

ReSciPE Project Findings to date (report to NSF December 2005)

1. Workshop venues: The workshops have been hosted by geoscience organizations representing atmospheric science, climatology, geology, limnology and oceanography, and astronomy, in addition to several multidisciplinary scientific groups. Additional efforts in geology, astronomy, ocean science, and space physics are underway for 2006. Our workshops have been well-received and well-attended.

We have presented workshops at several different types of institutions. In general, we believe the workshops at professional society meetings reach participants at a wider career stage, from graduate student to experienced scientist, while workshops hosted by particular institutions or labs provide more esprit de corps and more opportunity for the host institution to follow up. For example, our two NOAA lab workshops seemed particularly successful in terms of participants' enthusiasm and feeling they could use the material. (these observations stem from facilitator experience and impressions and are not yet backed up by any evaluation data, though such data have been collected). Our upcoming workshops at WHOI and Mauna Kea will both be tailored to fit ongoing efforts at those sites. We have learned some useful things about working with professional societies—there are differences among societies in their views of education as a part of their mission, and some are better organized to incorporate and advertise this type of workshop than others. So far, our cost per workshop has been lower than anticipated, in part due to our general frugality and in part due to several local opportunities with low travel costs.

2. Participants: Demographic data is collected in our pre-registration survey, which was completed by 167 registrants for all workshops except the SACNAS and ASP workshops (both held as open, parallel sessions that were part of the regular meeting, rather than meeting-affiliated but distinct workshops). We also did not collect data from the SACNAS teacher workshop. Registrants are not identical with actual participants; not all who register end up participating, and some participants show up who did not pre-register. However, from the pre-registration data, our evaluators have characterized our registrants as follows.

While most are from the US (98%) and Caucasian (75%), we also observe substantial diversity in a variety of respects. Of all registrants, 17% are from groups that are underrepresented in science (including survey categories of African-American, Native American, Latino, multi-racial, and "other"), a percentage that exceeds the general representation of these groups in science. Native Americans and Latinos are underrepresented in our registrant data because we could not collect pre-registration data from SACNAS participants. Likewise, women are represented rather better among our registrants, at 58%, than they are in science as a whole.

The workshops has attracted both early-career scientists—undergraduates, graduate students, and postdocs—at 27% of registrants, and practicing professionals, at 68% of registrants. It has reached scientists from a wide range of geoscience disciplines, with atmospheric scientists (24%) and geologists (15%) the largest groups, followed by aquatic science, biology, general science (an answer typical of educators), and chemistry. Persons indicating "other" disciplines comprised 20% of registrants. Space scientists are underrepresented in this data because we could not require pre-registration for the ASP workshop in Tucson.

The registrants came primarily from graduate degree-granting institutions (32%) and government (31%)—each group exceeding the total from K-12 schools, 2- and 4-year

colleges (26%). Their primary work roles are research (27%), teaching (23%), and administration or management (19%). Together, these data support a claim that we are in fact reaching researchers as a primary audience, not solely people who already focus most of their professional activity on education.

In addition to these data, we were able to reach a population of scientists from underrepresented groups (primarily Native Americans and Latinos/as) at the SACNAS meeting in Denver. These scientists are not represented in the demographic data cited above. While attendance at this workshop was not high due to unfortunate scheduling at the end of the meeting, we have been inspired to pursue additional opportunities to present our workshop at scientific meetings specifically for members of underrepresented groups. However, no firm plans can be reported at this date.

3. Participant response: Our evaluators have summarized the post-workshop data from 128 participants completing full post-workshop surveys to date (an additional 30 participants completed only a “short-form” post-workshop survey because we were unable to gather matching pre-registration data for those workshops). Additional analyses will compare pre- and post-workshop responses on some matched items, look at possible group differences in response, and analyze the responses to open-ended questions. Additional analyses of the pre-registration survey responses will examine some items that characterize participants’ prior education experience, education experience, and attitudes. These more detailed analyses of both pre- and post-surveys and the matched pre/post data will be performed after the evaluation data set is complete in spring 2006. The evaluation team provided the following summary of key findings from the post-workshop surveys:

Participants were highly satisfied with the quality of the workshop, have strong beliefs in the efficacy of inquiry strategies and are highly motivated to use them in their own educational and outreach activities. Participants also had a fairly high level of current knowledge of inquiry strategies, with almost all respondents rating themselves as having “a lot” or “some” knowledge of inquiry. Responses among workshops varied only slightly, with participants from all workshops giving high ratings to all survey items.

Current Knowledge Level

- Overall, workshop participants rated themselves as fairly knowledgeable about inquiry.
- Over 25% of all workshop participants rated themselves as having “a lot” of knowledge.
- Over 50% of all workshop participants rated themselves as having “some” knowledge.

Effectiveness of Inquiry Strategies

- Overall, workshop participants exhibited strong beliefs in the efficacy of inquiry strategies.
- Almost 85% of all workshop participants thought that inquiry is “highly” effective.
- No workshop participants rated inquiry as “not very” effective.
- Only one workshop participant “didn’t know” whether inquiry was effective.

Motivation to Use Inquiry

- Overall, workshop participants were very motivated to use inquiry in their outreach activities.
- 80% of all workshop participants were “highly” motivated to use inquiry.
- No workshop participants were only “a little bit” or “not at all” motivated.

Overall Quality of Workshop

- Workshop participants were very satisfied with the quality of the workshop.
- 90% of all attendees rated the workshops as “excellent” or “good.”
- No participants rated the workshop as “poor” or “very poor.”

We conclude from these highly positive responses that the workshop is effective for the large majority of participants and that they complete the workshop with good knowledge of inquiry-based science and with positive views of the effectiveness of inquiry and motivation to use inquiry. We will be analyzing the pre/post comparative data that will enable us to determine whether these positive attitudes are in fact an outcome of the workshop.

Although we know that participants are highly motivated to continue to use inquiry in the classroom, we do not know the extent to which they have implemented inquiry-based strategies or utilized their learning from the workshop to inform their practice. Follow-up interviews will allow us to discover the longer-term outcomes of the workshop and further understand the types of education activities in which workshop participants are engaged.

4. Dissemination: Word-of-mouth and invitations from participants in our previous workshops to work with their colleagues have begun to build our clientele. We have recruited workshops from a combination of active solicitation on our part (particularly of the professional societies) and people initiating contact with us (more the case for individual lab/institute hosts). We continue to receive invitations to give workshops and expect to run out of funds before we run out of invitations.

We are also beginning to appear on the radar screens of other organizations interested in scientist-education partnerships. Our project is listed first in the online resource list for SERC, the Science Education Resource Collection sponsored by DLESE, “Ways to Learn More about How Scientists Can Help Improve Science Education,” created by Jennifer L. B. Anderson, Ph.D., SERC, Carleton College.

http://serc.carleton.edu/teacherprep/in-service/Learn_More.html

The project has been mentioned in the DLESE news:

http://www.dlese.org/news_opportunities/description_full.jsp?id=NEWS-OPPS-000-000-001-082&q=

and posted to the bulletin board of the AAS Committee on the Status of Women in Astronomy: <http://www.aas.org/~cswa/bulletin.board/2005/07.22.05.html>

An action photo from our workshop for the ASP conference was featured in the post-conference photo collection: <http://www.astrosociety.org/events/2005mtg/pages/16.html>

5. Resource Collection: The ReSciPE Book continues to grow as we identify additional, high-quality resources. We have received positive responses to it (e.g. e-mails) but do not yet have data on its effectiveness or extent of use.

6. **Additional Workshops:** Three of our four scheduled workshops for 2006 have come through invitations by past participants. We are particularly pleased to have made connections with a large group of Hawaiian observatories and astronomy organizations, and with a group of oceanographers connected with the New England COSEE group.
7. **Research & Evaluation:** We have gathered pre-registration data from 167 registrants and post-workshop evaluation data from 128 participants. We are developing the interview protocols and samples and will begin interviews in January 2006.