

## Cases for Teaching Responsible Communication of Science

### Extreme weather, extreme communication? Role play version

It is early autumn, 2012. The central U.S. is entering its fourth month of severe drought. You are affiliated with the multidisciplinary Institute for the Environment at the University of Midwest, which has decided to use this extreme weather event as a “teachable moment” to issue a public statement on climate change. You hope the statement will be picked up by news media and circulate throughout your state of Midwest. But what should the statement say? How can scientists contribute appropriately to individual and collective decision-making on a controversial issue like climate change? Your task in this case study is to take a stand on these and related questions, and prepare a final version of the public statement.

You will be assigned to a group which will role-play one of four character positions. All characters will be participating in a meeting to discuss and revise the working draft of the statement; ideally, you will come to an agreement about its wording. At the meeting, you will be responsible for making the best possible case for your character’s positions. You should include as many different arguments as you can and aim to make your case persuasive to other participants.

The current working draft of the public statement has four key questions marked. You should be prepared to take a stand on each of them. But there may be other issues with the working draft that need to be fixed before it is released to the public. Do not let the issues identified limit your imagination.

The specific background information for your character identifies some issues you feel strongly about. The reading also includes material that may be helpful to you as you formulate your arguments. But you are in no way limited to the arguments included in these readings. Use your creativity to formulate arguments of your own and to adopt fully the perspective of the character you have been assigned to role-play.

A note about realism: This case is based on interviews with participants in the drafting, signing, and dissemination of a real public statement. The characters in the case, however, do not represent real individuals. Many of those interviewed had balanced perspectives and showed a vivid appreciation for the arguments of those who arrived at final judgments different from their own. In this case, their statements have been recombined to produce four divergent positions. Your in-class debate is therefore likely to be more vigorous than the nearly two months of conversation that produced the actual statement.

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Class Procedure: What to Expect

**1. Set-up (~10-15 minutes, to be done in class).** Your class will be divided into four groups. Each group will be assigned to represent one of the four character positions in the case. Make sure that you and your group members understand your task and your role.

**2. Individual preparation (~60 minutes, to be done outside class as homework).** Examine the current working draft of the public statement carefully in order to understand the four specific questions driving the discussion. Read the general background information explaining the context of this case. Look over the summary of the four roles in the case to understand the characters who will be participating in the drafting session. Read the specific background materials for the character position you represent. You may want to read the background materials for other characters, too, to see what they are going to argue. If your instructor has assigned additional readings, read them as well. Finally, you should do some internet research to help you brainstorm additional arguments

Use all this information to prepare two or three arguments that support your position that can be used in the role-play exercise. Arguments may be prepared in “bullet point” style, but should have enough detail that other group members can read and understand them.

**3. Group preparation (~10 minutes, to be done in class).** Work with your group to synthesize the individual arguments each student created and discuss how they can work together to form a strong position relative to the four specific questions driving the debate. Create a 5-minute opening statement where your group will introduce its major arguments. During this planning process, you should decide which group member will present which arguments. Note that all group members should be actively involved in the group presentation, and every group member should present some part of the argument.

**4. The drafting meeting (~40-60 minutes).** The Dale Director group will manage the meeting. Each group will be given 5 minutes for its opening statement followed by 5-10 minutes to respond to questions from the other groups. Groups will present in alphabetical order (A, B, C, D). At the end of the discussion, you should review the working draft and determine whether you have consensus on any of the four issues.

**5. Debriefing (~15-20 minutes).** At the close of the discussion, you leave behind your assigned role and the instructor will lead the whole class in a discussion of what you really think now that you have heard the arguments. Finally, the instructor will reveal the actual outcome of the drafting process and you will be allowed to continue to reflect on your experience through a broader discussion of the issues.

Working Draft of the Climate Statement

**DRAFT**

**State of Midwest Statement on Climate Change & Drought**

As **QUESTION 1** faculty and research staff at State of Midwest universities and colleges, we have confidence in recent findings that climate change is real and having an impact on the economy and natural resources of our state.

We feel that it is important for citizens of our state **QUESTION 2**.

We are living with climate change now and it is costing us money already. The drought that we are currently experiencing **QUESTION 3**.

The following observations support the case that more droughts and floods are likely in the future.

1. Globally over the past 30 years, there is clear statistical evidence that extreme high temperatures are occurring disproportionately more than extreme low temperatures. The climate likely will continue to warm due to increasing global emissions and accumulation of greenhouse gases.
2. In a warmer climate, wet years get wetter and dry years get dryer. And dry years get hotter—that is precisely what happened in our state this year. We can expect our state to experience higher temperatures when dry weather patterns predominate. The latest science, based on overwhelming lines of physical evidence, indicates we can expect dry periods to be more frequent as soon as the 2020s.
3. Our state also has experienced an increasing frequency of intense rains over the past 50 years, likely due to a higher surface evaporation in a warmer world. Because of these extremes in precipitation (drought and flood), citizens of our state will increasingly need infrastructure investments to adapt to climate fluctuations while developing and implementing mitigation.

As global citizens, our state should be a part of the solution. We can prosper, create jobs, and provide an engine for economic growth in the process. Our state should **QUESTION 4**.

**Dale Director 9/20/2012 3:57 PM**

**Comment [1]:** Question 1: Who signs?  
 (a) Leave this space blank; any faculty member affiliated with the Institute should be able to sign the statement.  
 (b) Insert the word “science”; any scientist should be able to sign.  
 (c) Insert the word “climate and related science”; only faculty who are experts in climate science or climate impacted fields should sign.  
 (d) other? What, exactly?

**Dale Director 9/20/2012 4:05 PM**

**Comment [2]:** Question 2: What’s the purpose of this Statement?—what text should go here?  
 (a) to learn that climate change is real and having an impact.  
 (b) to take action to limit greenhouse gas emissions and to adapt to the impacts of a changing climate.  
 (c) to work with scientists to start a conversation about climate change, its impacts, and what we need to do.  
 (d) other? What, exactly?

**Dale Director 9/20/2012 3:58 PM**

**Comment [3]:** Question 3: What should we say about the relationship of climate change to this year’s drought? Should the statement include uncertainties, limitations, and disclaimers?  
 (a) can be attributed in part to human-induced climate change.  
 (b) is consistent with an observed warmer climate.  
 (c) is consistent with an observed warmer climate, although science cannot say with certainty that the drought was caused directly by human activities.  
 (d) other? What, exactly?

**Dale Director 9/20/2012 3:58 PM**

**Comment [4]:** Question 4: what action should we call for, if any?  
 (a) re-establish the Midwest Climate Change Impacts Committee, to assess future impacts of climate change in the State of Midwest and analyze the costs and benefits of various legislative solutions.  
 (b) lead innovation in reducing greenhouse gas emissions, improve resilience in agriculture and communities, and move towards greater energy efficiency and increased use of renewable energy.  
 (c) impose a carbon tax of \$15 per ton of CO2.  
 (d) other? What, exactly?

### General background information

**The Institute for the Environment** based at the University of Midwest includes almost 100 faculty members at several colleges and universities in the State of Midwest. These faculty members come from fields like Ecology, Civil & Environmental Engineering, the Biological Sciences and the Geosciences—but also fields like Economics, Law, Journalism and even English.

**The drought of 2012.** The drought in the Central U.S. in the year the case is set has been the worst since the severe drought of the 1950s and the Dust Bowl of the 1930s. By the end of July, more than a fifth of the US had been classified as “extreme” or “exceptional” drought according to the weekly US Drought Monitor. Particularly hard hit were states in the Midwest (over 30% of their area in extreme drought) and High Plains (over 50% in extreme drought). These major farm states experienced exceptionally low rainfalls and temperatures 5-10° F or more above normal. Crops and pasture across the region were rated as in poor or very poor condition, and futures prices for agricultural commodities spiked. Corn production was expected to be 25% lower than projected before the drought, with some Midwest states experiencing even bigger drops. The nation’s consumers were faced increased food prices; the base price of milk, for example, had risen 25% since June.

### **What scientists at the University of Midwest say about the relationship of climate change to this extreme weather event.**

- Overall, it is clear that human activities cause climate change. In the future, due to climate change we can expect to see more extreme weather events. Events like the drought will become more common across the world.
- The attribution of single weather events like this summer’s drought to climate change is not possible. We cannot say that the drought is the result of climate change.
- This summer’s drought is consistent with our ever-evolving understanding of anthropogenic climate change. It is within the expectable range indicated by climate models.

**A global view on climate change and drought:** Selections from the Intergovernmental Panel on Climate Change Special Report on extreme weather, Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (2012), chap. 3.5. Citations and references to figures are omitted.

- *The Definition of Drought.* Though a commonly used term, drought is defined in various ways, and these definitional issues make analysis of changes in drought characteristics difficult. This explains why assessments of (past or projected) changes in drought can substantially differ between published studies or chosen indices.... Drought indices often integrate precipitation, temperature, and other variables, but may emphasize different aspects of drought and should be carefully selected with respect to the drought characteristic in mind. In particular, some indices have specific shortcomings, especially in the context of climate change.
- *Observed Changes.* There are still large uncertainties regarding observed global-scale trends in droughts. The [IPCC Fourth Assessment Report, issued in 2007] reported based on analyses using PDSI [the Palmer Drought Severity Index, a 'less sophisticated'

indicator of drought] that very dry areas had more than doubled in extent since 1970 at the global scale. This assessment was, however, largely based on [one] study only. These trends in the PDSI proxy were found to be largely affected by changes in temperature, not precipitation. On the other hand, based on soil moisture simulations with an observation-driven land surface model for the time period 1950-2000, [another study] inferred trends in drought duration, intensity, and severity predominantly decreasing, but with strong regional variation and including increases in some regions....In North America, There is medium confidence that there has been an overall slight tendency toward less dryness (wetting trend with more soil moisture and runoff), although analyses for some subregions also indicate tendencies toward increasing dryness....

- *Causes of the Observed Changes.* Overall, though new studies have furthered the understanding of the mechanisms leading to drought, there is still relatively limited evidence to provide an attribution of observed changes, in particular given the issues associated with the availability of observational data and the definition and computation of drought indicators.... We thus assess that there is medium confidence that anthropogenic influence has contributed to some changes in the drought patterns observed in the second half of the 20th century, based on its attributed impact on precipitation and temperature changes (though temperature can only be indirectly related to drought trends). However there is low confidence in the attribution of changes in droughts at the level of individual regions....
- *Projected Changes and Uncertainties.* For North America, intense and heavy episodic rainfall events with high runoff amounts are interspersed with longer relatively dry periods with increased evapotranspiration, particularly in the subtropics. There is a consensus of most climate model projections for a reduction in cool season precipitation across the US southwest and northwest Mexico, with more frequent multi-year drought in the US southwest. Reduced cool season precipitation promotes drier summer conditions by reducing the amount of soil water available for evapotranspiration in summer....
- *[Summary.]* There is medium confidence that since the 1950s some regions of the world have experienced trends toward more intense and longer droughts, in particular in southern Europe and West Africa, but in some regions droughts have become less frequent, less intense, or shorter, for example, central North America and northwestern Australia. There is medium confidence that anthropogenic influence has contributed to some changes in the drought patterns observed in the second half of the 20th century, based on its attributed impact on precipitation and temperature changes (though temperature can only be indirectly related to drought trends). However there is low confidence in the attribution of changes in droughts at the level of single regions due to inconsistent or insufficient evidence. Post-AR4 studies indicate that there is medium confidence in a projected increase in duration and intensity of droughts in some regions of the world, including southern Europe and the Mediterranean region, central Europe, central North America, Central America and Mexico, northeast Brazil, and southern Africa. Elsewhere there is overall low confidence because of insufficient agreement of projections of drought changes (dependent on model and dryness index). Definition issues and lack of data preclude higher confidence than medium in observations of drought changes, while these issues plus the inability of models to include all the factors likely to influence droughts preclude stronger confidence than medium in the projections.

**Advocacy by scientists: No!** From Thomas J. Mills (2000), Position Advocacy by Scientists Risks Science Credibility. *Northwest Science*, 74(2), 165–168.

- "Invariably, any...decision is a value-based balance among diverse considerations, of which science information is but one component. Even though a balance among diverse values is the central stuff of decision making, it is not the stuff of science. Science informs the choice, but it does not make the choice or direct a single solution.... At issue is not whether scientists have personal values. Rather, it is whether they should express those values by advocating for any particular decision outcome during a public debate in which they are being counted on to be a neutral provider of credible science information.
- "Position advocacy by scientists can take at least two forms. In the first form, the scientist advocates a position while pretending that the position is a science statement rather than a personal value statement. If science has any credibility in the debate, the scientists might do this to gain more attention and support for their personal position. This misrepresentation of personal values as if they were science is unethical...
- "The second form of position advocacy is more problematic. In the second form, the scientist carefully clarifies that they are expressing a personal value rather than science information when they advocate a position. They make it clear that they have taken off their science hat and put on their personal value hat. At best, the audience will be confused about whether the scientist is speaking science or personal values. The confusion is not helped if the scientist wraps their advocacy in scientific language. Most likely, the public will think, at least at first, that the personal value-based advocacy is really science information because, after all, the scientist gained the public platform through their scientific standing, not personal values. If this confusion occurs, the effect of the second form is the same as the first, that is, a misrepresentation, even if the intent is different.
- "What is the outcome, whether the misrepresentation was intended or not?...From at least one perspective the outcome will be erosion of the scientist's personal scientific credibility along with the credibility of the science information they brought to the dialogue. How can they be trusted to be a neutral source of science information if they entangle science with value-based advocacy, intended or not? The credibility damage might wash over onto other science information vital to the debate and perhaps even to the institution of science itself."

**Advocacy by scientists: Yes!** From James R. Karr (2006), "When government ignores science, scientists should speak up," *BioScience*, 56(4), 287–288.

- "When politicians and government institutions either misrepresent or ignore scientific findings and conclusions, scientists find themselves in a quandary. Should they stay disinterested and neutral, and defer to the policymakers, thereby risking science that may be distorted or hidden? Or should they speak up and try to educate policymakers and the public, whose ecological, economic, and social well-being may be threatened when scientific facts and lessons are misrepresented? Should doctors be neutral about the lives of their patients? Should lawyers profess neutrality about justice and injustice? I think not, and I also contend that scientists should speak up. Not speaking up would be tantamount to dereliction of duty.
- "First, science is central to policy decisions with immense societal impact. Whether US policymakers are setting NASA's budget, determining how to dispose of nuclear waste,

or protecting the nation's soil, water, and living resources, science is central to the decisions they make, and scientists are uniquely qualified to apply that science to the decision-making process. Scientists do more than collect data.... As practitioners of science, scientists have a unique and valuable perspective on which policies benefit the public interest. Their expertise complements that of politicians and policymakers. Given the complexity of the 21st-century world, either party would be remiss to ignore or marginalize the other.

- "Second, vast sums of government dollars go to fund academic and government research. Even if the government chooses to ignore the results of that research, scientists have a responsibility...to communicate the lessons of their research to the public. A majority of scientists, including me, have also been educated at public institutions. The public whose dollars pay for educational institutions and government granting agencies have a right to expect some public good from action based on scientific findings. They cannot benefit if scientists do not speak up and use their knowledge to inform and influence the policy process....
- "Fifth, as threats to Earth's living systems—human and nonhuman—continue to mount, timing matters. "Ecology is a discipline with a time limit, because much of what we study, upon which society is dependent, is fast disappearing." At a minimum, Bazzaz and colleagues note, "informing the general public about the relevance and importance of our work" must be added as a basic activity of science. Disenfranchised members of human and nonhuman communities, entities that often cannot speak for themselves, deserve nothing less from science and scientists."

### Introduction to the Character Positions

Note: All participants are affiliated with the Institute for the Environment. All agree that climate change is real, that much of it is caused by human activity, and that its impacts in the long term will be significant.

#### **A.C. Scientist & Colleagues**

- You are junior faculty members at the University of Midwest with research programs in climate science.
- You would not have initiated a public statement on climate change and the drought. You were quite willing to participate when invited, however, although you understand that the statement is indeed advocacy.
- Your basic position is that it is necessary for the statement to be scientifically accurate. In particular the statement needs to be absolutely clear that scientists are not saying that climate change caused the current drought.

#### **Brady Bernays & Colleagues**

- You are the Communication Director at the Institute for the Environment at the University of Midwest, with your assistants.
- You have been helping to coordinate the drafting of the statement and planning for its dissemination. You also consult on how to phrase and frame the message to communicate effectively to a non-expert audience.
- Your basic position is that scientists in the Midwest are responsible for reiterating a clear message: that climate change is real, that it is already affecting citizens of the state, and that it is time for the state to begin considering appropriate policies.

#### **Chris Critic & Colleagues**

- You are senior faculty members at the University of Midwest with research programs in physics.
- Although you agree that CO<sub>2</sub> emissions will lead to global warming, you are skeptical of the ability of current climate science to explain short-term trends like the current drought.
- Your basic position is that the current draft of the statement steps so far over the line into inappropriate advocacy that the group needs to start from scratch to develop a new statement that communicates about climate change in an objective fashion.

#### **Dale Director & Colleagues**

- You are senior faculty members at the University of Midwest with research programs in the biological sciences that emphasizes the impacts of climate change. You are also the Director of the Institute for the Environment at the University of Midwest.
- You were among the leaders who started the process of drafting the climate statement. Although in the past you have taken a relatively conservative position and avoided advocacy, you have come to believe that the impacts of climate change will be so severe and are so imminent that it is time for scientists to become more active in the public debate.
- Your basic position is that the statement needs to be written in a compelling way so that citizens of the state understand the urgency of the situation, and take action accordingly.

### Specific Background Materials for A.C. Scientist & Colleagues

You are junior faculty members at the University of Midwest with research programs in climate science. Your basic position is that it is necessary to be scientifically accurate. In particular the statement needs to be absolutely clear that scientists are not saying that climate change caused the current drought.

Your position on the four key issues:

- Q1: Who signs? No one knows your position on this one, so you can use your imagination. What would a person like A.C. Scientist think?
- Q2: Purpose? One of the main purposes when scientists address the public must be to educate them by conveying accurate information; you favor option (a).
- Q3: Should the statement include a disclaimer? You strongly believe that it is necessary to include a disclaimer that says explicitly: scientists cannot tie the current drought to climate change—i.e., option (c).
- Q4: What action should be called for? Option (b) sounds good to you—it calls for some action, but it's pretty nonspecific and nonpartisan.

Here are some notes you made for yourself about the draft statement:

- Most important: the statement has to include what we don't know along with what we do know. Even in a public statement we still have to maintain our discipline. If we do anything else, we lose a lot of scientific credibility. Of course we shouldn't be shooting ourselves in the foot by pretending that we don't have knowledge when in fact we do have knowledge. But it's important that we not over-state our level of certainty, either.
- This is especially true for those of us who are climate scientists. We climate scientists are involved in the drafting process in order to make sure that everything is still stated factually. I know for a fact that colleagues across the country will be reading this—it's going to get that much PR. If we're not careful, then our peers are going to hammer us.
- It's also key in statements of this kind to avoid giving the other side talking points and to prevent the press from taking things out of context. You have to make your intended meaning so clear that it can't be taken to mean something else. A carefully worded disclaimer will prevent misconstrual; it bulletproofs the statement.
- So what should the statement say at the end? If after laying out the facts we don't say something about what to do, people are frustrated. So as scientists we can't give completely neutered advice. We need to show the "so what?" Any scientific knowledge should have some kind of actionable statement or people won't understand why the scientists are telling it to them. They'll think: "OK, you've just lectured me, what's the take home point? This is a nice statement you scientists wrote in your ivory tower!"
- At the same time it is important to avoid specific, partisan, controversial proposals—that would be inappropriate. It's OK to mention things like energy efficiency and jobs, which are generally well accepted. That way there are no real partisan, political ramifications. There is no suggestion that we scientists know the best way to address the issue.

### Specific background materials for Bernays & Colleagues

You are the Communication Director at the Institute for the Environment at the University of Midwest. Your basic position is that scientists in the state are responsible for repeating a clear message: that climate change is real, that it is already affecting citizens of the state, and that it is time for the state to begin considering policy changes.

Your position on the four key issues:

- Q1: Who signs? Studies show that the American public still thinks that scientists disagree about the reality of climate change. Therefore the more academics who sign the statement, the better; that is option (a).
- Q2: Purpose? Communication research shows that science communication has the most impact if it is part of an ongoing, two-way conversation between scientists and the public. You favor option (c).
- Q3: Should the statement include a disclaimer? Recent work on climate communication emphasizes the need for focused messaging. According to this work, the disclaimer is confusing and weakens the message. This means that either option (a) or (b)—whichever the scientists think is more defensible.
- Q4: What action should be called for? No one knows your position on this one, so you can use your imagination. What would a person like Brady Bernays think?

Here are some notes you took from a recent reading on climate communication, *Connecting the Dots: A Communications Guide to Climate Change and Extreme Weather* (<http://climatenexus.org/wp-content/uploads/2012/02/connectingthedots.pdf>).

- “Extreme weather events are teachable moments on climate change. Weather stories are widely reported by the news media, fill social media channels, and are a mainstay of kitchen table conversation. Americans are particularly good listeners when the story is unfolding in their own backyards. However, the dots between climate change and extreme weather are rarely connected... The connections between extreme weather and climate change are complex and can be tricky to talk about in media settings... Helping Americans understand the link between climate change and our increasingly severe weather requires a well-crafted and disciplined approach.”
- “It is important to begin every conversation, including discussions about individual weather events, by first making the fundamental connection: climate change is now affecting extreme weather.”
- “Don’t start weak. Conversations in the media are extremely short and often framed by the first thing we say. Starting off by saying we cannot blame individual events on climate change is confusing at best and misleading at worst. Instead, start with what we do know, and build from there.”
- More good examples of effective language on p. 6 of the above pdf.
- Key point: “Americans are not looking for a science lesson, and science arguments alone tend not to be very persuasive with Americans. Americans simply want to know if there is a connection between extreme weather and climate change.”

### Specific background materials for Chris Critic & Colleagues

You are senior faculty members at the University of Midwest with research programs in physics. Your basic position is that the current draft of the statement steps so far over the line into inappropriate advocacy that the group needs to start from scratch to develop a new statement that communicates about climate change in an objective fashion.

Your position on the four key issues:

- Q1: Who signs? The best way to keep the statement on a good scientific basis is to only have climate scientists sign it—you favor option (c). In fact, you don't think *you* are really qualified to sign—you're a physicist, not a climate scientist.
- Q2: Purpose: No one knows your position on this one, so you can use your imagination. What would a person like Chris Critic think?
- Q3: Should the statement include a disclaimer? Of course—nothing else would do; you prefer option (c).
- Q4: What action should be called for? Further study of the issues is appropriate—that's option (a). All the other options are too political for a statement by scientists.

Here are some notes you made for yourself about problems you see with the draft:

- Advocacy! I try to stay very short of showing personal opinions or advocating for something, especially on hot button issues. When you read a letter to the editor, you can tell which side the writer is on. If we want to retain our credibility, scientists shouldn't be like that—we need to be neutral.
- Are we appealing to the reader's rational side or emotional side? Emotional arguments are only relevant in the political realm, not in the scientific realm. We should be better than that. The draft statement goes beyond what any reputable scientist should say. It really needs a total revision. Here's a couple of examples—there are plenty more.
  - “overwhelming lines of physical evidence.” Overwhelming is a pretty strong word.
  - “we can expect dry periods to be more frequent as soon as the 2020s.” Any time anyone says something is going to happen within the next ten years, they're making it up.
- I'm just very traditional in terms of not wanting to advocate. I want to say “here's what we know, here's what we're trying to figure out, these are the solutions that are out there.” Scientists get into trouble when we wade into areas where we're not expert, like public policy or economics. We should stick to talking about what we know.
- Since the statement is being presented as having a scientific basis motivating its publication, we want to have the signers be people who have some credentials of some sort in the field. Even having a couple of signers without credentials weakens the whole argument. An English professor? — that is ridiculous. If the statement ends up being signed only by a few people, it doesn't really matter because the facts are the facts. If there are five less people, it's not less factual; if there are twenty more, it's not more factual. The idea that consensus lends weight to scientific fact is completely foreign to anyone who does science work.

### Specific background materials for Dale Director & Colleagues

You are senior faculty members at the University of Midwest with research programs in the biological sciences that emphasizes the impacts of climate change. You are also the Directors of the Institute for the Environment at the University of Midwest. Your basic position is that the statement needs to be written in a compelling way so that citizens of the state understand the urgency of the situation, and take action accordingly.

Your position on the four key issues:

- Q1: Who signs? Even if she is not an expert in a field, a scientist can assess whether some work has followed the scientific method and is sound. So *all* scientists are qualified to sign, whether they're climate scientists or not; you favor option (b).
- Q2: Purpose? You used to be more cautious, but the increasing urgency of the problem and the continued political delays have persuaded you that it's time for scientists to call on citizens to act; you favor option (b).
- Q3: Should the statement include a disclaimer? No one knows your position on this one, so you can use your imagination. What would a person like Dale Director think?
- Q4: What action should be called for? It's past time to start making policies to address climate change; you favor option (c).

You wrote some notes to yourself about these issues:

- I called this meeting, and it's my responsibility to achieve a working compromise—to get a final version of this statement that is as strong as possible AND that my colleagues are willing to sign.
- So—who should sign? Anyone who uses the scientific method is able to assess the scientific content of the statement and is qualified to sign. Even if you're studying some rare salamander or something, you can tell that somebody else has followed the rigorous principles of science, of inquiry, of hypothesis testing, and that they've come to this conclusion. You respect the process and you can tell: “yes, this is good science at work.” But if your day-to-day work doesn't involve hypothesis testing, you aren't qualified. I know this is going to irk some of my non-scientist colleagues affiliated with the Institute for the Environment, like my friend in the English department.
- As for the call to action—well, the urgency of the situation requires action and we scientists need to advocate for it in a strong way. All of us in this state need join together to make new energy policies, and transition as quickly as possible away from fossil fuels. It's too late for just another bland call that “more research is needed.”
- This kind of call for action on climate change can be rigorous and held to the same scientific standard as the rest of the statement. It draws on a body of literature—not climate science, but in economics, policy studies and so on. If we draw from this kind of literature and respect good science, our advocacy is legitimate.
- Finally, we're citizens too, we're part of this community. We're going to be experiencing the impacts of climate change along with everyone else. So we should be able to have a say in what we decide to do.