

CAPITALIZING ON EXPERTISE IN MARINE EDUCATION AND OUTREACH TO BROADEN IMPACTS

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IN RESPONSE TO THE NATIONAL SCIENCE FOUNDATION'S MANDATE FOR broader impacts, academic scientists have become more engaged in education and outreach (E/O). Scientists participate in E/O by leading their own programs, such as lab internships, participating in local or regional programs, e.g., institution-supported efforts, or leveraging federally sponsored national-scale E/O programs. As a principal investigator at a research university, I (Girguis) have been involved with a variety of E/O programs, ranging from ad hoc groups (informal high school internships in my laboratory) to regional efforts (Harvard's Microbial Science Initiative, Science Cafés) and national programs (RIDGE 2000; Centers for Ocean Sciences Education Excellence (COSEE), and National Public Radio science shows). These opportunities have allowed me to share research on microbes living in the deep sea, including the deep subsurface biosphere.

I wanted to better understand which of my education and outreach activities were most effective. Accordingly, I sought to develop a framework for such an assessment by creating a list of "quantifiable" metrics, including A) the scale of the program (the number of students or individuals to whom these efforts were directed); B) the effort required by me and/or my lab members (time required to prepare the materials); C) the extent and accessibility of documentation after the event (activities whose content can be accessed online, and the degree of effort required to access those materials); D) participation by those traditionally underrepresented in science; and E) the personal satisfaction specifically resulting from preparation for the event. I ranked each of these metrics on a numerical scale, and used these data to generate an efficacy score (Figure 1). I define efficacy as the likelihood that the effort would produce a lasting effect, beyond the original event.

What I found was that my efforts required varying degrees of personal investment, had widely varying degrees of impact, and, accordingly, varying degrees of efficacy (Figure 1). The results (found online at cosee.umaine.edu/pgirguis) helped me realize which activities were most effective. Equally important, this effort helped identify those that were most personally satisfying, which I would suggest is a valuable consideration because it is likely that one will produce a better product (the outreach activity) if it is more pleasurable.

I was also struck by the efficacy of partnering with national organizations, like COSEE, wherein I could work

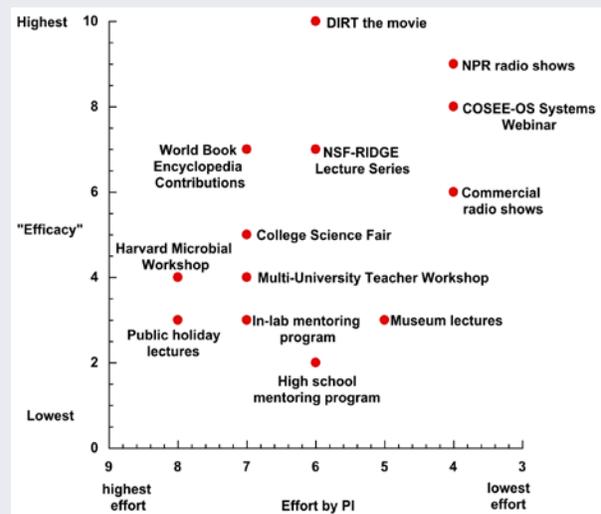


Figure 1. Plot showing the principal investigator's (PI) assessment of effort required (which is the sum of the time in hours required to prepare for the activity, as well as a numerical representation of the difficulty of preparation, minus a numerical representation of the personal satisfaction derived during the preparation for the event) versus the "efficacy" (defined as the likelihood that the effort would produce a lasting effect beyond the original event, and which is the sum of the number of students reached, the geographic extent of impact, and whether documentation is available and easy to access). Activities in the upper right hand corner have a high efficacy and required less effort—or were more satisfying—to the PI. Nevertheless, other activities (e.g. the World Book Contributions) may have required greater effort, but still have a substantial impact due to the personal satisfaction and accessibility of the material.

with professionals to develop my content while receiving valuable feedback. Key to the success of these endeavors is the collection and analysis of evaluation data, enabling principal investigators to refine their presentation styles and content levels to improve future E/O efforts. Such interactions ensure that the outcomes are grounded in appropriate educational practices.

Principal investigators are continually faced with the daunting task of running their labs, participating in community service, and leading E/O efforts. Investing energy in a self-assessment of E/O activities provides an opportunity to better prioritize one's commitments, and partnering with E/O experts can help principal investigators make best use of their most valuable resource—time.

ACKNOWLEDGEMENTS

This work was written by Peter R. Girguis, with contributions and support from A. deCharon and C.M. Herren. Support for this effort was provided by the National Science Foundation (OCE-1061934, OCE-0838107).

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