Ocean Research Interactive Observatory Networks Workshop
4-8 January 2004
San Juan, Puerto Rico

Improving Outreach and Education Efforts for an Ocean Observing System

Jack Thigpen
North Carolina Sea Grant
Department of Sociology and Anthropology
North Carolina State University
Raleigh, NC. USA

This paper describes how a regional coastal ocean observing system (SEA-COOS) is integrating outreach and education into a coastal ocean observing system. In addition, it examines some of the basic concepts of communicating scientific information to non-scientists and how these concepts can be applied to outreach and education projects.

SEA-COOS Structure

The SouthEast Atlantic Coastal Ocean Observing System (SEA-COOS, www.seacoos.org) is a regional partnership that has initiated an integrated coastal ocean observing system for a four-state (North Carolina, South Carolina, Georgia and Florida) region of the southeast coastal U.S. The long-term intent of SEA-COOS is to establish a regional coastal ocean observing system that will be part of the coastal component of the national Integrated Ocean Observing System (IOOS) envisioned by Ocean.US. SEA-COOS was initiated in September 2002 with funding from the Office of Naval Research (ONR) as a coordinating and enhancing effort between several existing subregional-scale efforts in the southeast, the Sea Grant Offices from the four states, and a number of federal agencies. SEA-COOS has been organized around four central functions: Observing, Modeling and Products, Information Management, Outreach and Education.

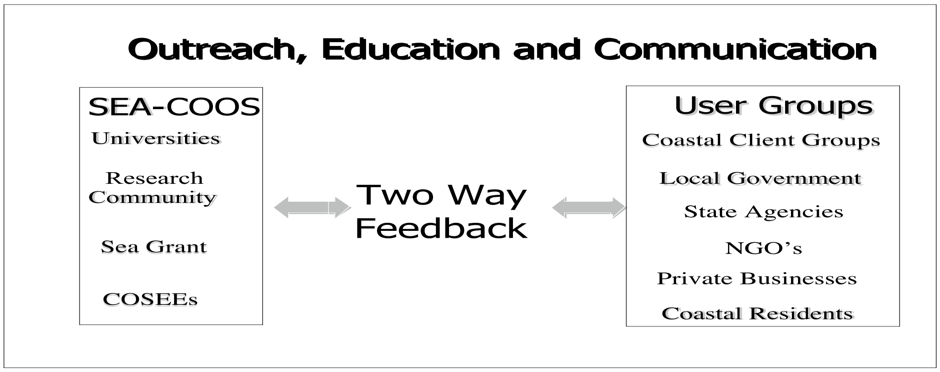
SEA-COOS Outreach and Education Workgroup

Objective:

> "…an outreach effort with the region's Sea Grant offices will establish a dialog with non-scientific users, identify their information needs and the preferred formats and modes of information delivery…" (SEA-COOS Initial Implementation Plan [p. ii], 2002)

SEA-COOS is using a combination of personal contacts, qualitative and quantitative social science techniques to identify users of observing information and their preferred methods of information delivery. As Figure 1 shows, the model for establishing dialog between researchers and the non-scientific users of information is based on a two-way flow of information. In concept, users information needs are identified in conjunction with the development of research agendas.

Figure 1. SEA-COOS outreach two-way feedback



In this context the "outreach" refers to efforts with various user groups (boaters, marine industries, emergency management agencies, etc.) and "education" refers to endeavors to develop information-sharing relationships with formal educators and their students.

Phased Approach to Information Delivery

Early on in the project it became painfully evident that the team could not provide "everything for everybody." Therefore a system of prioritizing and segmenting users is evolving. Two primary concepts are guiding the SEA-COOS outreach and education efforts. One is that SEACOOS can provide multiple situation-dependent educational products. These are 1) information (data), 2) products (forecasts, nowcasts, hindcasts), 3) training (how to interpret and use information), 4) informal networks (facilitating the sharing of information among and between individuals with similar needs), and 5) formal networks (the formation of associations and organizations by individuals with similar needs). The second concept is that the SEACOOS team needs to prioritize our opportunities and focus on what we can deliver. This may best be accomplished by a "phased approach" to user engagement and assistance:

Phase I: User groups we can help now with information currently available

Phase II: User groups we can help in the near future with information available in 2-3 years

Phase III: User groups we can help in 3-5 years

Together these two concepts form a matrix that will be used to provide a structural dimension for identifying outreach and education opportunities and tracking project performance. Table 1 illustrates this matrix in which different types of user assistance can be categorized by type and temporal availability.

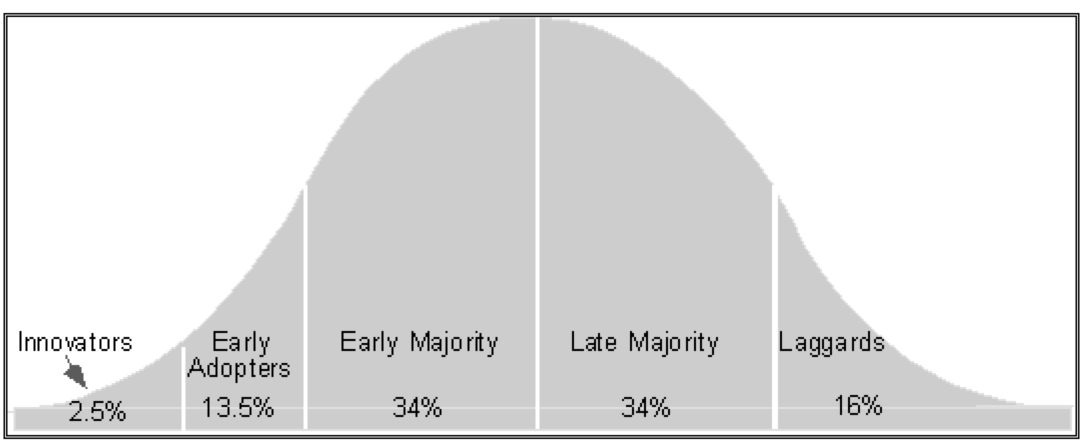
Table 1. Type of assistance by temporal availability

	Phase I (current)	Phase II (1-2 years)	Phase III (3-5 years)
Information			
Products			
Training			
Informal networks			
Formal networks			

Adoption / Diffusion Model All information users are individuals and all products have unique characteristics in the classical adoption / diffusion (A/D) model. Early studies of adoption and diffusion focused on agricultural technologies. The first studies were done by anthropologists and sociologists. A classic is the Ryan-Gross study of the spread of the use of hybrid corn, introduced by Iowa State in 1928, which had been adopted by most Iowa farmers by 1940. Ryan and Gross studied what factors influenced its adoption and found that communication between previous and potential adopters was important and an S-shaped rate of adoption. This result is still typical today.

Everett Rogers (1962 and 1995) posits that users of new technology will adopt (begin using) a new technology at different times. Rogers (1995) states that **diffusion** is a process by which an innovation is communicated through certain channels over time among the members of a social system. The **rate of diffusion** is the speed that the new idea spreads from one individual to the next. **Adoption** is similar to diffusion except that it deals with the psychological processes an individual goes through, rather than an aggregate market process. The rate of adoption or the relative speed with which an innovation is adopted by members of a social system is influenced by structural factors and the end user's personal characteristics. Rogers classifies adopters in five categories based on how quickly adoption takes place:

Figure 2. Rogers' (1995) Adopter Categories



In figure 2, a population of adopters are hypothesized to be normally distributed. **Innovators** (the first 2.5% of individuals in a social system to adopt an innovation) are portrayed as possessing the following characteristics:

- Venturesome and eager to try new ideas
- Have more years of formal education
- Have higher social status
- Have substantial financial resources
- Able to cope with high degree of uncertainty
- Contacts outside peer group
- May or may not be respected by peers

Early Adopters (next 13.5% of individuals in a social system to adopt an innovation) are:

- Respected by peers
- More integrated part of the local system
- Opinion leaders - potential adopters look to them for advice and information
- Change agents
- Role models for other members of social system

Early Majority (next 34% of individuals in a social system to adopt an innovation) are:

- Deliberate before adopting new idea
- Adopt new ideas just before the average member of a system
- Interact frequently with peers
- Rarely hold positions of opinion leadership
- Provide interconnectedness in the system's interpersonal networks

Late Majority (next 34% of individuals in a social system to adopt an innovation):

- Approach innovations with caution and skepticism
- Adopt new ideas just after the average member of a system
- Adoption may be due to economic necessity or peer pressure
- Unwillingness to risk scarce resources
- Uncertainty about innovation must be removed before adoption

and **Laggards** (the last 16% of individuals in a social system to adopt an innovation):

- Hold on to traditional values
- Resistance to innovations
- Last to adopt an innovation
- Near isolates in the social networks of local system
- Suspicious of innovations and change agents.

Similarly, the characteristics of different technological innovations can impact the ease and speed of their adoption. Rogers (1995) linked the innovation's

- perceived advantage or benefit
- riskiness
- relative ease or complexity of use

- immediacy of benefits
- observability
- trialability
- financial cost
- extent of behavioral changes required, and
- return on investment

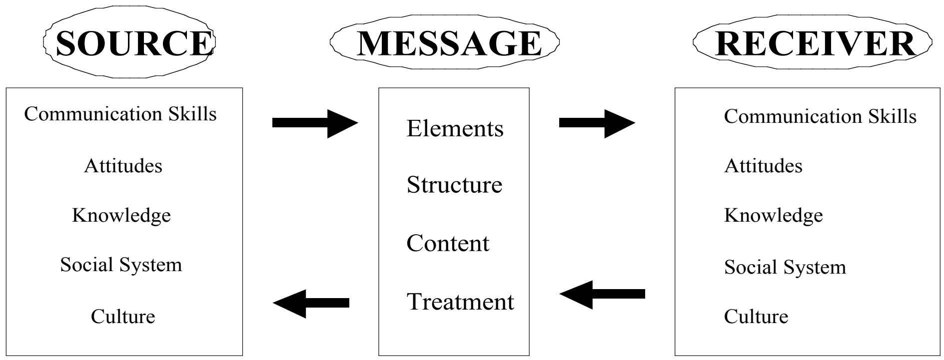
as key characteristics influencing how rapidly a technology or idea will be adopted. Rogers research (1995:18) also showed that while mass media is useful in creating knowledge about an innovation, face-to-face exchange between two or more individuals is more effective in persuading individuals to accept new ideas.

This model helps us to understand that information and technology users are a group comprised of heterogeneous individuals that will respond to different methods of outreach and education delivery methods at different times. People will begin using a new technology based on their individual characteristics, attitudes and their economic and cultural setting. By better understanding these characteristics we can better target those people who may be likely to adopt early and also have influences over others and therefore increase the adoption rate.

Inter-Working Group Dynamics As our ocean observing project evolves, so do the relations and interactions between the working groups. Initially the O&E workgroup was developing strategies for outreach and education somewhat on their own. Although a formal survey was done of other workgroup members to identify user groups and information needs, there was not the involvement of other group members in strategic planning and development of a working plan for the OEC group. This pattern of "working in silos," although an oversimplification, occurred, in varying degrees, within the other working groups as well. Needless to say, this was not the ideal way to foster collaboration and partnership building between the individuals in each working group.

Over an 18-month period there has become more inter-workgroup involvement that continues to evolve. This "cross-fertilization" has been enhanced by at least two factors. One, is the formation of inter-workgroup teams to focus on specific projects. This has been informal and these teams have formed as opportunities have arisen and been identified - sometimes by O&EC workgroup members, and sometimes by other workgroup members. Second, a more planned approach occurred in the November 2003 Workshop when workgroup members were divided into four thematic issue groups and worked together to identify short-term projects and develop a work plan for accomplishing these projects.

Bringing Researchers and Users Together Researchers and information users are typically in different institutional settings each with their own set of communication skills, attitudes, knowledge, social system and culture (Berdo, 1960). Thus, the role of outreach and education in the scientific process is to help the "source" of information (scientists) reciprocally communicate with the "receiver" of the information (information users) in an iterative process that results in satisfied users and better science. The key is to understanding the context in which both the Source and the Receiver operate and then to design the Message in a way that accurately transmits the information in a way that can be easily understood and appreciated by the Receiver. Figure 2 illustrates Berdo's model.



Adapted from *The Process of Communication: An Introduction to Theory and Practice*, David Berlow, 1960. Holt, Rinehart and Winston

Use of Web-Based Delivery System for User Feedback In today's rapidly changing communications world, the reliance on electronic communications is often seen as a hindrance to personal two-way communications. However, this format may bring users and scientists closer together as feedback on information and delivery methods can be built-in to web-based formats thereby connecting the two groups in a way not possible with the other formats. In the SEA-COOS project, information-users are expected to prefer a range of different mediums for obtaining information and providing input to researchers. These may include internet/web-based formats, telephone, radio and print. Of these formats, the electronic, web-based delivery system is primarily being used. As information products are developed and displayed online, they are evaluated by users through on-line survey techniques. This allows for immediate feedback and compilation of results for analyses of the preferences of different user group based on location, age, education, and special needs.

Conclusions

The integration of outreach and education (O&E) are necessary components of a useful ocean observing system. We believe that our work with SEA-COOS is applicable to any type of ocean observing system (or research project, for that matter) – those who are working on the deep sea floor, those suspended at mid-water in the open ocean and those placed in geologically active places. These lessons learned also apply to any situation where PIs are working relatively independently with a need to develop cross-cutting relationships with applied users of information. As our SEA-COOS example evolves, seven points have emerged that may apply generally to the process of infusing new content into new environments:

1. O&E needs to be two-way so that project members can learn from users and vice-versa;

2. Information and technology users are a group comprised of heterogeneous individuals that will respond to different methods of outreach and education delivery methods at different times;

3. Mass media is useful for creating knowledge and awareness, but lacks the two-way communication essential for rapid adoption of new technologies;

4. O&E can provide an array of different forms of assistance to users including information, products, training, and network-building;

5. A "phased approach" in which users and their needs are identified by those that can assist "now," in 2-3 years and in 3-5 years;

6. There needs to be a strong and continuing effort to integrate O&E with the other functions of the project; and

7. The internet can bring users and project team closer by providing quickly effected changes with two-way interactions on information delivery.

References

Berlow, David. (1960). ***The Process of Communication: An Introduction to Theory and Practice.*** New York: Holt, Rinehart and Winston.

Hall, Nick; Jordan, Gretchen and Sprunt-Crawley, Anne. "Evaluations Help Demonstrate Impacts and Improve the Performance of the Federal Technical Assistance Programs." *Proceedings: 1999 International Energy Program Evaluation Conference*, August 1999, 761-770.

Rogers, E.M. (1962). ***Diffusion of Innovations*** (1st edition). London: The Free Press.

Rogers, E.M. (1995). ***Diffusion of Innovations*** (4th edition). New York: The Free Press.

Ryan, B. and Gross, N. (1943). "*The Diffusion of Hybrid Seed Corn in Two Iowa Communities.*" **Rural Sociology**, 8:15-24.