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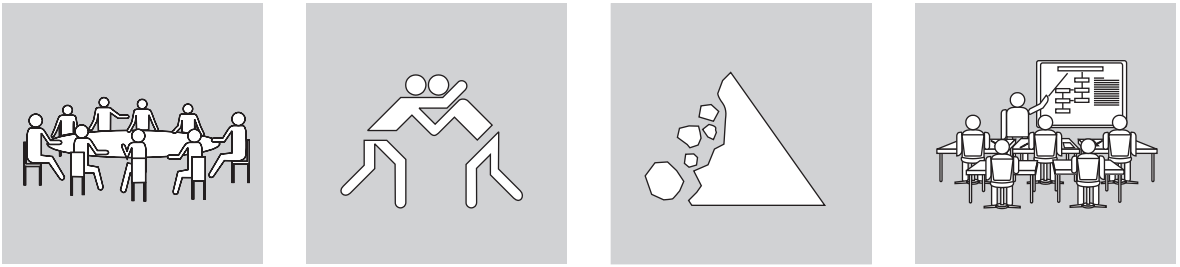
Handling Scientific and Technical Information in Contentious Public Issues:

Tools and Techniques for Extension Educators



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Helping People Put Knowledge to Work

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INTRODUCTION

This booklet is designed to aid Extension educators who work on contentious public issues. It focuses on one very important component of public issues education—those situations where information is likely to be debated and discussed apart from a public issue that concerns a community and divides its members. It is based on material developed by a consortium of organizations involved in resolving environmental disputes (Adler et al.). This booklet defines the recommended "best practices" to use when you are asked to lead a collaborative process and help a community resolve a difficult issue. These recommended practices are organized around the following topics:

- Defining Your Role
- Considering Knowledge
- Assessing the Issue
- Designing the Process
- Defining the Problem
- Working with Experts and Information
- Negotiating and Problem-solving
- Making and Implementing Agreements

To get the most from the best practices described in this booklet, you may wish to consult other reference materials in public issues education methods to help you with educational program design, public issues assessment, group facilitation, conflict resolution, and collaborative decision-making (see Singletary et al.).

Throughout the booklet, you will use the following scenario to consider how the recommended practices can be applied to a situation in your community.

A CAFO Study Committee

Swine production in your county has doubled in the past five years. As the number of confined animal feeding operations (CAFOs) has expanded, concerns about odor and water pollution have been voiced by rural neighbors, environmental organizations, and public health advocates. Recently a group of investors announced plans to construct a large sow operation on land in the county. Concerns have intensified to a fevered pitch as citizens grapple with balancing the economic benefits of increased livestock production with their quality of life and environmental protection.

Recognizing the need for a public discussion on the livestock industry, the county board of commissioners passed an ordinance declaring a moratorium on new intensive livestock operations and expansion of existing operations until they can devise a plan about how to proceed. The ordinance called for the formation of a CAFO study committee to review research, describe the problems associated with intensive livestock operations, and recommend solutions. Committee members were appointed by the board who represent the various interests with a stake in the outcome. County leaders have asked you as an Extension educator to facilitate a process whereby the committee can gather up-to-date information, discuss the issues, and arrive at policy recommendations.

You know going into this project that members of the CAFO study committee disagree strongly over the social, environmental, and economic impacts of swine farming. Although the committee has not yet been officially convened, committee members have been amassing data—much of it from the Internet—to support their positions for or against intensive livestock operations. Several members have contacted you to suggest specific speakers. Some committee members have stated that they mistrust data that comes from the state university (your employer). You suspect there are other information concerns that haven't been identified.

DEFINING YOUR ROLE

An extension educator can play a number of useful roles in public issues education. The roles listed below are those that emphasize the data and information aspects of being a public issues educator. Some educators take on multiple roles—for example, the joint roles of convenor and facilitator. It's important for you to consider which roles are most appropriate in a public education situation, given the topic, your level of experience in public issues education, your group process skills, the potential risks of getting involved, and the time and financial resources available.

Roles of an Extension Educator

A **networker** identifies and links people and resources to increase people's knowledge of public issues and their ability to participate in public decision-making.

A **convenor** recognizes a public issue, identifies key stakeholders, gains their support and cooperation in the educational process, and works with them to design and carry out a process to achieve a mutually satisfying outcome.

A **program designer** identifies a public issue and key stakeholders, analyzes the situation and stakeholder needs, helps design and develop a long-range educational program, and establishes action steps to implement the program.

A **diplomat** moves tactfully between stakeholders to encourage them to work together through an educational process.

The **forecaster** analyzes emerging issues to help a group begin to address issues as early as possible.

A **facilitator** guides a group through the details of a structured process, helps the group identify and achieve its goals, and intervenes as necessary to help the group reach agreement.

The **trainer** uses formal instruction and other learning experiences to help citizens acquire the knowledge and skills needed to understand public issues and to work effectively with others to resolve them.

An **information provider** gathers, shares, and interprets research-based knowledge and information.

The **researcher** conducts objective scientific analysis and helps people understand how research results apply to public issues.

The **technical expert** provides objective information and expertise to aid decision-making.

Consider the Scenario

Suppose that you are the Extension educator working with the CAFO study committee. You know that you will play more than one role in guiding this group through a learning process. You will be a program designer who must put together an educational program around this issue. You will also be a facilitator and guide the group through its deliberations. And you may be asked to provide information to the group because you have technical expertise in water quality. This type of situation requires care. If your primary role is to guide and facilitate the stakeholders through a learning process, you won't be effective if you try to be the group's chief information provider.

CONSIDERING KNOWLEDGE

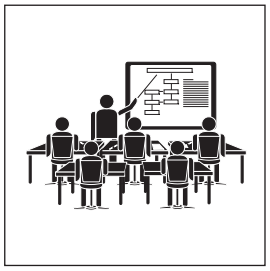
Before getting involved in a public issue education program, you need to consider approaches that are appropriate to the level, amount, type, and scope of substantive knowledge that you and the stakeholders possess. Begin with an assessment of your own knowledge of the issue to be addressed. Although you needn't be an expert in the technical field with which you are working, you need to be sufficiently grounded in the issues and language of the topic to be an effective facilitator. This will help you to sharpen your insights, ask better questions, and keep up with the group. On the other hand, if you have a high level of knowledge in the field, you will need to balance your role as a facilitator of an information-gathering process with your role as a technical advisor. You and your stakeholders must be comfortable with how you handle both roles. Otherwise, your impartiality could be jeopardized.

Other Recommended Practices

1. If you lack experience or knowledge, don't hesitate to partner with someone who has it.
2. Do not pretend to be an expert if you are not. Immerse yourself in the issues and language of the topic to sharpen your insights and to help you ask better questions.
3. Let the stakeholders educate you on the scientific and technical issues. It's all right to ask them for an honest assessment of your lack of knowledge. Ask them to let you know when it helps and when it hinders the group.
4. Help the stakeholders understand their need for independent assistance.
5. If you have expertise in an area, use self-restraint. If you feel compelled to share your knowledge, ask the group for permission first.
6. Be prepared to manage the different kinds of knowledge the stakeholders bring to the table.
7. Ensure that the appropriate types of scientists are involved.

Consider the Scenario

Suppose you have technical expertise in the field of water quality, but no experience in livestock management or the other technical issues you know will be discussed by the committee. As you start this project, you decide to form a technical working team of campus and field faculty from your university who do have expertise in livestock production, water quality, air quality, economics, and associated fields. This team of experts can help you understand the technical issues, and identify documents, research, and other resources that may be useful to you in your work with the CAFO study committee. Do not assume, however, that your technical team will also serve the study committee in the same capacity. It is up to the study committee to decide on their sources of information.



ASSESSING THE ISSUE

This is the initial phase of both a decision-making process and any educational effort associated with it. At this stage, examine and evaluate the problem, and determine how an educational effort might help to resolve it. Form a coordinating group of key stakeholders early in the process. They can help you identify potential scientific and technical issues, the information needs of all the stakeholders, the kinds of data they may be relying on, and the potential data conflicts that may emerge (Carpenter and Kennedy). Identify sources of information and methods, and identify which scientists are most trusted by each party. Find out why.

With your coordinating group, identify the impacts, risks, and benefits that a decision-making process might provoke. Discuss with the stakeholders their various perceptions of *risk* and *precaution*. Find out how their ideas apply to the issue at hand. Risk preferences can vary widely among stakeholders. Perceptions about risk and precaution have to do with how people *feel* about the uncertainty of potentially harmful activities and where their tolerance for it begins and ends. People's tolerance of scientific uncertainty, often shaped by their preference for risk or precaution, will affect how they view their need for scientific data and other information before making decisions (Raffensperger and de Fur).

Question your own assumptions: are data-related issues actually at the core of the controversy? It's important not to reduce or trivialize institutional racism, power relationships, risk preferences, and economics. A narrow scientific focus may miss or distort the issues or process. For example, in conflicts that involve the location of unwanted land uses, the chief concern for many people may be the injustice of their neighborhood serving as the dumping ground for others' refuse. Although science and technology can provide ways to mitigate negative impacts, the stakeholders may not be willing to consider this approach to solving the problem because of their feelings about the situation.

Coach the key stakeholders during initial meetings on different approaches they might use to resolve information-intensive issues. As much as possible, get them to think about how information will be jointly gathered and examined.

Other Recommended Practices

1. Don't assume all the key stakeholders have accepted you.
2. Make preliminary estimates of funding and other finite resources, and consider how to balance resources among technical assessment and public involvement.
3. Complete a formal issue assessment that includes scientific and technical issues. Raise questions that identify what is known, potential information needs, and potential data conflicts.
4. Have scientists explain how they define risks and accuracy for the particular problem or analysis.
5. Given what you know about each scientist's position, frame or re-frame technical questions. Pose questions as problems to be solved and questions to be answered; ask "how" rather than "should."
6. Determine what resources are available to help focus the issues, what information is proprietary, and what can be freely shared.
7. Coach the stakeholders on different approaches that might be used to resolve information-intensive issues. As much as possible, get them to think about how information will be jointly gathered and examined.

Consider the Scenario

Suppose you decide to contact the individual committee members to learn about their information needs. It is at this stage that you discover important information about committee members' perceptions of the issue and their approaches to solving problems. For example,

you learn that members are amassing data favorable to their own interests to bolster their positions in the upcoming committee meetings. You also learn that some members mistrust information from your university. From your technical advisory team of university specialists, you learn that the group will need background information on a wide range of subjects, including groundwater transport, nitrogen transport, animal feeding technologies, and odor abatement, to name a few. Becoming aware of data issues in advance will help you design a process that prevents data conflicts and enables study committee members to learn together and make wise decisions.

DESIGNING THE PROCESS

Develop an educational process that allows stakeholders to define the information they need, where they will get it, when they need it, and what they will do with it. Take the time to design methods for doing so. This should be done before convening a group of stakeholders, but with the ideas and assistance of the coordinating committee of key stakeholders. After officially convening the entire group, work with the stakeholders to establish the ground rules and operating principles that will govern their interactions and decision-making. You also need to consider appropriate educational techniques and interventions as you prepare the agenda and day-to-day activities of the group.

Design a process that anticipates and intentionally incorporates the scientific and technical issues. Anticipate and help organize the roles of the experts. Examples of strategies that work include organizing a technical committee that reports to the whole group and a moderated panel discussion where the participants can ask the experts questions

Other Recommended Practices

1. Timing is critical. Actively coordinate the gathering and analysis of technical information. Pace the data flow so the needed information is available when needed.
2. As early as possible, get the stakeholders to decide jointly what *adequate* information is—what kind and how much—and when to include the information in the process.
3. In advance, have them define what they will do with new information and how they will incorporate it into their process if they decide to use it. Identify what kind of information would change their minds.
4. Support the flow of information using information strategies:

    a. Advise stakeholders to appoint a technical study team. The team can be composed of outside experts, process

participants, or both.

b. Organize a "science summit" wherein the experts isolate disagreements, clarify what does not need to be contested, and search for areas of agreement.
c. Organize a moderated panel discussion wherein the participants can ask questions of the experts.
d. Develop poster sessions that provide opportunities for stakeholders and experts to exchange views.
e. Ask experts and stakeholders to create background papers together and make presentations to the group.
f. Facilitate a "fish bowl" science discussion wherein a panel of scientists discusses the issues while being observed by an audience of stakeholders.
g. Organize a session wherein experts are invited to draft proposed language for a negotiating document.

5. Develop written protocols that define ground rules; describe the group's mission, tasks, and goals; and identify final products.
6. Ensure the proper level of confidentiality for technical discussions through documents or contractual agreements (for example, ground rules or a protocols list).
7. Determine how much of the process needs to be behind closed doors versus how much needs to be in the public eye—know the legal requirements.
8. Pre-negotiate the financial and time resources that will be needed to deal with technical information.

Consider the Scenario

Suppose you discover, through preliminary conversations with committee members, that a few of them are motivated to work with you as "process advisors," similar to a steering committee. You ask them to help develop a decision-making process that is both fair and efficient. With input from these advisors, you decide to divide the decision process into two phases: a joint fact-finding phase and a deliberation phase. The fact-finding phase will involve presentations from experts, field trips to farms and research sites, reviews of research studies, and other methods of collecting information to be selected by consensus of the committee members. You decide to produce a "consensus document" of the committee's findings at the end of the fact-finding phase that will form the foundation for the committee's policy recommendations.

Once the process is in place, you convene the entire study committee. The initial meetings are devoted to developing protocols that will guide the committee through their discussions. Committee members identify what they need to know and where the information will come from. They develop the following ground rules about the information they will receive:

1. *All written materials used by the committee will be peer-reviewed, scientific studies.*
2. *All information that comes from group members in the form of anecdotes or "local knowledge" will be attributed as such.*
3. *Technical experts and scientists presenting information must meet criteria related to years of experience in the field and academic credentials.*
4. *All data sources and presentations will be approved by consensus.*

DEFINING THE PROBLEM

In this stage, you help the group focus on the problem and work to establish common definitions of the issues to address and resolve. Don't focus on data and data analysis too early. It's usually more important to understand the legal, political, social, economic, and scientific contexts. This will help determine how the scientific and technical data and questions fit into the big picture.

It is useful to generate multiple descriptions of the scientific and technical problems as opposed to an inflexible, single-problem definition. Grappling with descriptions will often stimulate both scientists' and stakeholders' understanding of how problems are linked to each other. Use data as a discussion point rather than assuming it will lead to an answer.

There may be situations where the definition of the problem to be solved rests on the results of the technical studies that frame it. Is there disagreement among stakeholders about the studies that should be undertaken and the research methods that should be used to define the problem? If there is, the stakeholders must negotiate together on the studies to be undertaken and the methods to be used in producing and analyzing them.

Use *situation mapping* (Daniels and Walker) to identify data needs. Situation mapping helps people to represent a situation graphically and share their understanding of it. It is particularly useful in the early stages of defining a problem, and it can be used to help a group pinpoint information needs.

Creating a Situation Map

Materials needed: A drawing surface, such as a white board, chalk board, flip chart paper, or a blank overhead transparency and overhead projector; colored markers, chalk, or pens.

The process begins with a "map chassis"—a core drawing that gets people thinking and involved in editing and adding to the map. A situation map consists of two basic components, elements and relationships (Figure 1).

- Elements are parties, issues, and activities—nouns that are represented by polygons.
- Relationships are verbs on lines that connect elements.

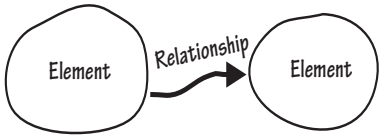


Figure 1. Elements and Relationships in a Situation Map.

Begin by introducing a map chassis such as the one in Figure 2, which illustrates some of the issues involved in the scenario presented at the beginning of this booklet. Map elements—such as stakeholders, issues, and activities—are drawn as polygons and labeled with nouns (for example, "Air quality" and "Farmers"). You can use colors and shapes to represent categories or types of elements. Relationships are represented by lines and can have arrows that indicate the direction of the relationship. The lines are labeled with verbs (for example, "Impacts," and "Depends on"). Lines can be solid or broken to represent relationships of differing strengths. The map chassis is a way to get the group started. The objective is to revise the map so that it reflects the participants' views of the situation.

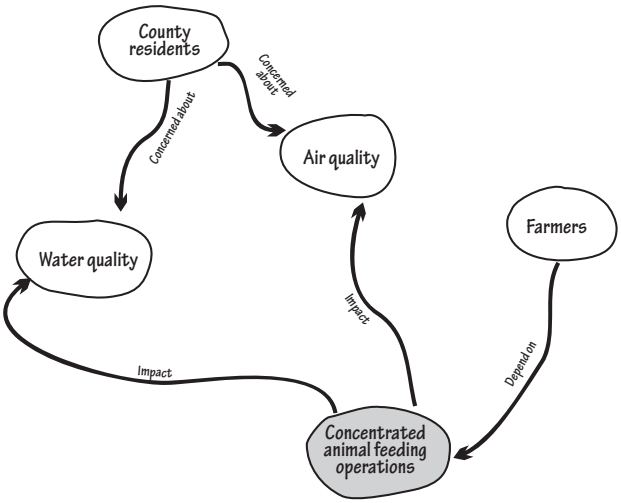


Figure 2. Example of a Map Chassis.

Beginning with the map chassis, ask the group to edit and refine the map to reflect what they know about the situation. Ask the participants some prompting questions to stimulate responses for editing and adding to the draft map:

- What are the central issues?
- Who are the key stakeholders? How do they interact?
- What actions, behaviors, or practices should be included?
- What connects with what? In which way or direction?

Remind the group that this is a brainstorming process. The rule of thumb is to generate ideas and get them on paper, then evaluate and refine those ideas. Remind them also to focus on capturing the dynamics that give rise to the situation, and not to worry too much about capturing every detail.

Add new elements and relationships as the group responds. Before committing any new items to the drawing, ask for confirmation by the group members.

If controversial elements or linkages are proposed, denote them with a question mark. Record tangential or crosscutting remarks in the margins. When in doubt about how to represent an issue on the map, ask the participants to guide you.

Continue to add and modify elements and relationships until no more additions or modifications are offered. The completed map may resemble the map in Figure 3.

Next, introduce the new map component of *information linkages* (the dashed lines in Figure 4.). Ask the participants to identify information linkages between the "human" elements (people, organizations, and interest groups that possess information) and the "nonhuman" elements (places, actions, and resources) that are the subject of the information.

Next, ask them to identify the following data and information parameters:

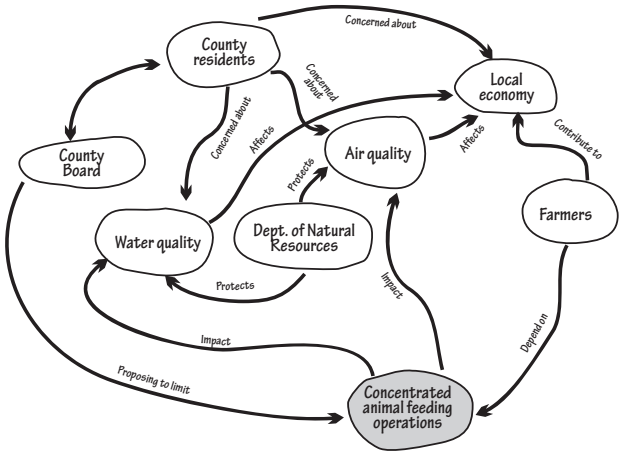


Figure 3. Example of a Situation Map.

- For each element that describes a person, organization, or interest group:
  - What data and information does this entity provide?
  - Are the data viewed as credible by all stakeholders?
- For each "nonhuman" element (a thing or an action):
  - Is information complete?
  - What additional information is needed?
- For each relationship:
  - Is more or better information needed to understand the interaction among elements?
  - Establish priorities for collecting information and data.

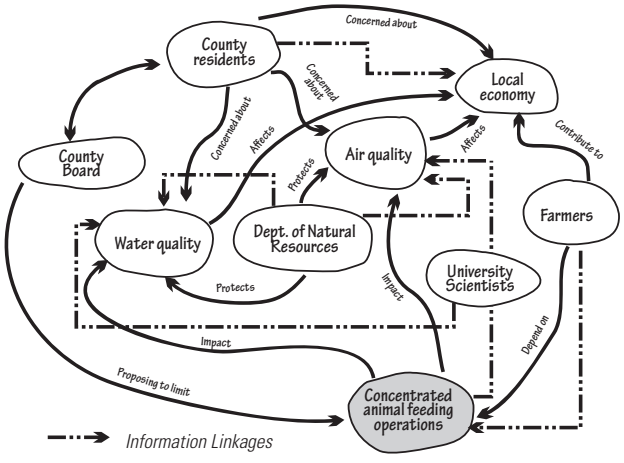


Figure 4. Completing the Situation Map with Information Linkages.

Review the map with the group to be sure that all members are satisfied with their product.

Consider the Scenario

Suppose that you guide the study committee through a situation mapping session that leads the members to define the problem as follows: How can we continue to produce livestock in our county and minimize air and water pollution? Using this framework, committee members assess the information that exists and identify information gaps. They decide that they will need information on nutrient cycling, confined animal housing and feeding operations, odor detection and abatement, environmental law and policy, and other topics. They identify sources of information to include: scientists and technical experts drawn from three different universities, two state agencies, the local economic development agency, and two livestock producers. They also select two research reports for data on air quality. With the committee's direction, you organize a moderated panel discussion of scientists on the topics of nutrient transport in surface water and groundwater. You also arrange presentations from the scientists and technical experts selected by the group.

WORKING WITH EXPERTS AND INFORMATION

At this stage, you use methods and techniques to encourage the flow of information among the experts and the group participants. Your role is to help keep the scientists on target with what is important to the group.

Many strategies can be used to effectively manage information flow. Whenever possible, meet with scientists ahead of time to find out what they are presenting and to make sure it is relevant to the decisions that need to be made. Encourage scientists to use plain language and good visuals, such as photos, maps, and cartoons. When scientists present models, maps, or graphs, be sure to allow time for them to clarify the assumptions behind the data and to explain how the stakeholders can understand or appreciate the maps or models. During any presentation, politely interrupt the speaker if he or she slips into jargon or acronyms. Ask each expert to explain his or her understanding of the pertinent risks, benefits, and cautions, as well as how that information applies to the facts at hand.

Discourage overly sophisticated presentations by only one side. PowerPoint presentations, highly designed graphs, and complex maps can create a sense that certain solutions are predestined. Instead of or in addition to these kinds of presentations, try using jointly constructed visuals like flow charts that all the parties can understand.

Encourage stakeholders to rely on the persuasiveness of evidence generated by good scientific methods, not on quantity of information alone or on the presenter's personality.

Other Recommended Practices

1. Clarify with the stakeholders how experts will be brought in, what they will provide, and what roles they might play that would be pertinent to a resolution.
2. Build bridges between scientists and nonscientists by helping each to

understand the other's perspectives, values, and ways of knowing.

3. Ask scientists to explain the assumptions behind the data they present.
4. Be prepared to discuss the basic assumptions behind any scientific assertion, especially if there is conflict over it. Help the participants understand that differences in assumptions are rarely due to malice or ignorance, but legitimate differences in professional approaches, interests, and previous experiences.
5. Ask each expert to state his or her understanding of the pertinent risks, benefits, and cautions. Ask each to describe the situation both qualitatively and quantitatively.
6. Urge scientists to use peer-reviewed studies.
7. When scientists are working away from the main group (for example, on a technical committee), help the stakeholders focus their questions to the scientists and reach consensus on the questions before giving them to the scientists. Avoid "Should we?" questions. Use "Under what circumstances might we?" questions.
8. Assist dueling experts by bringing in an acceptable third-party scientist. Experts are generally amenable to discussing their differences with a respected colleague in their field.
9. Encourage lay stakeholders to rely on evidence generated by good scientific methods, not on quantity alone or the scientist's personality.
10. Include social scientists to strengthen the analysis of cultural and social impacts and to clarify some of the more qualitative and subjective aspects of decision-making.
11. Public issues educators need to guide participants through a reality check. Ask questions that lead the participants to question whether their positions are tenable and can be sustained.

Use a Focused Discussion

The purpose of a *focused discussion* (Stanfield) is to get all the participants together "on the same page." The discussion may be short or long, depending on the situation. Focused discussions are particularly appropriate after a presentation or a video or when the participants were asked to read something to prepare for the discussion.

The value of a focused discussion is that it helps the participants identify and focus on the real significance of the issue being discussed. It helps them put events into perspective. And, it gives participants common understandings of the issues. Each focused discussion is tailor-made for best results — questions have to be relevant to the subject and the group.

In a focused discussion, the facilitator leads a group from surface observations of a situation to in-depth understanding and a response to it. It works well with unsophisticated and anxious participants as well as with confident and strong-willed ones. The facilitator uses focused questions to engage participants in the discussion. The questions are designed to fit the situation, and they are prepared in advance. It doesn't hurt to write more questions than you'll probably need.

The focused discussion moves the participants through four sequential levels of thought:

Level 1 questions should be easy to answer: this introductory phase helps to break the ice. These first questions focus the participants' attention, identify what they can observe directly, and clarify information. They ask what participants have heard, seen, read, or otherwise learned about the situation. These questions help to ensure that everyone deals with the same information:

What caught your attention when you read the article?
What stuck in your mind?
What were the main points?
What points didn't you understand, or which ones need clarification?

Level 2 questions bring out the participants' initial emotional responses to the situation.

They are concerned with feelings, moods, memories, and associations. Questions at Level 2 help participants describe how they feel about something, whether they like it, whether it angers or excites them:

What does it remind you of?
How do you feel about what you just heard; are you skeptical, intrigued?
What was your gut reaction?

Level 3 questions build on the objective data and feelings from Levels 1 and 2. They draw out the significance of the information and help build a story of what is happening. The story may answer some of the *why* questions within the situation and reveal the values held by members of the group. Level 3 questions may consider alternatives and options:

How does the information presented fit with the topic at hand?
What do you see as strengths and weaknesses of what you just heard?
What is an insight here?
How will this affect our work?
What does all this mean?

Level 4 questions relate the discussion to the group's goals. The questions use the information discussed in Levels 1, 2, and 3 and lead the participants to make short- or long-term decisions or choices based on that discussion. Level 4 questions help bring the discussion to a close:

What are some of the first steps we need to take to implement those changes?
What are some changes that can be made to resolve the problem?
What is our response?
What decision is called for?
What are the next steps?

As a general rule, use three or more questions at Level 1 (perhaps more with an unsophisticated or anxious group). You need enough questions to get all the significant facts and data and enough basic questions to engage the participants in the discussion. Similarly, ask enough Level 2 questions to get at the emotions and feelings that the various participants are willing to share. Level 3 may take more questions than Level 1 or 2 simply to deal with all the information that has been discussed. It's a good idea to come prepared with more questions than you'll probably need. Level 4 will probably only need three or four questions to bring closure to the discussion.

During the focused discussion, should the responses and information be recorded—yes or no?

NO, if the primary purpose of the discussion is to get the group warmed-up and ready to work together. It's the conversation that's important. Recording adds an artificial element to a good conversation.

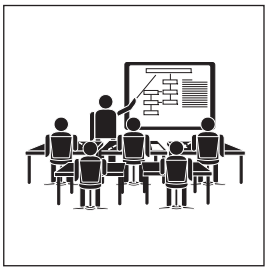
YES, if you are using the discussion as a lead-in and the group needs the information for further work. Facilitators often use Level 1 questions as a warm-up activity. No information is recorded. Then, because the other information is needed for the rest of the meeting, responses are recorded from the remaining focus questions.

Consider the Scenario

Prior to hearing from scientists and experts chosen by the CAFO study committee, suppose you facilitate a discussion to clarify the role of experts, policy makers, and other stakeholders in the decision-making process. The committee agrees that the experts will not participate in their deliberations over policy recommendations. The experts may be asked to provide information during the deliberations, but will have no role in the final decision.

You contact each presenter before their presentation and describe the committee's mission and information needs. Each presenter arrives at the meeting with visuals, handouts, and other supporting materials. Following each presentation, you engage the committee in a "focused discussion" using four levels of questions. You discover during one of these discussions (in response to the Level-2 questions), that some committee members are

concerned about the assumptions used by a scientist in his model of groundwater movement and nutrient transport. The committee asks the scientist to run the model again using a different set of assumptions and report back. The scientist agrees. As the committee hears from scientists, they begin to understand and appreciate the importance of sound scientific methods, and they are able to discriminate between scientific approaches.



NEGOTIATING AND PROBLEM-SOLVING

After gathering information, the stakeholders move to actively discussing the issues and seeking workable solutions. Your role now is to help them use information effectively to solve problems and work toward agreement.

Sometimes participants in a group defend their own position not on its merits, but by the lack of others' data: "Show me the data!" goes the cry. In these instances, remind participants that this is a joint search for common understanding and that the onus of proof should not be placed on any single participant, expert, or group. Frame the discussion on how the group can find a livable solution. Discourage traditional offer/counter-offer negotiation styles that imply "right" and "wrong."

Work toward jointly producing and analyzing the technical information that will lead to developing criteria for evaluating the options and eventually choosing some options. When the data are inconsistent or when interpretations of the data conflict, develop methods for dealing with the conflicts. Clarify any remaining uncertainties, and identify possible contingent responses. Determine whether and how the fact-finding phase has (or has not) answered the most important questions. Integrate findings into recommendations. The greater the uncertainty, the more adaptive the solutions should be.

Other Recommended Practices

1. Make sure that the participants produce and analyze the technical information together. This will lead them to develop their criteria for judging possible options and to choosing the options that might work.
2. Privately explore the best and worst alternatives to a negotiated agreement to understand how each party proposes to handle scientific uncertainties if there is no agreement.
3. It can be useful to get a commitment from the participants to consider a

representative experiment or data collection effort. Decide in advance what decision they will collectively make under different outcomes of the experiment. Agree on the method to test or gather data. The data or experiment should provide enough information to make a decision or justify the participants' joint decision to others.

4. If a model is used in the representative experiment or data collection effort, have the expert advisors and the stakeholders negotiate critical assumptions that will be used in the model(s). Discuss the limitations and uncertainties of modeling as well as the benefits.
5. Separate any debate about *precaution* versus *reasonable risk* into pieces that allow stakeholders to make trade-offs according to their risk tolerance.
6. The scientists, engineers, and technical experts who advise a stakeholder group often have psychological barriers to making trade-offs. When that's the case, help the stakeholders understand that complex policy problems often involve very different approaches, and that it's often possible to balance several competing ideas. Explore "bundles" of gives and takes with the stakeholders; ask the scientists to present their approaches in terms of probable ranges rather than a perfect number.
7. Help the advisors and the stakeholders understand that compromises are not inherently bad.
8. Many stakeholders in public issues are experienced negotiators. Let the "natural dispute resolvers" get more involved in the process. Stay out of their way.

Consider the Scenario

Suppose you must facilitate a review and discussion of reports, studies, and presentations as the CAFO study committee begins to assemble information. You help them structure the information into a form that they can use to evaluate policy options. For example, you organize data on nitrogen transport to surface waters by source: hog houses, waste lagoons, and effluent spray fields. For each source category, the committee compiles data on nitrogen loading and potential mitigation methods. In cases where data are inconsistent or interpretations of it conflict, the committee agrees that they will seek other information sources that may shed light on the issue. If that is unsuccessful, they will organize a facilitated "fish bowl" science discussion wherein a panel of scientists discusses the issues and provides insights on how to proceed.

As the data-gathering phase progresses, you constantly check back with the committee to determine whether and how the most important questions have been answered. Once the committee feels that it can proceed to the recommendation phase, you compile the information gathered by the committee into a fact-finding document that is endorsed by all committee members. The committee publishes its findings and circulates them widely to constituents and policy makers. The committee agrees to base its recommendations on these findings. Your role during the recommendation phase is to keep the discussion going, to maintain an open and balanced discussion, and to organize information so that the committee can use it effectively.

MAKING AND IMPLEMENTING AGREEMENTS

In this final phase of the decision-making process, the stakeholders agree on a plan, put it in writing, ratify the agreement, assign responsibilities for carrying out the plan, and maintain avenues for renegotiation, if necessary. Your role is to help the group solidify agreements, assign roles and responsibilities for implementing recommendations, and communicate recommendations to constituents and policy makers.

As stakeholders learn about complex issues, they may discover that significant gaps remain in their knowledge about the problem and its potential solutions. It is often difficult for them to make well-defined recommendations in situations of uncertainty. In such cases, your role may be to help stakeholders understand when they have enough agreement on technical issues to go ahead and negotiate solutions. When agreements are based on key scientific assumptions, define those assumptions for the group as explicitly as possible. Explore how to monitor the assumptions and determine what to do if those assumptions turn out to be different or untrue. Try to help craft an agreement that allows for change, so if the advisors or the stakeholders are wrong about the science, the stakeholder group can revisit and renegotiate the issues. In many complex problems, the right action may be no action—a well-informed public may be the best result of the process. Sometimes "some improvement" is all that can be attained, and that's OK.

Other Recommended Practices

1. The public issues educator may have to confront the participants to get them to make their best-case and worst-case arguments to each other. For example, a statement such as this would be appropriate: "We are not going to settle this unless you can convince the other side to agree. Let's map out everyone's best facts and arguments."
2. Help participants understand when they have enough agreement on technical issues to go ahead and negotiate solutions.
3. Promote dynamic, flexible, and adaptive agreements that balance these concerns:

    - the need for economic stability (reasonable stability) and
    - the need for flexibility in environmental assurances based on performance.

4. Help participants understand that all scientific decisions are provisional despite the finality of legal, administrative, and political decision-making. The solution is "temporary" until future scientific evidence can better inform a decision.
5. Help the stakeholders understand that although the agreement may still pose great uncertainty, they can still respect the science and the scientists.
6. Include the scientists and other technical advisors when you celebrate closure.

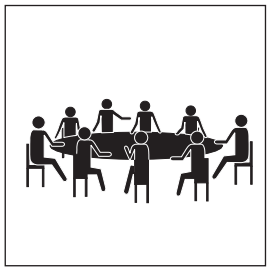
Consider the Scenario

Suppose the CAFO study committee is working through a series of recommendations based on the problems they identified during the fact-finding phase. One recommendation the committee is wrestling with is the establishment of buffer distances between CAFOs and perennial streams. The committee members are basing their recommendation on this assumption: the predominant soil type found in the county transmits nutrients more rapidly than other soils. In response to your instructions to make this assumption explicit in their recommendations, the committee members establish a buffer rule that specifies separation distances based on soil type.

It turns out that considerable scientific uncertainty exists at this time about the role of CAFOs in atmospheric deposition of nitrogen to surface waters. Hence the committee cannot agree on recommendations limiting the size or number of waste lagoons. In response, you facilitate a discussion of how to create recommendations that can be adapted as new information on this topic emerges. The committee

members recommend a "reopening clause" on any CAFO policy adopted by the county so that policy can be adapted and improved as science and technology advance.

After six months of defining, gathering, and considering information, and three months of deliberating policy alternatives, the CAFO study committee reaches consensus on a set of policy recommendations. You celebrate with the committee by inviting all the scientists and technical experts who worked with them to have cake and coffee during the signing of the recommendation document.



RECOMMENDED READING

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