

CHILLY CLIMATE RESEARCH

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The booklet put together by Emy Wadsworth for the AGRED committee has numerous references to chilly climate research. For the purposes of today's brief presentation, we will focus on methodological issues pertinent to this research. We have tried to include critical points for you to be aware of as consumers or as producers of chilly climate research.

Negative Findings: Cautions

A skeptical view of social science findings is common among non-social scientists, including engineers. Indeed, social scientists ourselves are skeptical about findings! When the findings support people's expectations, however, people tend to accept them readily. Thus, the engineers you work with may be ready to embrace negative results of chilly climate studies although they probably quickly critique the methodologies of studies that do find a chilly climate influence. This inconsistency in itself is a useful point to make in conversations with colleagues about the research you read and/or conduct on the subject.

Particularly troublesome are summary reports produced by non-researchers. The research as described by nonprofessionals probably deserves to be torn apart—crucial methodological points are often omitted or misrepresented. So if your colleagues are critical of the research in the field, a good first step is to find the work that they are judging, as written up by the researchers themselves.

Evaluating or Designing Research

1. How are data collected? If students are surveyed, about their experiences, the results are of questionable reliability. First, we have problems of "selective perception"—the student may have ignored chilly behavior in the course we focus on, because she has come to take such behavior for granted, rather than because the behavior did not occur. In addition, we have problems of "selective memory"—those who persevere in a chilly environment may be especially likely to forget bad experiences (to "let go" of them, rather than to "get hung up" on them).
2. Who have we ignored? If we survey students in a junior level course, the students who have dropped out because they do notice and they do remember chilly experiences are simply not in our sample. A short hand way of putting this is: we are sampling on the dependent variable; those who may have dropped out because of the chilly climate are not in the study.

Observational studies avoid problems of selective perception and selective memory, and problems of sampling, but are costly in time and effort. In addition to the time spent in courses doing observations, you must plan on time to train the observers, and develop checklists or other "instruments." Otherwise, you will be substituting the researcher's selective perception and memory for the students'. Your scientific colleagues understand the problem of "quick and dirty" research in their fields, and if it is made explicit should understand it in this area as well.

3. What kinds and levels of courses are studied? Whether the researcher uses observational or the more practical survey design, she must be thoughtful in her selection of the courses chosen for study. For example, observations by students in Jan Carpenter's women's studies course at Penn State showed little gender bias/ chilly climate activity in the large lecture classes. Instead, it occurred in small lab sections, where the peer interactions are greater, and the structural control of the professor is less. Other institutions may have other patterns; for example, disciplines at an institution may vary in the sex composition of their faculty and thus in the informal sensitization that takes place. Courses should be carefully selected for study in order to represent disciplines that vary in this way.



4. How cold is chilly? When we don't have our researcher's hat on, we realize that a student may be seriously affected by one explicitly racist or sexist comment from a teacher or a peer. Nevertheless, in interpreting or analyzing survey data we often assume that the impact on students will be directly related to the frequency of occurrences. If we don't find this sort of relationship, we may be tempted to reject the chilly climate hypothesis prematurely. Think of this metaphorically: degree days may help us predict the productivity of our tomato plants; however, just one freeze will kill them no matter how warm all the other nights may be. It may be more appropriate to interview students than to use questionnaires; in an interview the meaning of the events can be explored. Like observations, interviews are time consuming; finding or becoming a skilled interviewer is not always easy. She develops trust without putting words into the mouth of the respondent. She follows up on answers with questions that show sensitivity and respect, and even some familiarity with the student's world.

5. Students carry the effects of previous experiences. Although it makes for much messier research, students may be influenced by their experiences in earlier or other courses than the ones we observe or survey. Using the course as the "unit of analysis" makes sense when curricular and faculty variation are the focus, but the curriculum and the instructor are not writing on the classical "tabula rasa" (blank slate). Positive as well as negative previous experiences may account for the weak impact of one's current classroom reality. For example, women whose early physics courses are single sex may be more successful in advanced physics courses than women whose classroom experiences have always been sex-mixed.

6. Catch 22: demanding quantitative research when the numbers are too small to support it. If you have very small enrollments of groups that warrant study (for example, African American women), research is stymied by the common demand for a statistical paradigm. Even with larger numbers, taking numerous factors into account simultaneously will reduce your ability to make strong claims about your findings. This will often be the primary basis for dismissing research results—regardless of the nature of their conclusions. Consider using non-quantitative approaches to make up in depth for the lack of numbers.



What CAN we do?

If your goal is to learn about climate impacts at one or a few institutions, start by talking to people who know the institution from different standpoints. Identify the problematic aspects that some people claim to see, and design instruments that will enable you to systematically explore the validity of those claims. Speak to the cynical: find out what the people who distrust the literature would consider a credible design—ask them what would make them change their mind, and see if you can actually use that input in shaping your research strategy. If they take the anti-scientific position that nothing would convince them that there is a chilly climate impact, that is an important statement in itself.

Use the WEPAN electronic bulletin board to find other people doing research at institutions that are like yours in ways people think is important (for example, public vs. private; engineering school at a technological school vs. in a predominantly liberal arts institution). Using instruments already developed and with a base of evidence is helpful. Talking to people about how they'd change their instruments the next time around is also helpful.

Observations enable us to use the course rather than the student respondent as the unit we study; this helps us to overcome the dilemma of studying underrepresented people's experiences with overly small samples. In depth interviews allow us to explore the possible connections between aspects of students' experiences that don't "make sense" from our standpoint or that of our colleagues.

We also have to realize that there won't be any really neat and wonderful and simple set of findings. It is important to avoid the trap that says climate is irrelevant if we can't document a universal and stunning impact on students. A smaller impact on some students is still be worth pursuing! When skeptics point out that this is a tradition for engineering education, you might suggest that both males and females could benefit from changes (look at the attrition rates of males, too). Finally, we need to be alert to the rhetoric used to describe the climate issue (for example, "coddling"). Sometimes attacks on evidence evaporate when colleagues face the fact that some people want the climate to be chilly. That is a philosophical discussion, not one about the nature of empirical findings.