

Changing the Culture of Science: Teaching Research Ethics to Graduate Students and Post-doctoral Fellows

By way of introduction, I want to provide a very brief overview of the development of research ethics and the context for the development of teaching research ethics. I will then describe “Graduate Research Ethics Education,” which the Association for Practical and Professional Ethics has been conducting for the past six years with funding from the National Science Foundation.¹ I will discuss our goals, some of our activities, and something of what we think we have learned. In the process, I will indicate why I think Western Michigan University’s recently funded NSF project is a wonderfully conceived next generation effort at research ethics which takes the educational process in graduate research ethics beyond what we were able to do, particularly in terms of developing institutional structures on campus.

Overview of the development of research ethics

The growth and development of interest in research ethics extends over the past 50 years and has often been spurred by public concern about various events and issues in scientific research. I want to briefly catalogue those concerns.

Human Subjects

In this century, the concern about research ethics first gained worldwide attention in the Nuremberg Trials with revelations of Nazi doctors’ experiments on Holocaust victims.² That incident resulted in the development of the Nuremberg Code for Research on Human Subjects, which called for a prohibition on experimentation on human subjects without their knowledge or consent.³

That awareness and concern for research on human subjects was heightened in the United States by revelations of a series of human experiments that were conducted in this country without the subjects’ knowledge or consent. The first of these was the Tuskegee Syphilis Experiment, conducted on a population of African-American men in Macon County, Georgia. That experiment began in 1932, well before the Nazi experiments, and continued until 1971, long after the Nuremberg Code was established. The 1950s and 1960s saw disclosures of other experiments involving research on vulnerable human populations. For example, nontherapeutic studies of hepatitis were conducted using institutionalized mentally retarded children at Willow Brook State School in New York.⁴

Only recently, we have learned of human radiation experiments conducted in the 1950s on U.S. soldiers and civilians.⁵

Attention to these early cases led to the creation of the National Commission for the Protection of Human Subjects in 1974 and its issuance in 1979 of the influential Belmont Report, which is a statement of ethical principles and guidelines for research on human subjects.⁶ That document, in turn, shaped subsequent federal guidelines on government-funded research on human subjects not only in the natural and biological sciences but the social sciences including psychology, sociology, archeology and anthropology as well as education. Those guidelines continue to be refined, but apply only to federally funded research.

The ethical issues in human research have not disappeared. For example, within the last two years, it has come to light that drug companies have paid private physicians to enroll their own patients in drug testing that is nontherapeutic and unrelated to the patients’ own health concerns.⁷ Often the testing is in areas beyond the physicians’ competence and training. Patients, trusting their physicians, have agreed to participate and have sometimes been harmed by the experiments.

Research on animals

Public awareness of ethical concerns dealing with scientific research has expanded beyond research on human subjects to include research on non-humans. Considerable public attention has been given to alleged abuse of animals in research, the proper use of animals in research or any use of animals in research. That has led to the development and refinement of federal guidelines and institutional policies on the use of animals in research. Not all animals are covered by such guidelines, however, and many species remain completely unprotected.

Scientists now generally agree that wherever possible, animals in research should be replaced with nonanimal alternatives such as computer models or cell lines; the number of animals used in research should be reduced as much as practicable; and experiments should be refined to reduce the pain and suffering of animal subjects wherever possible. Discussion continues about appropriate guidelines on experimentation with animals.

Research Ethics and the Practice of Science

Some public concerns have to do with the impact of ethical/unethical behavior of scientists and engineers and the very practice of science and engineering.

One area involves conducting and reporting research. Over the past thirty years, we have witnessed a steady drumbeat of cases of fabrication of data and fraud in research reporting. In some instances, work of other scientists based on fabricated data has been wasted. In others, use of results based on fabricated data has resulted in injury or threat of injury to the general public. Some scientists, trying to call a halt to fraud and fabrication, have stepped forward, blown the whistle, and paid with significant damage to or loss of their careers.⁸

Not surprisingly, both the awareness of fraud and fabrication and the treatment of whistle blowers raised questions in the public's mind about the credibility of work in science and the level of public support deserved by science.

I have mentioned a few areas of concern in research ethics, but the field involves a wide range of topics in conducting, reporting and funding research. It also involves the web of relationships in laboratories and research communities, including relationships of faculty with each other, relationships of faculty and mentors with graduate students, and relationships among graduate students and postdoctoral fellows. It involves conflicts of interest, conflicts of commitments of faculty, and issues of institutional responsibility for education in ethical research.

I want to emphasize that research ethics is not limited to the physical and natural sciences and engineering. Many of these issues extend to the work of scholars in the social sciences as well as nonscientific disciplines as diverse as history and biblical scholarship.

Increased Pressure on Researchers

Some of the causal factors that may have accelerated ethical breaches in research have to do with increasing pressures on researchers to obtain funding and to publish or perish. More recently businesses have exerted pressure to control the publication of research they have funded. For example, Nancy Olivieri, a researcher at the University of Toronto, was conducting clinical trials for the generic drug company Apotex.⁹ She became concerned about evidence of serious side effects of the drug and urged the company to release her results to the public. They refused. She ultimately

broke her confidentiality agreement with Apotex and went public with her concerns. Apotex threatened her with legal action, and the hospital of the university where she did the work attempted to dismiss her.

Ethics and the Culture of Science

Scientists themselves are increasingly concerned about issues in research ethics. That trend can, I think, be partly explained by a shift in the intellectual framework over the past 50-75 years. In the 1920s, an intellectual position known as logical positivism developed.¹⁰ It claimed to justify a sharp distinction between facts and values and encouraged the notion that scientists' and engineers' work was value free and therefore scientists did not have to worry about ethical issues in their disciplines. This background view itself may have contributed to some of the problems in research (perhaps including the Tuskegee Study), since it encouraged a kind of moral blindness among individual scientists.

In my view, that intellectual framework also helped to create and support a scientific culture over the past seventy-five years that led many scientists to be indifferent, skeptical and even antagonistic toward the role of ethics in research and, consequently, the need for ethics education for scientists.

Logical positivism, in various forms, was shown to be indefensible 50 years ago (at least to the satisfaction of many philosophers). Consequently, logical positivism's influence in philosophy has waned considerably, but even today it seems to have residual effects in other disciplines, including both the natural and social sciences. (In my view, especially in the social sciences.) Nevertheless, an awareness of the deficiency of its extreme forms has filtered down to other disciplines, and its support has gradually crumbled. Over the past 20-30 years, the scientific community's growing awareness of the deficiencies of logical positivism, has, I believe, led to more openness and added legitimacy to the discussion of ethical issues in science and engineering.

The combination of concern about ethical lapses in science and the collapse of logical positivism as an intellectual bulwark against taking seriously the ethical issues in science have now opened the area for discussion. The federal government is now pressing scientists either to conduct research in an ethical manner or risk sanctions, and new federal regulations now require ethics education in federally funded science research.

I must say that I am struck by how much the landscape has changed in the scientific community, in terms of the amount of interest in and the perceived legitimacy of concerns involving research ethics, even since 1994 when we began working on this effort.

Graduate Research Ethics Education (GREE)

It is in this context that our work with graduate students and post-doctoral fellows in science and engineering began with an NSF grant in 1995, renewed to run through 2002.

Target audience: graduate students and post-doctoral fellows

We wanted to work with young scientists – graduate students and post-doctoral fellows – rather than established faculty. That was a new idea for the National Science Foundation, and they had to be convinced. Their understandable belief was that the effort should be aimed at current faculty for more immediate impact.

Our reasons for designing a program for young scientists had partly to do with the mentoring tradition in the sciences. Graduate students have the strongest identification with and motivation to learn from their advisers or mentors. The socialization forces on graduate students to fit into their professions are enormous, and students understandably look to their faculty advisers and mentors for guidance. Most current faculty in science have learned research ethics through mentoring relations, but those mentors have generally not been trained in ethics or ethics education. For reasons mentioned above, not all faculty recognize the legitimacy of ethics education in science. Those who do are likely to be novices in ethics education and tend to provide a provincial view of research ethics – the view from my lab/bench/ discipline. When approached from that perspective, it is sometimes difficult to be self-critical about research practices in one’s own bailiwick. Sometimes the ethical perspective is better gained from a broader interdisciplinary view, where one can learn from the experience of other practices or disciplines. It is also the case that, unlike earlier generations of researchers, the practice of science now involves large labs with much less contact between lab supervisor or advisers or mentors and graduate students; hence, mentoring may be less effective.

We believed that, by developing in graduate students a habit of taking the ethical questions as a normal component of their research, we could not only influence their own behavior but also make them much more conscious teachers of research ethics to the generations of students they would have in their own laboratories over the course of their careers. By working with students at the beginning of their careers, rather than at mid career, we hoped to have a multiplier effect on the generations of students. Consequently, we wanted to try an intervention to provide ethics education in research where it often did not exist.

Our Objectives

Our pedagogical objectives were related to the Hastings Center Report’s objectives for ethics in higher education. In 1977, the Hastings Center undertook a two-year systematic study of the teaching of ethics in higher education conducted by leading teachers of ethics across disciplines. Some of the results were summarized in *Ethics Teaching in Higher Education*, edited by Daniel Callahan and Sissela Bok¹¹. One outcome of the study was a consensus on what ought to be the objectives of ethics education in undergraduate and graduate and professional schools. The researchers concluded that ethics education should not be focused on acquiring factual information or mastery of a literature. Rather, it should focus on the development of several distinct capacities/dispositions. The Hastings Center Report identified five specific outcomes, which I will briefly itemize. My own explication of these capacities varies somewhat from that of the Hastings Report. (I will use the terms “ethical” and “moral,” interchangeably in what follows.)

Recognition of ethical issues

One objective is to simply develop the capacity to recognize ethical issues. With respect to this objective it is useful to observe some findings in moral psychology. Over the past twenty years, researchers at the Center for the Study of Ethical Development at the University of Minnesota believe they have shown that adults vary in their capacity to recognize moral issues. There is such a thing as moral blindness. The good news is that education of the right sort can make a difference. Persons who do not recognize ethical issues or ethical components in a situation can do so, given proper ethics education.¹²

Reasoning about ethical issues

A second objective is to develop a capacity to reason about ethical issues, including analysis to clarify the ethical issues, application of appropriate concepts and ethical principles to the situation, and thinking through the ethical implications of alternative solutions to a problem as well as balancing competing ethical considerations. The researchers at the Center for the Study of Ethical Development at the University of Minnesota Center also be-

lieve they have shown that the capacity to reason about moral issues varies in adults and that reasoning capacity can be improved with the right sort of ethics education

Perhaps even more interesting is their finding that that these initial capacities to recognize ethical issues and to reason about ethical issues can vary independently. One can be skilled in moral reasoning but not recognize a moral problem and vice versa.

Moral imagination

A third capacity is the capacity for empathy, caring and feeling, a capacity to imagine what it feels like to be on the receiving end of unethical behavior. Recall, for example, the lack of moral imagination in the character, Oskar Schindler, in the opening scenes of the movie *Schindler's List* as he moves without compunction into an apartment from which Jews had just been evicted. Compare that scene with his much altered sensibilities at the end of the movie as he regrets not being able to save more Jews from the Holocaust. I want to suggest that there is a second sense of moral imagination as well. That is a capacity to imagine alternative solutions to an ethical problem. Sometimes when faced with an ethical issue, what is required is to think out of the box and come up with imaginative solutions regarding what action to take. Sometimes, for example, whistle blowers find themselves in a difficult situation because they can conceive of only two alternative actions, blowing the whistle on the corporation or going along as an accomplice. It sometimes takes moral imagination in this second sense to conceive of other morally defensible alternatives.

Disposition to responsible ethical behavior

A fourth capacity is a disposition to responsible behavior. Ideally, one wants ethics education to reinforce the person's desire to do the right thing. This can occur in part by habituation, by actually doing the right thing repeatedly. I think regularly thinking about ethical issues and trying to figure out what to do can also reinforce it. That reflection reinforces a habit of looking for the ethical elements in a research situation and trying to determine the right thing to do. Thinking things through can in this sense reinforce a disposition to do the right thing. If one has some knowledge and skill in dealing with ethical issues, that gives one confidence in one's ethical analysis and judgments, and in that sense also reinforces a disposition to act ethically.

Tolerating and reducing disagreement and ambiguity

By learning how to think about ethical issues, one comes to realize that sometimes there are positions and solutions that do not survive careful scrutiny and that no thoughtful person can accept. That can lead to reduction in the amount of disagreement and ambiguity in ethical issues. On the other hand, understanding of ethical thinking may also lead us to recognize that, in a given case, there may be not only some unacceptable answers but also a range of solutions that are all, roughly speaking, equally morally justified. If people can agree on methods for analysis and discussion of ethical issues, there will tend to be more rational discussion and less rancor. These factors can lead to more toleration in the discussion of ethical issues and proposed solutions.

Objectives for GREE

Our objectives for the Graduate Research Ethics Education Project were conceived in the context of the goals articulated in the Hastings Center Report. Our overall goal was to have an impact on the culture of science, particularly an impact on how research ethics is taught and practiced in the scientific community.

As I have noted, our strategy was to work with young researchers in graduate school or post-doctoral fellows at the beginning of their careers in science. We tried to select young scientists who showed promise of leadership in their fields and interest in research ethics. We hoped to build a small community of young scholars, committed to dissemination of research ethics throughout their careers. We hoped thereby to have an impact on participants, faculty, departments and research education in various universities, and ultimately on the culture of science.

Specific teaching objectives

Our specific teaching objectives included efforts to: a) develop in participants a capacity to recognize moral issues in research, a capacity for moral reasoning about those ethical issues, a capacity for moral imagination, and a disposition to act in morally responsible ways in research; b) develop a multidisciplinary perspective on issues of research ethics; c) introduce participants to an understanding of ethics and provide a historical perspective on misconduct in science; d) enhance their effectiveness as teachers of research ethics; and e) create a network of young scientists and engineers who will, over their careers, act as a catalyst to help create a scientific and engineering culture in which ethical considerations are just considered a part of doing good research. Notice that these are objectives not likely to be achieved in many of the minimalist programs developed by universities to meet NIH/ PHS training requirements, for example attending a lecture on compliance or completing a short set of questions on a web site.¹³

Selection of participants

Each year, for the past six years, we have advertised for applicants from all over the United States to apply for participation in the program. We wanted students who had actually had experience at the bench or in research, and so participants were required to have completed at least two years of graduate work or be post-doctoral fellows in the natural or physical sciences or in engineering programs. We also asked them to show evidence of leadership in their fields since we wanted participants likely to be influential during their careers. We required nomination by a faculty adviser/mentor. We worried from the beginning about participants returning to unreceptive departments with no support for their newfound enthusiasm for research ethics – a worry, I might add, that turned out to be well founded. Applicants were also required to write an essay on why they wanted to be involved in the program. Each year we selected 15-18 participants from the 50-70-nominations we received from all over country.

Pre-workshop activities

One provision of the project was to provide participants with a working library in research ethics. Each participant received a library of 15-20 books and a number of articles related to research ethics. After the selection of participants in early spring, they were asked to do a substantial amount of reading in preparation for a workshop in early summer. Readings focused on the history of research ethics, ethical theory and particular issues in research ethics.

Participants were also asked to write an initial draft of a case involving some incident in research that raised ethical issues they found especially interesting or puzzling. Participants were given materials on how to write up cases. Many drew from their own first hand experience in the lab and described an incident they had observed or experienced themselves. Those cases were sent to us in advance for review and suggested changes before participants arrived at the workshop. The idea was to use the case writing to get participants to begin to reflect on their own experience and articulate that in light of their readings in research ethics.

Workshop activities

Participants then attended a very intensive four and one half day workshop that ran each day from 8 am to 9 pm. We deliberated about the minimum length for the workshop and concluded that if we lengthened it, we ran the risk of not getting any bench scientists to apply since their advisers or lab supervisors probably would not approve a longer stay away from the bench. Our poll of participants confirmed that worry. Pedagogically, a longer and less hurried format would have been preferable, but we had to be practical.

The workshop included lectures and discussions of issues relevant to research ethics; discussions of cases and the teaching of cases and research ethics teaching. An evening discussion series of videos, focused on various aspects of research ethics, provided participants with an opportunity to discuss and synthesize what they were learning as well as making them aware of pedagogical tools they might be able to use in their own teaching.

Participants met in small groups early in the workshop to discuss their own cases and see how they might be modified or improved. This was another way participants came to realize how differently individual disciplines viewed the same research ethics issues and how different were some of the issues facing specific disciplines. Participants were then encouraged to refine their cases during the workshop. On the last day, all the participants and faculty assembled to review all the cases. Each case was discussed to improve it as a pedagogical tool. The substantive issues raised by the case were also discussed. This exercise was another opportunity for participants to learn from the perspectives of those in other disciplines.

Post-workshop activities

After the workshop, participants had several tasks. They were to further refine their cases, based on the feedback from the workshop. The cases were then posted on a list serve, and participants were asked to provide further feedback. The email conversations among participants usually generated several hundred exchanges during the summer and fall. After submitting a final case, participants were asked to write an ethical commentary on the issues it raised. Each faculty member in the workshop was also asked to write commentaries so that each published case was accompanied by two commentaries.

Participants were also asked to engage in some project at their home institution to share what they had learned. The format varied with each individual. Some led a brown bag discussion with their laboratory colleagues. Some offered a seminar for their departments. Some taught a session in a faculty member's course. Some developed and taught a course of their own. Some played a role in planning a research ethics education program for their department or a larger, campus wide effort. Some participants assisted faculty in revising practices in their lab or department. We asked faculty to send us a letter indicating the participants' impact on the local campus. It was clear that they had much more impact than we initially anticipated.

Participants asked for more help with teaching research ethics than we had time to provide during the workshop so we requested additional funding for each of the last three years of the project, which we received, to offer a one half-day seminar on teaching six months after the workshop

One final funded part of the project is a collaborative writing project by participants in the first three years of the project. Entitled *A Guide to Graduate Research Ethics Education*, the volume will be addressed to graduate students in science and engineering as a way of assisting them with negotiating the ethical terrain during their graduate training. We expect to complete it this year.

Participants have been encouraged to submit proposals for the Association's Annual Meeting on topics in research ethics or the teaching of research ethics, and many have done so. Others have made presentations at conferences sponsored by the American Association for the Advancement of Science, Office of Research Integrity and other science conferences.

Outcomes of the Project

To date we have worked with 96 graduate students and post-doctoral students from 54 different universities and 40 disciplines or subdisciplines in the physical and natural sciences and engineering. We have accepted several participants in psychology and anthropology whose emphasis was very close to the physical sciences or had a specialty in research ethics.

Some former participants are now already in tenure track faculty positions and active in research ethics and the teaching of research ethics in their universities. Many have made presentations on teaching research ethics at professional meetings. Some have indicated the impact of the work on their reports of results in journal publications. One participant, for example, recounted how the GREE experience shaped the way he and colleagues reported results in a paper appearing in *Nature*¹⁴ Some participants have already published articles on research ethics in the journal, *Science and Engineering Ethics*.¹⁵ One pair of participants has teamed up to produce a set of cases in research ethics aimed particularly at scientists in ecology.

Over 1000 copies of the first five volumes of *Research Ethics: Cases and Commentaries* have been sold/distributed to hundreds of universities in the United States and abroad. Some are being regularly used in classes in graduate schools and medical schools and posted on university web sites as a teaching resource in research ethics. The first five volumes have also been posted on *onlineethics.org*, the online ethics center for science and engineering at Case Western Reserve University.

What we have learned

We believe that, in the course of this project, we have learned a number of things about teaching research ethics to graduate students.

1. The great value in the interdisciplinary nature of the group

Having such an interdisciplinary group produced extremely rich discussion on many issues in research ethics, which cut across disciplines. This discussion included questions such as "What counts as raw data?," "Who owns the graduate student's data?" and many questions of authorship practices; supervisors' practices in dealing with graduate students and postdoctoral fellows; and institutional practices for educating graduate students about ethical conduct of research. Although responses to such questions may vary with individual disciplines, the discussion was very effective in broadening participants' perspective on research ethics. As participants learned about research practices from other laboratories and other disciplines, they came to realize the strengths and weaknesses in the approaches of their own laboratories and disciplines. That enhanced their capacity to be self-aware and self-critical of their own lab or practice, much as traveling in a foreign country enhances understanding of one's own culture. This is not an experience students are likely to get in their own universities if all research ethics education is done within the department.

2. The value of the graduate student perspective

Working with graduate students and post doctoral fellows has helped us to see how different their perspective is, compared to faculty, on many of these issues; it has given us a glimpse of issues often not talked about or admitted by faculty in discussion of research ethics. Graduate students are much more attuned to problems of relationships in the laboratory between students, advisers and faculty; problems among faculty; and problems among graduate students. Faculties need to be listening more to their graduate students' concerns in these areas. Our work has underscored the need for safe forums for graduate students to have regular discussion of such problems with faculty and has revealed the relative lack of forums in many settings. It has also enabled us to see a wide variety of department or laboratory approaches for ethics education, relations with mentors, and faculty conflicts of interest, and to assess the strengths and weaknesses of those approaches. Some of our participants were very happy with their departments' practices, and some were very angry. What we saw has underscored the value of preventive ethics in these settings. Some problems appear over and over because institutional arrangements have not been created to address these issues.

Since graduate students are often involved in cutting edge research projects, review of their cases has given us a glimpse of emerging issues that have not been addressed or resolved by research guidelines, e.g., group consent for research on individuals (a study of genetic traits in the Amish, for example).

3. Preventive ethics

We were particularly struck by the impact on participants of the concept of preventive ethics. As they struggled with many difficult cases, particularly those involving mentor relations, other laboratory relations and relations in the research community, they grasped the value of avoiding an ethical difficulty when possible, rather than trying to resolve it after the fact.

As we listened to participants share experiences in their graduate programs and discuss their own cases, we noted that many of the ethical difficulties that arise in research departments or laboratories could be avoided if departments self-consciously set out clear expectations for graduate students at the beginning of their programs and provided vehicles for regular and open discussion of those expectations.

One participant helped us appreciate one preventive mechanism for helping maintain a healthy balance in the power relations between faculty and students, thereby avoiding many of the ethical issues that can arise in that relationship. That is the mechanism of having portable national fellowships for students. If some outside agency such as NSF controls the funding for a graduate student's career, that student is much less vulnerable to a faculty member's unethical behavior. If the department environment is unethical or if the student is treated unethically, the student can walk.

4. Value of case studies

Cases were initially prepared before the workshop, reworked during the workshop with two feedback sessions, and polished over the summer and fall with feedback via e-mail from peers and faculty. The extensive revision and collaboration process was intended, in part, to develop an extended con-

versation among participants and faculty on research ethics issues and teaching research ethics and to create a community of colleagues who trust each other enough to raise these issues and discuss them frankly.

Developing and discussing case studies drawn from their own experience, and writing commentaries on their own cases proved to be a very effective pedagogical tool for helping participants learn to recognize ethical issues. The intellectual difference between writing one's own case and reading and discussing one written by someone else, is significant. Experience does not come with "ethics problem" stamped on it. To move from raw experience with its amorphous and confusing mixture of impressions, emotional reactions and relevant and irrelevant facts to the recognition of an ethical issue is itself a significant intellectual activity. Considerable reflection is often required to determine that a problem is indeed an ethical issue and to identify and enumerate the ethical components of the situation. Many participants had the experience of beginning with a gut instinct that something was wrong and eventually being able to articulate the ethical issues. Others found they began with one notion of the ethical issue in a situation and came to see either that it was not an ethical issue or not the one they thought it was, or that there were other ethical issues they had not recognized or considered.

Writing commentaries on their own cases particularly challenged participants to reason about the cases, to articulate concepts and relevant differences between their cases and standard cases they had studied or discussed, to discern where relevant concepts and principles applied. The focus on crafting ethically justifiable solutions to problems challenged them to develop their capacity to put themselves in the place of the recipients of their proposed actions and thereby developed their moral imagination.

Discussion also spurred reflection on teaching objectives and techniques as they thought about how to teach the cases. Cases proved to be a pedagogical tool with which participants were comfortable and one they could use in a wide variety of situations when they tried their hand at teaching research ethics on their own campuses. Participants and faculty can use cases to initiate discussions of ethics without having to assume the intimidating position of ethics expert or having to deliver a scholarly lecture on ethical theory.

Feedback from students indicated that the use of cases for discussion in their labs and departments provided a nonthreatening means for faculty and students to raise and discuss issues in a case that were in fact impeding work in their own lab. It allowed students and faculty together to discuss a case that indirectly addressed issues in their own labs, yet because it came from an independent source, faculty were not put in the position of defending the behavior, and students were not seen as criticizing the local practice directly. It also provided a vehicle for students to raise questions about local policy they may not have felt free to raise otherwise.

We were surprised that participants came up with a new range of cases year after year. Topics included perhaps the predictable issues of authorship, data ownership, collegial relations, experimentation on humans and animals, and deception in research, but also the less familiar issues such as compliance with laws in archeological research, use of credit ratings to track down experimental subjects, use and abuse of research data in developing environmental policy, the impact of industry funding on integrity in research, ethical guidelines for research in other countries, the responsible use of engineering modeling in forensic engineering, and expert testimony.

In this final summer of workshops, we experimented with encouraging participants to write up cases in which someone did the exemplary thing. Case writing tends to focus on problem behavior. The motivation for writing such cases may often be the author's moral outrage at someone's behavior.

Morally outrageous behavior can also be pedagogically effective in gaining and holding the reader's attention. In that sense, the cases are easy to teach. The downside of such cases is that focusing only on "bad behavior" may give students a skewed perception of scientific practice and may lead to cynicism about the behavior of others as well as their own. Regular use of cases of "bad behavior" may also condition students to assume that the behavior of agents in cases is always unjustified.

We gave participants the option of writing up cases that might display exemplary behavior. Many had difficulty doing that. They found it easier to write about bad behavior. Others wrote up cases that reflected standard practice in their area, which they assumed was therefore exemplary. Further discussion and analysis led them to conclude they had in fact a case of morally unjustified behavior.

A good format for exemplary cases turned out to be one in which they described the character's behavior without identifying it as exemplary and asked the readers to discuss whether the agent's behavior or some alternative was ethically more defensible. This exercise requires readers to go through the same ethical analysis and justification of alternatives that they would in other cases and hence recognize the moral justifiability of the agent's behavior. We expect that this format will help with the teaching difficulty of the lack of drama in cases of exemplary behavior compared to those involving unethical behavior.

We initially thought that we should not list the authors of the published cases since many of them drew on their own experience or situations in their home institutions. The wisdom of that insight was quickly reinforced by a couple of unfortunate incidents involving discussion of participants' cases on their home campuses.

The development and discussion of these cases in our own workshop often allowed participants to engage in a full airing of ethical concerns that they were not really free to discuss on their own campuses. That is one advantage of ethical training that takes place outside the home department or institution.

5. Post-workshop sharing

We were surprised by the extent of participants' impact on their home campuses: labs, departments, fellow students, and faculty: This impact is perhaps best illustrated in the words of participants and faculty from participants' home institutions.

Impact on research (from an adviser)

I wanted to let you know what a terrific experience the . . . workshop was for S. The knowledge she gained was immediately apparent. . . . Both she and I noticed with great pleasure the increased sophistication with which she approached our research ethics problems. As you may know, S. is the project coordinator of my NSF grant on community perspectives on ethical practices in adolescent risk research with diverse ethnic populations. The work has challenged many of our conceptions of ethics in science decision-making.

Impact on Lab

The authorship practices in my lab are being changed as a result of things I learned during the workshop. I have already changed certain aspects of the way my lab works. I did not see some of the practices of my lab as requiring moral choices that I now see as ethical decisions. This workshop may change the way research ethics decisions are made in my department. [E]ven my very skeptical P.I. wants to get involved.

Impact on faculty

I have learned a lot about research ethics from J. since she returned from the workshop and I know that her experiences have stimulated many discussions among the graduate students. J., the other members of my research group and I will be developing a set of lab policies in the next few months that will likely serve as a model for other groups in our department.

Impact on fellow students

Since returning from the workshop and subsequent APPE meetings, I have had the rather unnerving experience of being considered the local ethics expert. I just started a new position as a post-doc and am trying to put together an ethics brown bag in my new department. Despite my relatively low profile in the department, word got around that I did ethics and I was approached by several students for advice in handling situations they were involved with. Most were minor but one was serious and the hunger for this kind of advice simply underscored to me the need for research ethics education.

Many of my colleagues have never had any course work in research ethics and most feel their mentors are not doing an adequate job in relaying the importance of ethical behavior in research. The workshop allowed me to utilize ethical principles in analyzing potentially troublesome situations, bring to light the importance of ethics to scientific research. Most seemed to take ethical behavior for granted, but now many realize that ethical thinking should always be part of an active research program.

Impact on participants

My experience with a very serious case has brought home to me. . . there are still some very serious ethical issues within research science that need to be addressed and it will cost some scientists quite a bit more than the time devoted to an ethics brown bag to resolve them. Research ethics is not a peripheral issue – it is integral to the nature of the scientific enterprise.

6. Faculty receptivity

We found a tremendous range of receptivity, collegiality and institutional support by faculty for participants' efforts to share what they had learned about research ethics. Many, if not most, faculty were genuinely eager to see what they could learn from their participants' experience and were very supportive of the participants' efforts to share with the group. Some faculty and departments were hostile to discussions of ethics, or felt threatened or angry, or thought it simply a waste of time. Some participants found themselves in an adversarial relationship with their advisers or lab supervisors whom they now perceived, more clearly, to be engaged in unethical behavior or who simply did not appreciate the ethical dimensions of research practice. It was clear that participants did best when they had an adviser or mentor who shared their concern for ethical research. (One participant was advised not to make an ethics presentation in the department to avoid serious risk to her graduate career.)

We had a small window into the culture of departments at 54 universities. Over the years we sometimes had multiple participants from the same department or institution. We were struck by the variation in institutional support for ethics education of graduate students and how much difference that can make to encouraging faculty to invest their own time and energy in such effort. The need for institutional support for diffusing research ethics

throughout the university is very real and is lacking in many places. The relation of administration and faculty is symbiotic in this endeavor. Sometimes the faculty were eager but did not receive adequate support. Sometimes the administration was supportive, but faculties were uninterested.

7. Faculty-student relationships

A number of years ago, at Indiana's Poynter Center for the Study of Ethics and American Institutions very successful and long established Teaching Research Ethics workshop, a faculty member from a Big Ten University stood to announce, "there **are** no problems in the research laboratory between faculty and graduate students – we are all colleagues."

One of the things we learned in listening to participants, reading their cases and sharing their home experiences was how different are the student and faculty perceptions on this subject; how common are difficulties in faculty-student, adviser-advisee, senior researcher-student researcher, interaction of peer lab partners, graduate students and post-doctoral fellows; and how much difficulty could be avoided by good early discussion of department and faculty expectations of students on such issues as data ownership and authorship practices in that particular lab. Needed are ethics education of graduate students and faculty and some forum or opportunity in the laboratory or department for ongoing dialogue between faculty and students. I noted that we are preparing a book, which is meant to address issues related to this situation.

8. Fellow graduate students' receptivity

Many of our participants returned home to find they were quickly dubbed the ethics gurus of their groups, labs or departments. They were sought out by graduate colleagues eager for advice on an ethical issue in the lab or department. There was clearly a hunger among many of their colleagues to discuss ethical issues that arose in their own departments.

9. Impact on participants

My observations in all these categories implicitly identify items that had an impact on participants. I do want to single out one item for emphasis. We have had a lot of feedback from participants that the GREE experience had been very helpful to them in working through difficult ethical situations they encountered in their own professional life after completing the program. The situations involved faculty, research projects and publication as well as relations with fellow students.

Based on our experience, it seems to me that there are several strengths of the program you are about to launch at Western Michigan. 1) It has interdisciplinary components that reach beyond individual departments, and it allows interdisciplinary dialogue within the institution. For the reasons I have articulated, that can be very valuable and a component missing in ethics education programs confined to individual departments. 2) The team pairing of graduate students and faculty within the departments creates the possibility of a forum for safe and nonthreatening dialogue and the opportunity to develop collegial student-faculty relations within departments. Both features provide an opportunity for departments to identify, modify and improve efforts in research ethics education and research practices. 3) The structure of the project also institutionalizes feedback and dialogue with the administration.

All of these features enhance the possibility of long-term institutional change and renewal of research ethics education and the conduct of responsible research at Western Michigan. As such, this project could turn out to be a model for institutional change and renewal in a way that our project could not. Your project is, in that sense, a second-generation ethics education initiative that extends the work we were able to do in our project.

¹ Graduate Research Ethics Education, NSF Grant # SBR 9421897; Continuing and Expanding Graduate Research Ethics Education NSF Grant # SES981-17880

² For a description of these experiments, see Robert N. Proctor, *Racial Hygiene: Medicine Under the Nazi's*, (Cambridge: Harvard University Press, 1988), pp 217-223.

³For a discussion of the Nuremberg trials and code, see *Trials of War Criminals Before the Nuremberg Military Tribunals Under Control Council Law 10* (2) U.S. Government Printing Office, Washington, DC, 1949.

⁴Saul Krugman and Joan P. Giles, “Viral Hepatitis: New Light on an Old Disease,” *Journal of the American Medical Association*, 212:6 1019-21 May 11, 1970.

⁵ Final Report of the Advisory Committee on Human Radiation Experiments by *United States Advisory Committee on Human Radiation Experiments*, U.S. Government Printing Office.

⁶ *The Belmont Report: Ethical Principles and Guidelines for the Protection of Human Subjects*, The National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, U.S. Government Printing Office, 1979.

⁷ Kurt Eichenwald and Gina Kolata, Drug Trials Hide Conflicts for Doctors Business Section, Sunday May 16, 1999, Late Edition - Final, Section 1, Page 1, Column 1.

⁸ See for example, Robert L. Sprague, “The Voice of Experience” in *Science and Engineering Ethics* Volume 4, No. 1, January 1998, pp 33-45. This entire volume of the journal is devoted to the problem of whistleblowing in the scientific community.

- ⁹ Robert A. Phillips, PhD; John Hoey, MD, “Constraints of interest: lessons at the Hospital for Sick Children” *CMAJ* October 20, 1998; 159: 955-7.
- ¹⁰ See A. J. Ayer, *Language, Truth and Logic*, (New York: Dover) 1946.
- ¹¹ Daniel Callahan and Sissela Bok, eds., *Ethics Teaching in Higher Education*, (New York: Plenum Press) 1980.
- ¹² See James Rest and Darcia Narvaez, eds., *Moral Development in the Professions: Psychology and Applied Ethics* (Hillsdale, N.J.: Lawrence Erlbaum Associates, 1994).
- ¹³ This includes, in my judgment, National Institute of Health’s own “course,” “Human Participant Protections Education for Research Teams,” at the following web site: <http://cme.nci.nih.gov/>
- ¹⁴ Capaldo, K.P., J.J. Corbett, P. Kasibhatla, P. Fischbeck,, S.N. Pandis, “Effects of Ship Emissions on Sulfur Cycling and Radioactive Climate Forcing Over the Ocean,” *Nature* 400:743-746, 19 August, 1999.
- ¹⁵ Julia A. Frugoli, “Commentary on ‘Mentors, Advisors and Supervisors: Their Role in Teaching Responsible Research Conduct’: It Really Does Take A Village” *Science and Engineering Ethics*, 7, 4, 469-470; Leslie R. Sims, “ ‘Sherry’s Secret’—Case Study and Commentary on Research Ethics” *Science and Engineering Ethics* (2001) 7, 1, 147-150; Diane Hoffman-Kim, “Commentary on ‘Normative Orientations of University Faculty and Doctoral Students’ ” (M. S. Anderson) 6, 4 463-465. Joe Cain, "Why be My Colleague’s Keeper? Constructing Moral Justifications for Peer Review," *Science and Engineering Ethics* 5,4: 531 – 540, Stephanie J. Bird and Diane Hoffman-Kim, “Damned If You Do and Damned If You Don’t: The Scientific Community’s Responses to Whistleblowing,” *Science and Engineering Ethics*, Special Issue: Whistleblowing and the Scientific Community 4,1 3-7.