

Milestones, Schedule and Costs

Education and Public Outreach Addendum

Objectives and Planned Activities

The objective of the education and public outreach addendum to the suite of Earth System Modeling Framework proposals is to develop and implement professional development opportunities on the Earth system sciences for middle and high school educators. Building upon and extending existing resources, a series of nationally-advertised professional development workshops for middle school and high school educators will elucidate concepts associated with Earth system science and modeling. This project will be implemented by UCAR and collaborating scientists, education specialists, and nationally recognized experts in professional development in the geosciences for middle and high school educators. The ESMF Investigator Team will provide expertise in their various disciplines over the course of the project.

Workshops

The most effective way to improve the scientific literacy of students is to work to improve the training of those responsible for educating them. The focus of this effort will be to build upon our extensive experience and existing resources to develop and implement a series of professional development opportunities for middle and high school educators that provides the training they need to enrich the learning of their students. In order to ensure the highest leverage to educators, we propose to target our training activities on educators with a proven track-record of providing training opportunities in their own regions or districts.

The workshops proposed here will extend upon the highly successful model used for the Michigan Space Grant Consortium (MSGC) Geoscience Education Workshop (see below). The yearly workshop series will target 20 educators per year, and will include an intensive 2-week summer semester at NCAR in Boulder, followed by 2 additional 2-day professional development opportunities during the school year.

In addition to providing background content on the Earth system that highlights issues in climate modeling and weather prediction, the workshops will provide opportunities to explore modeling concepts through state-of-the-art Earth system models (the science focus of this suite of proposals) as well as simplified STELLA models of components of the Earth system relevant to curriculum needs of educators as expressed in the National Science Education Standards. Educators will be trained on easy to implement hands-on, inquiry-based classroom activities that illustrate concepts of modeling and aspects of the Earth system. The workshop will include opportunities for educators to gain field experience - for observations and data collection that will be utilized in their studies and also expand their appreciation of the Earth sciences. Finally, the workshop will provide guidance on techniques participants can use to bring the training they have received back to educators in their own districts.

The workshop opportunities will be advertised nationally. Participants will be selected from the applicant pool based on their previous experience and success in regional or local professional development for science educators, as well as our programmatic desire to have a diverse and geographically distributed set of workshop participants. Travel and living expenses for workshop participants will be covered during the workshops, and each participant will receive a stipend to support their efforts to bring the training they have been provided

back to educators in their own districts. In return for the training and support they have received, participants will be expected to train an additional 20 educators per year in their own districts. Materials needed for this training will be provided from the project.

A dedicated project web site will be developed that provides access to information about the project, all lectures, labs, and other training resources, and also provides a venue for communication among project participants.

Previous Relevant Education and Outreach Activities of Project

Personnel Science and education personnel participating in this proposal have extensive experience in development of highly-valued educational resources and successful professional development opportunities for K-12 educators. Over the past decade, UCAR has developed a number of professional development resources with funding from NSF for middle and high school educators on global change, climate change, and the ways in which components of the Earth system are interconnected. In addition, NCAR has been responsible for the development of an influential series of documents *Reports to the Nation* that highlight our understanding of the Earth system and the potential contributions of humans in changing our climate. With funding from NSF, UCAR developed Project LEARN, in which science education faculty, scientists, and professional development specialists provided training to over 2000 middle school educators on the atmospheric sciences. After six years of funding, resources developed through this program are being made available on-line to support educators nationwide.

Prior to moving to UCAR, Dr. Roberta Johnson (the Director of the UCAR Office for Education and Outreach) developed, in collaboration with colleagues, a highly successful workshop for middle and high school Earth science educators while she was the Director of the MSGC (funded by NASA). This workshop utilized the concept of global change as a vehicle for exploring the breadth of the geosciences, covering topics ranging from recycling to anthropogenic effects on ozone and greenhouse gases to the role of plate tectonics in determining planetary climates. Workshop activities included a combination of lecture, computer-based training and activities (with an emphasis on modeling illustrated through STELLA), training on hands-on inquiry-based activities, field experience, and project development. Resources utilized in the workshop included content and activities available through the NASA-sponsored Windows to the Universe project, also PI'd by Dr. Johnson.

Management and Coordination

Dr. Johnson will be responsible for the directing the educational activities described in this addendum. She will be assisted by the staff of the UCAR Office of Education and Outreach, including Ms. Susan Foster, who will manage the project and assist in design and implementation of the workshop. Dr. Killeen and other selected science CoIs on the project will participate in the educational effort by giving lectures to project participants and participating in other workshop activities. Mr. David Mastie and Mr. Parker Pennington IV, both recognized experts in teacher training in the Earth sciences at the middle and high school levels, will collaborate in the effort and continue in the roles they have had in the MSGC Geoscience Education Workshop as lead teacher trainers, working with local UCAR EO staff.