COSEE's Influence on Scientists' Professional Practices:

Findings from the COSEE Scientist Study

Andrea Anderson

SoundView Evaluation & Research

Rena Dorph

The Lawrence Hall of Science

The University of California, Berkeley

Patricia Kwon

Patricia Kwon & Associates

With the support of

Joo Chung

Matthew Cannady

The Research Group • The Lawrence Hall of Science

The University of California, Berkeley

David Plude

SoundView Evaluation & Research

and the

COSEE Evaluation Working Group

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Executive Summary

Background

The *2010 COSEE Scientist Engagement Survey Key Findings* reported that 28% of scientists who participated in COSEE in 2010 agreed or strongly agreed that COSEE had a positive impact on their scientific research. This finding sparked interest in better understanding the impact COSEE had on scientists' professional practices. In response to this interest, the National Science Foundation commissioned COSEE evaluation researchers to design and implement the study described herein.

Study data collection began with interviews of 14 scientists selected from among the 28% of scientists referenced above. These interviews were designed to support the development of a scientist survey that served as the main data collection method for this study. The final scientist survey was sent to 1,841 COSEE-involved scientists. With a response rate of 41%, we analyzed 767 completed surveys. Scientists answered 48 Likert-style items examining the impact of COSEE on scientific research, involvement in education and outreach (E&O), and university/college level teaching. There was also opportunity for free response to open-ended questions and scientists at all career stages, equally from men and women, provided further elaboration of the survey responses through their comments.

Three main sources of evidence for impact are: 1) factor analysis scores— determining a statistical measure of the scientists' perceived impact of COSEE in their scientific endeavors, including instruction, research, and E&O; 2) descriptive or secondary indicators of professional responsibilities; and 3) comments made to the free-response questions.

Results

The study resulted in several findings regarding survey respondents' perceptions of COSEE's impact on various aspects of their professional practice, most notably the impact of COSEE on respondents' professional responsibilities.

1. **Survey respondents are accomplished professionals and increasingly involved with Center and Network activities and partnerships.** The majority (78%) work in academic institutions, and reflect the full range of career stages. During 2011 75% of respondents participated, while 70% have done so for three years or less.

2. **Respondents indicated that COSEE had a positive impact on their professional responsibilities, including education & outreach, college-level teaching, and research.** More specifically, 81% of scientists responding to the survey said that COSEE had a positive impact on their E&O and 45% of respondents said that COSEE had a positive impact on their scientific research and on their college-level teaching.

3. **Scientists' thinking about research, teaching and E&O is evolving—in part due to involvement with COSEE.** Survey results showed that more than one-third of the scientists (37%) agreed or strongly agreed that COSEE involvement changed the way they think about research questions, with 34% indicating a shift in focus toward more societally relevant questions.

4. **The quality and quantity of education and outreach increased because of COSEE, according to respondents.** Nearly three-quarters of the scientists taking the survey said COSEE helped improve the quality of their work and gave them opportunities to plug into existing education and outreach (73% and 72%, respectively).

5. **Respondents report that their college-level teaching improved.** Nearly three-quarters of the respondents (70%) said their science teaching improved, while 78% asserted that COSEE expanded their network of colleagues (i.e., educators and other scientists) to support their teaching.

6. **Length and type of affiliation with COSEE influenced the degree to which COSEE impacted respondents' professional activities.** Statistical analysis showed positive correlation between number of years with COSEE and impact on factors: research, education and outreach, teaching and institutional support, while there were significant differences on those factors based on the type of involvement.

7. **COSEE activities (e.g., professional development and proposal support) targeted at scientists had an impact on respondents' professional practices.** There were significant differences with those who involved COSEE in proposal development and/or participated in professional development for three of four factors, compared with those who did not participate.

8. **Respondents' perspective on the impact of COSEE on their teaching is related to their personal and professional characteristics.** There were significant and positive relationship for females and those not tenured on the "teaching" factor, but a significant negative correlation between academic degree and the "teaching" factor.

9. **Respondents note other personal and institutional benefits from COSEE.** Three-fourths of the responding scientists (75%) agreed or strongly agreed that COSEE had a positive impact on their understanding of science education practices and science learning research.

10. **Respondents are reaching out to underrepresented audiences, but institutions are still finding it challenging to recruit them into the sciences.** The survey results revealed that 52% of respondents agreed or strongly agreed that COSEE had a positive impact on reaching out to underrepresented audiences, yet only 24% similarly agreed that COSEE had a positive impact on their institution's success at recruiting underrepresented students into the sciences.

Conclusions

The study described herein contributes to understanding the benefits of COSEE to scientists and the scientific enterprise and provides evidence and support for NSF's investments in education and outreach. This contribution is three-fold. First, researchers used factor analysis to develop and evaluate a survey instrument, which may be useful in future studies. Second, the scientists who participated in this study provided us with key insights about the ways in which COSEE impacted their professional practices. Third, the study raised questions that are worthy of future investigation.

Finally, this study shows there is an intensity and duration of engagement needed in order to witness the types of transformative outcomes we observed among these respondents. It suggests that substantial investment is required to meet NSF's goals for Broader Impacts and to transform relationships between scientists and educators