are ensuring

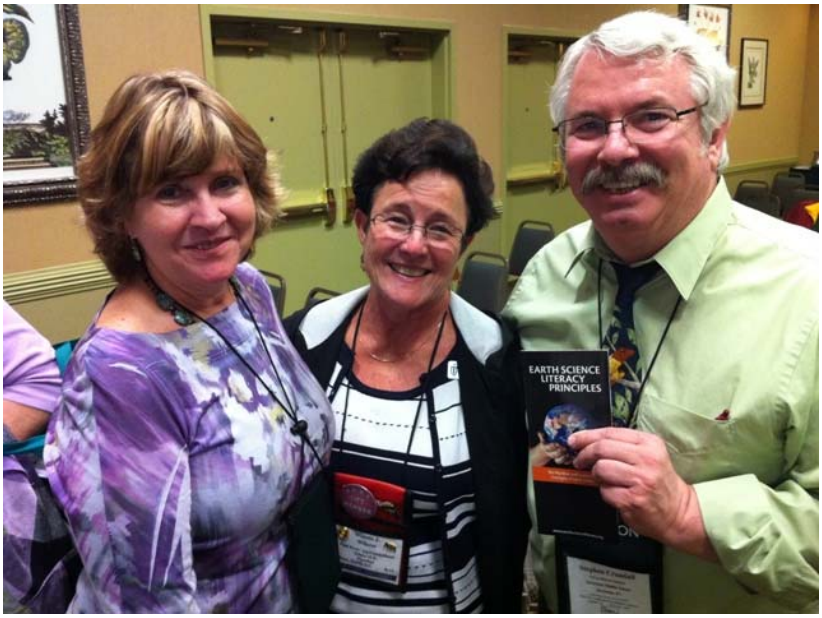
Dr. Jon Olson (STORE) from the Petroleum and Geosystems Engineering Department at UT Austin pulls teachers up for a short quiz during his plenary session on 'Energy, Engineering and the Environment' at the annual FAST Conference in Orlando.

that the state's Earth and Space Science capstone course is taught at the appropriate level by teachers who are (1) properly prepared and (2) aided by online, well-defined and standards-aligned course roadmaps, including recommended high quality, research-based learning activities and teacher resources (visit www.txessrevolution.org). By attending the FAST 2011 Conference in Orlando, representatives of STORE and the TXESS Revolution intended to share some of their research expertise in science and engineering, lessons learned in STEM professional development, as well as specific earth science curriculum developed in the areas of energy, climate and water.

Dr. Katherine Romanak (STORE) and two groups of teachers work on compromising between their various energy strategies to come up with one strategy and set of policies that will govern both groups.

Drs. Jon Olson and Katherine Romanak of STORE visit with FAST President Marsha Winegarner (center) at the recent annual conference in Orlando.

With initial funding from the National Energy Technology Laboratory of the Department of Energy, research scientists and engineers with STORE are working to increase climate and energy literacy levels throughout the Gulf Coast states. Dr. Jon Olson of the Department of Petroleum and Geosystems Engineering gave a plenary lecture at the FAST Conference on ***Energy, Engineering and the Environment*** with an associated workshop on ***Hot Showers and Potatoes - What do they have in common?*** These activities focused on reviewing the country's energy usage, what role it plays in our way of life, and how we as a society in America experience 'energy on demand'? In the workshop, teachers explored heating the water for a hot shower using alternative energy supplied from a 'potato power plant'. Dr. Katherine Romanak of the Bureau of Economic Geology focused her presentation, ***Climate Change and Climate Mitigation Technology***, on integrating science, technology, engineering and math to solve an issue of global societal concern: global climate change. Her accompanying ***What to do with CO2?*** workshop explored options for reducing our carbon footprint as we look forward to the world's energy needs of the future.



Dr. Kathy Ellins discusses Earth and Space Science instruction with Winnie Wilson and Stephen Crandall, past presidents of the Florida Association of Science Teachers.

The Texas Earth and Space Science (TXESS) Revolution is a teacher professional development program designed to strengthen earth science education in Texas. The program received primary funding from the National Science Foundation's Opportunities for Enhancing Diversity in the Geosciences program. Dr. Kathy Ellins and Dr. Hilary Clement Olson, both of the Institute for Geophysics, met with Florida science specialists and teachers to discuss the TXESS Revolution teacher professional development program, and then presented workshops on ***Earth Science Education - Approaches for 21st Century Learning*** and curriculum activities ***(Faunal Succession*** and ***Climate and Civilization – The Maya Example)***.

In addition to presenting talks and workshops, the members of STORE and the TXESS Revolution benefitted from networking with various teachers, science specialists and FAST leaders at the conference. The University of Texas team thanks Marsha Winegarner for her kind invitation to participate in the conference, and also extends their appreciation to their colleague Chris Comer for introducing them to this grand opportunity. The members of FAST are to be congratulated for their dedicated community of science teachers, specialists, and administrators, and thanked for their hospitality in Orlando.

Note:
For online learning activities and resources in Earth Sciences, including those presented and/or discussed at the 2011 FAST Conference, please visit www.txessrevolution.org and www.storeco2now.com.

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