**Pacific Northwest
National Laboratory**

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U.S. Department of Energy

**Guidelines—A Primer for
Communicating Effectively with
NABIR Stakeholders**

December 1998

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Guidelines—A Primer for Communicating Effectively with NABIR Stakeholders

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Summary

This primer is a tool to help prepare scientists for meetings with stakeholders. It was prepared for staff involved with the Natural and Accelerated Bioremediation Research (NABIR) program, sponsored by the U.S. Department of Energy. It discusses why some efforts in science communication may succeed while others fail, provides methods of approaching group interactions about science that may better orient expert participants, and summarizes experience drawn from observations of groups interacting about topics in bioremediation or the NABIR program. The primer also provides brief, useful models for interacting with either expert or non-expert groups. Finally, it identifies topical areas that may help scientists prepare for public meetings, based on the developers' ongoing research in science communication in public forums.

I. Introduction

Engaging the public about establishing Field Research Centers at U.S. Department of Energy (DOE) sites is expected to be an important undertaking of the National and Accelerated Bioremediation Research (NABIR) program in future years.^(a) During those engagements, NABIR scientists will have to communicate with non-scientists and engineers about basic research in bioremediation. Such a discussion would not have occurred 20 or 30 years ago. More than any previous generations, children born after World War II have been taught that they must be active citizens, and that they have an obligation to participate in their government. They have learned this lesson well. As a result, the nature of public discussion about local, regional, national, and global affairs has been broadening to encompass more elements of society, and deepening in content as interest in government activities increases and the education level of the citizens continues to rise. This is certainly true in the sciences, where scientists are increasingly communicating with non-scientists about their work. Communication between scientists and non-scientists fills a variety of needs, such as raising national awareness about the implications of global warming, testifying about scientific data in criminal trials, and defending government funding for scientific programs.

Unfortunately, consistently successful communication between scientists and non-scientists remains elusive. Some efforts, such as communicating about the benefits and risks of medical radioisotopes, are relatively successful. Others, such as communicating about the benefits and risks of food irradiation, fail miserably.

Public support and politics are outside of the everyday concerns of most scientists. Yet scientific work often depends on public support. If the project is expensive (e.g., remediating a contaminated aquifer) or controversial (e.g., the use of genetically-engineered, herbicide-resistant crops), public emotions can be stirred. "Vagueness, anxiety, fear or abhorrence often prevail over rational judgment, and incorrect or even hostile (it is absurd, extravagant, useless or diabolical) commentary about certain kinds of research spread quickly."^(b) It is at this point that good scientific conversation is most important and very difficult to achieve.

^(a) This report was developed by Pacific Northwest National Laboratory (PNNL) for DOE. PNNL is operated by Battelle Memorial Institute for DOE under Contract DE-AC06-76RLO 1830.

^(b) *Science*, 8/7/98, p. 776.

**Who are the
NABIR
stakeholders?**

In the broadest sense, NABIR stakeholders are any persons or groups who are interested in or potentially affected by NABIR research. By this definition, they include citizens, regulators, technology developers, science and technology users, Congress, Native Americans, local officials, environmental groups, and public interest groups. Depending on the site and the particular aspect of the NABIR program being discussed, the set of interested stakeholders will differ, and their "frames of reference" will vary accordingly.

**Why should we
talk with NABIR
stakeholders?**

Experience to date indicates that stakeholders generally regard bioremediation as a promising way to address environmental contamination. They want scientists to succeed in developing breakthrough methods to solve intractable problems, and they look to the talents of scientists to generate the knowledge to enable these breakthroughs. NABIR scientists can take advantage of this public support and benefit from stakeholders' insights.

- Early involvement will help identify performance criteria, some of which if not addressed could be research or program show stoppers. It may also identify opportunities that the scientists have not considered.
- Stakeholders possess valuable information about political, regulatory and community concerns regarding site remediation and the application of NABIR research. It is far better to understand and account for these concerns at the outset of a project than to be hindered or blocked by them later.
- Community leaders are looking for solutions to community environmental problems outside the DOE. The NABIR program will gain community support through constituent involvement and collaboration on related problems.
- In a democratic society, citizens will ultimately decide the nature and direction of publicly funded scientific research. Because science-infused decisions are generally superior to decisions made without the benefit of scientific knowledge, scientists have a responsibility to citizens to enhance understanding the science involved in the decision they are making.

**Purpose of this
primer**

With this primer, we have tried to avoid prescription for successful communication. Instead, it is intended to be a flexible approach, introducing you to what you can expect and a fruitful way to look at the interactions you will have. It is certainly not the last word on the subject. You should

feel free to add to and amend the information and approaches contained here. Like a scientific hypothesis, if it doesn't work, change it and test again.

However, several purposes are expressly excluded from this approach. Our goal is neither the management of information to the public nor manipulation of public sentiment. We want to break down the "us versus them" sort of mentality that it is so easy to slip into when an expert meets a non-expert group. The operant idea is to combine presentation and mutual exchange in a facilitated setting. Your role in these meetings is unlike teaching in a classroom or presenting at a professional conference or interacting with peers in a business meeting. For participants, you are the expert who is willing to listen, respond, and explain. For them, you appear to be as willing to learn as to offer information. This requires some preparation on your part and considerable flexibility. Some people will find this sort of situation an easier "fit" than others. But we are convinced that many scientists with much to share and a real passion for the work could, with some observation and practice, have much to contribute to discussions with the public.

This primer exists to help you prepare. However, we hope that it can also help you look back at meetings you have already experienced, providing you with a vocabulary and hypotheses to reflect usefully on what happened and what (possibly) could work better in the future.

The following sections introduce you to a way to think about and prepare for meetings with the public. Section II, "Orienting Ourselves," suggests why some efforts to communicate science succeed, while others fail. It provides a method of looking at group interactions about science that you may want to use often to gain perspective in group interactions. Section III is on understanding the multiple perspectives in groups where you are the expert. It provides a simple way to gauge why expert/group interactions might be succeeding or where they might be going awry. Section IV, "On the Spot," summarizes information drawn specifically from experiences with groups interested in bioremediation research. It discusses what you can probably assume about meeting participants, gives examples of common themes and concerns that surfaced in meetings we have observed, and provides guidelines in the Listening, Acknowledgment, Feedback, and Facilitation (LAFF) model^(a) (short enough to write on the palm of your hand—if you do that sort of thing) for interacting with meeting

^(a) Adapted from the LARC model, K. Domenici and S. Littlejohn (1998), *The Facilitator's Toolkit*, Public Dialogue Consortium, Albuquerque, New Mexico.

participants. In Section V, "Where Do We Go From Here?", we recommend several ideas for public meetings, based on several findings of our studies of science communication in public forums.

II. Orienting Ourselves—Why is Communication Between Scientists and Nonscientists Often so Unsatisfying?

Like other professionals, scientists are able to communicate effectively with each other using a limited set of communication tools. As scientists, we are trained to present our work to other scientists, primarily in the form of journal articles, books, or live presentations. Discussions and debates about scientific work are conducted in a “scholarly” manner, for example by questioning assumptions, inquiring about the study design and data collection methods, criticizing the analytical methods, and debating whether or not the data support the conclusions drawn by the author or presenter. Questions are answered and criticisms rebutted using appropriate scientific terminology (e.g., endocrine disrupter). In fact, in dealing with other scientists, *not* using the shortcuts, implicit references, and special vocabulary would be damaging to our reputations.

Among scientists, certain beliefs affecting our use of language and views of communication have been conditioned by professional values and practices:

- the importance of the scientific method in reaching conclusions—if not tested and retested, then not certain
- division of science into disciplines, each with its own special vocabulary and procedures
- knowledge derived from science as, in itself, morally neutral
- belief in scientifically acquired knowledge as a foundation to improve human health and welfare and the environment
- separation of information (factual and testable knowledge) from persuasion
- view that complex information is essentially non-convertible—that is, it must be “dumbed down” to be paraphrased or explained
- belief that scientific information is the most important thing that a scientist can communicate.

However, non-scientists, or even other scientists, may or may not share the above beliefs. As a result, they understand science to varying degrees and have a multitude of different frames of reference about the communicability or even the worth of scientific information. Their questions will come from

their respective frames of reference. Those frames of reference may be incongruent with those of scientists who are trying to talk about a kind of basic research.

Questions may seem trivial or may not be answerable given the present level of scientific understanding. Or the questions may be superficially simple but difficult to answer in terms that can be understood by non-experts. For example: "How safe is it to live next to this abandoned manufacturing plant?" or "Can you prove to me that this genetically engineered organism will not mutate after it destroys the contaminants in the soil?"

The presentation and questioning techniques that scientists have been taught, and that work so well when communicating with other scientists, are simply not adequate to address this larger arena of public dialog. When scientists rely *only* on familiar professional techniques to communicate science and basic research to the public, two outcomes often result that open up a chasm between the scientist and other meeting participants. First, the scientists feel "besieged" by a barrage of questions that appear to be trivial, irrelevant, or unanswerable. Believing that they are victims of a mismanaged process, they avoid further public interactions, particularly with non-scientists. Second, other meeting participants feel that the scientists have not adequately answered their questions, which, after all, were asked in good faith. Believing that the scientists have not been responsive, they begin to question the scientists' motives and integrity.

These outcomes are far less likely to happen when some attention is paid to the frames of reference of meeting participants. Analyses of taped dialogs between NABIR scientists and non-scientists revealed that the more effective communicators of science already possessed and used a relatively large repertoire of communication skills that help them bridge the chasm. These tools are known to students and practitioners of communication, but are usually not taught to scientists, and the scientists themselves often do not recognize them as *bona fide* communication tools. Their utility begins to surface when we think of communication with the public as more than simply an exchange of information—in fact, as a kind of ecological system in itself.

Why information may not be enough

In our observations, we have found a paradox when we expected to communicate only by providing information. Certainly, no one who comes to a public meeting wants their time wasted with a lot of peripheral material or overt "public relations" stuff. On the other hand, providing only scientific information to the public also does not lead to communication. Chances are that not all stakeholder issues are technical or scientific in nature. The technical information that the scientist wants to provide actually may lie

outside the other participants' realm of concerns. They are there to discuss something else. They may be interested in the economics of bioremediation or how the Department of Energy will handle contracting issues (regional, national, or international). They may want answers to technical questions not related directly to site clean-up: Will bioremediation help clean-up nitrates in their well water? Will the clean-up operations be put up for bid and clean-up slowed after a couple years?

Access to good, objective scientific information is essential to successful scientific engagement. However, relationship-building seems to provide the key to the communication paradox. The process of communication can be pivotal in developing rapport (positive relationships) among scientists, the sponsoring agency, and members of the community. Relationship development is affected by interests, understanding of the science (comprehensibility) and emotional undertones that affect the delivery, reception and perception of scientific and technical information.

There are a lot of things that can affect how a message is heard and understood:

- Emotionally hot topics impede ability to listen or understand.
- Different frames of reference (world views, values, expectations) impede comprehension.
- Difficult material is often "tuned out."

Many of the participants in our meetings may live and work in communities affected by clean-up activities and, therefore, have a stake in scientific discussions. However, they may have limited or minimal formal exposure to science and scientific ideas. For them, bioremediation is complicated new material. It may take time for them to understand the scientific discussions. Although we may use the same body of *facts* that we use with more sophisticated listeners, their concerns, rational or not, must also be addressed. For us as scientists, it is a matter of "fact," but for many community members, emotional or non-rational responses indicate deep personal concerns. One of the respondents in our focus groups said it well:

"People give you back a scientific answer when you're talking about a question that involves you and your sense of well-being. You want to be responded to on an appropriate level."

When emotions run high and new information is being delivered, some time must be spent establishing common ground. This often happens at the

Communication as an ecological system

beginning of an event or conversation. It usually means asking questions and listening—establishing that you are interested in who is there. At this stage, scientific information embedded in the responses needs to be delivered in the context of the other participants' (non-scientists') interests and concerns. Over time and as community issues continue to be addressed, you can establish common frames of reference—common vocabularies, common connections in life, a common interest in the science. With a common frame of reference, much more time can be spent discussing science.

The concept of communication as an ecological system begins to capture the complexity and inter-relationships that exist in a public discussion about science.

Communicating in a public setting possesses the analogs of all three key attributes of ecological systems: structure, energy, and nutrient flow. Together, they allow the system to evolve. When scientists engage in public discussion about science and basic research, they are attempting to explain how the basic or applied research that they are conducting has the potential to affect how their world evolves.

In this system, the groups to which people belong provide *the structure*. People may belong to these groups intentionally, unintentionally, through their employment, or simply because of where they live and work. Singly or as groups, they possess different "frames of reference" with respect to science as a whole and sometimes specific scientific topics (e.g., radioactive contamination of soil).

The energy that drives this "ecological system" is the desire or need to communicate. The desires or needs may originate in personal health concerns, concerns for environmental quality, or the need to keep an activist organization funded by a citizen constituency. Communication occurs among individuals and groups because these desires and needs exist.

The nutrients that feed the system are both the information that is communicated, and the way in which that information is communicated among various individuals and organizations. The information and process of communication itself have the potential for each party in the discussion to benefit from any other, albeit not always equally.

This analogy is not perfect. Notably, energy can be received and harnessed by anyone in the communication system. This is not true of ecological systems, where plants harness the sun's energy, and all higher trophic levels.

are dependent on plants. But the broader harnessing of energy and the nature of communication itself result in a system that is even more complex than an ecological system:

- Communication can occur anywhere in the system, and among any of the individuals or organizations. Hence, there are more potential interactions in a communication system than an ecological system.
- In addition, communication has the potential to change both the sender and receiver, and in the process, what is conveyed changes to a greater or lesser degree. These changes drive the evolution of the social system in which science operates.

III. At the "Organism" Level—Multiple Perspectives

As an expert, you are one element in the meeting ecology. However, when you see an ecosystem, the other participants (the "organisms") probably see only their share of the ecosystem, that is, they have their own frame of reference. Often, the most significant challenge for a scientist may be not in the conveyance of information, but in establishing working relationships with other meeting participants. This challenge is heightened when it is necessary to respond to meeting participants who have different levels of scientific expertise, who are distrustful, or who raise issues based on emotional self-interest. The primary conclusion to be drawn here is that *how* you talk about science and substantive issues and *what* you say depends on *whom* you are talking with, the backgrounds and experiences they bring, and their goals for the engagement.

During the process, different people will want to talk about different things. Individuals participate in communication events for different reasons. Each event has its own context, participant interests, representation and outcomes. At the same time, we know from our research and the literature that the *process of information exchange*, that is, how and what information is communicated, influences public perceptions of science. When the public is scientifically naive, disinterested, or hostile, the challenges to communicating science seem immense. It hardly seems worth the effort of getting involved when the participants resist the process of creating a common frame of reference for discussion or collaboration. This is evident at public events where it is clear that many participants come only to advocate their particular (sometimes narrow) interests or views. Acquiring information, while important, is not participants' only—or perhaps not even their primary—concern.

Scoping Out the Situation—The Science Challenge Interaction Model (SCIM)

The Science Challenge Interaction Model (SCIM) demonstrates the challenges faced by scientists as they attempt to convey information at public participation events, and demonstrates how effective communication strategies can be devised to address those challenges. In general, people participate constructively when they feel that their ideas and concerns are taken seriously. This is true for all participants in the process—scientists and community members. However, the challenges that people face to be heard and understood differ depending on their frame of reference. In the ideal event, everyone can make important contributions in their own way. The challenge is how to communicate in a way that enables productive interaction given all of the different frames of reference that are present. The SCIM model provides insight into the collective interactions of the scientist and/or presenter and the community member. The interactions

One of our key findings is that the process of information exchange influences how scientific information provided by scientists is received by members of the public. In other words, communication involves more than sharing information. For example, to prepare for our public engagement process, we developed fact sheets from information provided by NABIR scientists about bioremediation. These fact sheets were reviewed for accuracy by NABIR scientists. But when the fact sheets were presented to one group composed of members of the public, those people perceived the fact sheets as persuasive rather than simply informative. Even when the participants were told that the fact sheets were meant to be informative, they were skeptical. When the same fact sheets were presented to another group, also composed of members of the public, they saw them as primarily informative rather than persuasive. How is it that the scientists who developed and reviewed the fact sheets and the different members of the public who read the fact sheets had such different responses? Clearly, individuals valued, organized, and interpreted the same information differently. The models we present below will show you how individuals can understand the same information in completely different ways, and how you can take these frames of reference into account when you speak with members of the public.

among their points of view show which of the techniques identified in the LAFF model would be most useful when facilitating the communication process.

We often blame conflict or hostility on another person's ill will, political or personal, or even bad intentions. We fail to realize that we may have done the same thing if we were in the other's shoes. Why? We interpret events differently for ourselves than we do for them. Our behaviors seem to us to be defensive responses to the other. We may even see other persons engaging in unprovoked acts of aggression. What happens if we see the behavior of the other as a response to our own actions?

From the point of view of the scientist:

As a scientist, you are expected to provide objective information. Unfortunately, chances are that the public engagement event will have emotional undertones. In addition, the sophistication of the *public* participants will influence the scientific content of the discussion. These dynamics will affect communication and your ability to provide useful, substantive information.

Our interviews and focus groups results suggest (but we should generalize cautiously) that the greater the technical sophistication of the participants, the more the discussion can focus on scientific content. The lesser their sophistication, the greater the need for the scientist to adapt scientific information to the communication environment. In addition, from the literature we know that hostility or high degrees of emotion affect a presenter's ability to respond to information.

Understanding this perspective:

Quadrant I: If you have a non-expert group that seems to be supportive, your challenge is to build a feeling of safety and invite participation. Focus on listening, questioning, and establishing common ground. Create a positive environment for discussion of substantive issues. Explore the issues together in terms all understand.

Quadrant II: If you have an expert group that expresses a lot of support, your challenge is to organize and channel their energy toward a positive result. Focus on listening and responding. Your scientific knowledge adds substantive foundation to the discussion.

Quadrant III: If you have an expert group that expresses a lot of disagreement, your challenge is to control the process and help build credibility and trust. Focus on listening and acknowledging. Your scientific expertise is essential. When dealing with an informed hostile group, objective information is essential to establish credibility. It is during emotional events that your knowledge is the most necessary. However, it must be provided while acknowledging the frames of reference of the other participants.

Quadrant IV: If you have a non-expert group that seems to be hostile, your challenge is to develop credibility. Focus on listening and acknowledging. Identify goals, interests, values, and needs. Restate comments in constructive ways.

From the point of view of other meeting participants, the NABIR team can look like this:

People are more likely to contribute constructively when their ideas and concerns are taken seriously. Our focus groups and interviews indicate that stakeholders want something more from communication than a series of facts. They have questions that they want answered. They want to be listened to and they want their contributions understood. Members of the public generally do not want to be passive receivers of information, but they do want to be consulted.

This model reflects meeting participants' views of the engagement. Public engagement processes often include both subject-matter experts (typically, scientists and engineers) and communication experts (typically, facilitators who are not scientifically or technically trained). The responsiveness axis (responsive to non-responsive) reflects a participant's perception of the communication team's receptiveness to their ideas and concerns.

Understanding participants' perspective of members of the NABIR team:

Quadrant I: Responsive non-expert—This may be a non-scientist staff member or facilitator, who is nonetheless interested in other participants' concerns and adept at linking scientists' concerns with those of other participants. Regardless of the affiliation of the responsive non-expert, he or she can be invaluable in establishing rapport with non-expert participants because they share questions and concerns.

Quadrant II: Responsive expert – The scientist-participants are perceived by other participants as interested in their concerns and still able to answer a wide range of scientific and technical questions. They are willing to restate questions, "translate" discipline-specific concepts or terms, and listen to participants' restatements and translations.

Quadrant III: Non-responsive expert—The scientist-experts are perceived as knowledgeable about the scientific matters and probably well prepared. However, participants note an “expert witness” attitude, removed from the concerns of other participants in the meeting or willing to answer questions. A false responsiveness may actually be perceived as non-responsive, as well—as when participants suspect an expert of waffling or turning uncomfortable questions aside.

Quadrant IV: Non-responsive non-expert—Participants note that the team member may not be a scientist or a lay-person who is informed about bioremediation, the site being discussed, or current concerns of the community. This participant may be present to answer programmatic or legal questions only. To other participants, the non-responsive non-expert may convey a tone of bureaucratic judgement or of disapproval of questions that seem too simple.

IV. On the Spot—The Role of a Science Communicator During Public Engagement

What can you expect to do when you (as a scientist-participant) engage other participants in the communication ecosystem? The scientists we observed in meetings:

- Provided information
- Responded to inquires
- Asked helpful questions
- Summarized comments
- Helped to organize the discussion
- Helped to clarify group goals
- Encouraged participation
- Acknowledged contributions
- Provided focus
- Dealt with skepticism
- Developed trust
- Helped participants communicate
- Summarized what has been said
- Provided encouragement and acknowledgment
- Were good listeners and clear speakers.

In short, the scientist communicators engaged in normal, everyday communications activities.

Practical, day-to-day skills provided our scientists with the basic ingredients for effective communication, and are the basic elements of the LAFF Model.

This support was clearly evident in our focus group discussions that began with a highly-charged and potentially negative interaction. Not five minutes into the discussion, distrust of DOE became a hot topic. By the end of the discussion, scientists and community members were discussing the use of “bugs to solve problems.” Through a series of small steps, with intuitive use of communication tools (e.g., listening, acknowledging, reframing, and providing scientific information) by the team scientist, a significant turn in the conversation materialized. Participants, scientists and community members, realized that they share a common goal – to solve previously irresolvable problems. And the vision shared by all participants is related to efforts to “Achieve a cost-effective cleanup.” The more the NABIR Program can establish links with this and other relevant

However, collaboration often requires a shift in attitudes, receptivity to ideas, and/or understanding. The "collaborative shift" is one of the most powerful phenomena in public engagement. How can we encourage a shift towards collaboration? First, by recognizing (that is, by listening and acknowledging) the concerns of participants. To enhance public understanding of bioremediation research, NABIR scientists must facilitate a collaborative shift not only by conveying the content (substantive ideas, facts, etc.) of the NABIR Program and related issues, but also by developing relationships between people, institutions and ideas. It is within and through these relationships that public understanding of bioremediation is developed.

"In order for collaboration to occur in the first place, the participants must believe that the collaboration will serve their own interests. But as the process evolves, and as the emotional energy that helps sustain the initiation through the difficult times develops, there is a shift from narrow parochial concerns to broader communal concerns. This shift is often described as occurring at a specific time or around a particular event. Once it occurs, it is actively promoted and reinforced by the group. This shift is a profound one, and it marks the turning point in a collaborative initiative" (Chrislip and Larson, 1994).

visions, the easier it will be to maintain community interest and support in discussions and the development of the NABIR program.

When talking about bioremediation research, the science team and community members share a common goal – to solve previously unsolvable problems. But they may not share a common context for discussion or collaboration. "Bridgework" is needed between scientists and non-scientists, and among scientists trained in different disciplines. Effective bridgework:

- Establishes common ground, thereby developing an area for initial connections to take place. Common ground allows different social worlds to be bridged and common forms of communication to be developed.

Honors the different motivations of stakeholders. Honoring their motivations will enable their self-interests to be valued through the process. Self-interests are always part of why people participate in public engagement events. We all know about those events where a FEW participants seem

What Can You Assume About Participants?

convinced that their primary job is to advocate for the narrow self-interests of their own group. One of the outcomes of effective communication is to provide a context for collaboration where self-interests can be aligned with common goals.

Even if you are not familiar with participants in a meeting, there are probably some assumptions you can make about them:

- People will probably need to talk about issues that concern them, whether directly related to bioremediation or not. If people feel their interests or concerns are not being addressed, they cannot hear the science you are presenting. Listen and provide information, if possible. Acknowledge their interests and concerns.
- Many members of the public would like to find positive elements in the project that they can relate to, e.g., demonstrating good stewardship of federal funds or that the project is effectively accomplishing what it is supposed to do.
- When introducing basic science or a new technology, expect some degree of suspicion. Community members are requesting perspective in terms they can understand. "What happens if nothing is done? What are the important issues that I should be concerned about?" They are trying to develop a frame of reference for how the science you are talking about affects them as they live in this community.
- The timing of information releases affects the perception of issues. Some participants may come prepared to respond to recent information from the news media about the science, the agency, or the region.
- There may be alternatives to bioremediation. What are they? The public will want to place your comments about bioremediation into a broader context.
- Long timetables for scientific/technical projects raise issues of concern (red flags) that must be addressed. Because the public may be reluctant to support the long time-lines, they need to be explained in terms that people believe are significant.
- When there is discussion about risks, participants may want reference points for thresholds of risk (i.e., the degree of danger, the longevity of the risk) in terms they can understand. They want to understand the consequences for the deployment of science.

Managing Your Own Responses-- The Listening, Acknowledgment, Feedback, and Facilitation (LAFF) Model

The LAFF model identifies three sets of communication competencies (i.e., listening, acknowledgment, feedback) and a mechanism for enhancing the communication process (i.e., facilitation) when necessary.

- *Listening (including questioning).*

We must listen for more than what we want to hear. People generally try to acknowledge only those topics they are prepared to talk about. But in public discussions, other topics raised by the participants must also be acknowledged if the discussion is to remain fruitful.

- *Acknowledgment (including perception-checking).*

When you acknowledge someone, you make sure that you understand their point of view. Acknowledgment may involve asking questions or restating one's understanding.

- *Feedback.*

Feedback includes a variety of responses: responding with a new idea, responding with a similar, supporting idea, nodding, writing a note, etc.

- *Facilitation through a third party.*

Sometimes help is needed to manage communication. In such cases, the assistance of a third-party facilitator (process expert) is useful.

The LAFF model outlines specific communication strategies that are based on practical communication skills used everyday. The challenge for the scientist is to transfer these skills to engaging the public. How successful you will be at communicating science at a public event depends on many factors, including communication skills that may or may not be used in your standard work routine. In addition, individuals vary greatly in their abilities to deal with hostile community members or individuals who do not understand basic scientific principles.

The LAFF model is based on individual communication competencies. A high degree of variability exists among individual communication training and skills. Some public events challenge even the most highly trained communication specialists. For many scientists, public involvement is a novel and uncomfortable experience. Their communication training may be taxed to its limit, or even overrun. Behaviors performed in the presence of others are facilitated, augmented, or exaggerated to the extent that they are well learned; they are debilitated to the extent that they are not well learned (Zajonc 1960). The LAFF tool helps ensure the success of the science engagement process by allowing for the services of a trained facilitator, someone who is a communication process expert.

- **Step 1 - Listening (and questioning)**

Do not assume that you and others at the event share the same expectation as to outcomes.

Delay judgment.

Learn about the interests of the other participants. Check perceptions to develop your own frame of reference and adjust for other frames of reference.

Attend to as much of the message as possible.

Turn each speaker's ideas and perspectives into productive activity through good questions.

- **Step 2 - Acknowledgment (and perception-checking)**

Restate the content of what others say.

Reflect concerns demonstrated by others.

Identify goals, interests, values and needs.

Comment on positive contributions.

Reframe comments in constructive ways.

Summarize what has been achieved.

- **Step 3 - Feedback (response options)**

State your own content.

Explore common ground, or different interests, goals, needs.

Frame issues and options.

Suggest positive resources.

Discuss implications.

Create a positive environment for discussion.

Explore the problem further.

Solve a problem collaboratively.

- **Step 4 - Facilitation**

Engage a trained facilitator

Acknowledging the concerns and interests of others is powerful. In one of our focus groups, distrust of DOE among non-expert participants was a dominant theme. In responding to participants' concerns about the trustworthiness of DOE, the team scientist used many of the elements in the LAFF model. At the end of the session, when the facilitator asked community members what scientists needed to do to communicate better with the public, one of the responses said, "Do just what you did here. Develop trust." The scientist at this event was not specially trained to acknowledge

Topics from Our Meetings

or to use communication tools strategically to garner trust, but he used those tools intuitively. Trust was neither established through use of a single strategy nor all at once. Instead, it was gained through a series of small steps, using communication strategies that felt and looked natural.

During the public meetings we have studied thus far, participants' concerns and questions about bioremediation touched on many ideas of which facts were significant or interesting, what policies should be in place, and which values (social, economic, personal) might be affected by bioremediation research. Specific advice about what to communicate may lend a false sense of confidence. You *will* encounter new ideas, probably as soon as you show up. However, from the list below, you may note that two kinds of preparation, besides your expertise in basic research, may serve you well: (a) your familiarity with applied research and similar kinds of programs and (b) speculation about what would happen *if*.... Our observations tell us that *what* to communicate varies over time and is affected by the process of the meeting—whether participants feel free to ask questions, for instance.

So, feel free to modify or add to what we have observed. *Your* list is the one that will work for you.

- *The links between bioremediation research, science, and technology to practical applications.* How does bioremediation research answer questions (currently unanswerable) that can enhance clean-up concerns? How could it be applied to other kinds of contamination or environmental concerns?
- *Your role and level of responsibility.* Programmatic responsibility is diffuse. Scientists, program managers, funding agencies, all have different responsibilities that are worth talking about. However, it should be clear that your role is to talk about science, not about programmatic goals or bureaucratic structures.
- *How basic science presents a clear alternative to no-action.* That is, unless we can answer critical questions, certain problems will remain unsolvable or highly expensive. Give examples, as closely linked to bioremediation research as possible.

- *How research is directly related to site or local community conditions, issues and needs.* Do homework up front to be able to answer such questions as, What need will this basic research fulfil? How does this research fit into the larger picture of site clean-up? How does this research integrate or differ with other activities? Will the results of this research have applications outside DOE's needs that are important to the community? To prepare for groups near DOE sites, learn from Site Technology Coordination Groups how research correlates with site clean-up needs.
- *Your personal credibility.* Provide information about what you know about the research, and how you came to know it. For instance, you may be familiar with bioremediation through work in the petroleum industry. Credibility will be enhanced if you can respond in terms of participant's interests.
- *Related technologies as outcome of basic science.* Participants seem to ask, Why are you asking about basic science when you can't tell us about the technology part of it? For scientists, this means they could be asked to talk out of their research domain. For example, NABIR scientists must be willing to discuss activities in EM-50 and ER, even if they are different programs.
- *Scientists as de facto advocates for specific programs and agencies.* Scientists may sometimes be seen as representatives of the interests of DOE or other government agencies or of particular programs. Thus, their words may be interpreted as more persuasive in intent than informative, in spite of the actual language used by the scientist.
- *Historical links to topics under discussion.* Participants may want information about how bioremediation was used in the past and what happened in those instances—both successes and failures—so as to provide a context for the science.
- *Usefulness of bioremediation in regaining use of contaminated lands.* Be able to explain how bioremediation may lead to immobilization of contamination, and the possible steps to be taken after immobilization to remove or neutralize contamination. Be prepared to address the concern that "immobilization is not remediation," and the concern about injecting substances into the land.
- *Reversibility of bioremediation's effects.* If bioremediation changes subsurface conditions, will they eventually revert to their original state, an unexpected state, or a less healthy state?

- *Satisfaction of regulatory requirements.* To what extent do bio-remediation program activities satisfy regulatory requirements? This may be a good opportunity to gauge public and political expectations for regulatory protection.
- *Time tables for deployment.* Know the clean-up timelines and the decision-making schedules for which remedial methods will be deployed. Although participants will realize that in order to get answers, research is needed, many are also prepared to apply pressure to show results. Be prepared with success stories and clear reasons for "more research before application," if possible.
- *Safety issues.* Explicitly and directly address how microbial processes will be monitored and controlled. It will be hard to pass "Go" if you do not address this concern. Explain the consequences of simulated microbial processes. Address the NABIR program's position in regard to genetically engineered microorganisms.

V. Where Do We Go From Here?

This primer explores the underlying reasons for the difficulties that scientists often face when talking about their work with the general public and even relatively well informed stakeholders. But it does not and cannot instill in scientists the process skills necessary to enhance HOW they communicate. Reading about those process skills is only a marginal improvement. What scientists need is hands-on experience developing process skills in an interactive setting.

We recommend that scientists who are interested in expanding their communication skills interact with stakeholders, with guidance from one or more process communication experts. Together, they would form the communication team for a facilitated event. The goal of the event would be three-fold. First, the communication team would engage stakeholders about some aspect of the NABIR program. For example, the designation of potential field Research Centers could be the focus. Second, following some preparatory instruction, scientists and the facilitator would engage stakeholders using process tools that enhance listening, acknowledgement, and feedback during the event. In this way, they would learn new tools by using them. And third, the communications team would record and analyze the event to identify ways of improving the engagement process. This approach would serve to further NABIR goals, train scientists to be better communicators, and improve the communication process through a series of engagements.

Establishing a Science Communication Team

NABIR stakeholders are extremely diverse with respect to their basic values, interests, training in science and technology, and expectations for the future. One key preliminary finding of our engagements with Hanford stakeholders is that the less technically trained the stakeholders are, the more important is *how* communication is established and the less important is *what* is communicated. This appears to be particularly true at the initial stages of engagement, when first impressions are extremely important. As a result, before NABIR scientists engage stakeholders about the program, it is very important that they team with communication specialists who understand the broader functions of communication and the process tools associated with them. These specialists can help scientists use different tools to enhance communication and enhance their listening, acknowledging, and feedback skills.

Another key finding of the initial Hanford stakeholder engagement effort is that stakeholders within and outside "official" DOE engagement processes will have issues, concerns, and interests that are both directly and

indirectly related to basic research. In many cases, they will extend beyond typical scientific concerns and into the larger social infrastructure in which NABIR scientists are working. For example, they may ask questions about:

- the knowledge your research may yield, and its possible effect on the community and region
- the level of trust (or distrust) engendered by the DOE
- the history of the site at which you are working
- the technologies that are expected to be produced as a result of your basic research, and
- the policies and politics associated with the funding of your project and the NABIR program.

These findings argue for two actions. First, it is important to have as diverse a communication team as possible, including, to the extent practical, spokespersons for science, policy, and funding decisions who can speak to various related and sometimes unrelated issues. Given the practical limitations of assembling such a team, it will usually be necessary to establish communication mechanisms *a priori* to answer questions that cannot be responded to in the immediate engagement process. And second, it is important that the team define the scope of the meeting at the outset. The team should, for example, anticipate and discuss at the beginning what they would like to learn from the meeting, what they can and cannot respond to, and the degree of influence that they have or do not have over elements of the project and program. These actions will help focus discussions.

VI. References

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