



Online Ethics Center
FOR ENGINEERING AND SCIENCE

Introduction: Why Teach Research Ethics?

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An essay discussing why teaching research ethics is important, and the requirements, skills, knowledge and other attributes of good RCR instruction.

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Overview

Before creating a program of instruction or education in the responsible conduct of research, it is essential to first ask: What are the goals for teaching responsible conduct of research? While some courses may be created only in response to federal or institutional requirements, it is nevertheless important for an instructor to assess what outcomes he/she hopes to achieve, and what changes he/she wants to evoke in a student's thinking, attitudes and actions. Currently, there is no agreed-upon set of goals or objectives across institutional training programs in RCR (Kalichman and Plemmons, 2007); however, most teaching goals could fit into one or more of the following four general categories: knowledge, skills, attitudes, and behavior. The current requirements for RCR education, and these different pedagogical goals, are the subject of this section.

Before addressing these goals, it is important to recognize that many scientists are skeptical about the value of explicit education in RCR. While this skepticism is healthy and sometimes appropriate, many arguments against instruction are based on some of the misconceptions described below.

- Although there are explicit regulations that govern some aspects of scientific practice -- for instance, the treatment of human subjects -- these regulations are insufficient to determine every choice a scientist will need to make. Moreover, scientists must always interpret regulations in their scientific practice. Treating human subjects responsibly involves more than just knowing regulations, and so too with other issues of RCR. This point is sometimes expressed by saying that RCR is more about conscience than it is about mere compliance. Additionally, many scientific practices are not directly covered by regulations, and scientists need to know how to proceed responsibly and with integrity in the absence of regulatory guidance.

- Where trainees learn by example, they must discern which features are important and which are not. For instance, they might learn that the reagents used are more critical than the style of music played in the lab. Even if they are trained to do research responsibly, then, they may or may not distinguish the elements that are matters of responsibility and integrity from those that are matters of style or manners. Explicit instruction in RCR can serve as an adjunct to and reinforce learning by example, by making trainees reflective about where and when issues of responsibility impinge on their research.
- Also, scientists who are not prepared to face ethical dilemmas may not have the presence of mind to do the right thing or the time to figure out what the right thing is. RCR education encourages scientists to think through ethical problems before they arise, before matters are clouded by demands for immediate resolution.
- It is rarely the case that people are intent on doing wrong. Failures of research integrity that result from ignorance or carelessness might be averted by even a modicum of attention to RCR issues. Furthermore, even though a course in research ethics may not set straight a scientist who is intent on falsifying data or mistreating research subjects, such a scientist will interact with peers and coauthors who will be in a position to recognize misconduct. A course in research ethics may be enough to make them more reflective and mindful of ethical issues.
- It's wrong to think that RCR is distinct from the demand to do good science. Promoting the integrity of science is one of the demands of responsible conduct. There may be times when it would be possible to learn something new only by acting irresponsibly, and that knowledge would then come at too high a price. Science is not a disembodied pursuit of truth; it is also a human project.
- Since science is self-policing, it may be tempting to think that the scientific community can handle any matters of responsibility by its own methods. This is already rebutted by the creation of regulations to govern scientific research due to past failures of the scientific community to minimize and mitigate misconduct by some scientists. Moreover, RCR education raises issues for scientists in a way that will promote reflection and consciousness of their roles

as members of the scientific community. Thus, RCR education can help science take care of itself.

Requirements

The need for research ethics education is specified, in part, by federal requirements from the [NIH](#) and [NSF](#), and so some extent by [institutions](#). Some of the rationale behind these requirements is discussed below as well.

The first such requirement was for National Institutes of Health (NIH) Training Grants to provide an opportunity for trainees to receive instruction in RCR (NIH, 1989 and 1992). A recent update refining this policy is more explicit about the audience, frequency, and format of RCR instruction: [Update on the Requirement for Instruction in the Responsible Conduct of Research](#).

While the National Science Foundation (NSF) has had a longstanding interest in education in the ethical practice of science, it has only recently introduced a broad requirement for all undergraduate, graduate, and postdoctoral researchers receiving funding from the NSF. The requirement can be found at: [Chapter 4 of NSF Grantee Standards](#) and additional information can be found at: [Frequently Asked Questions](#).

With increasing federal requirements, and increasing attention to the need for research ethics education, more and more institutions or individual programs and departments are making such education a requirement for all students or even all researchers.

The purpose of teaching research ethics is to promote integrity in the work of scientists, scholars, and professionals involved in the field of scientific and scholarly inquiry and practice. Responsible and ethical research behavior of researchers, research institutions, and government agencies has historically relied on a system of self-regulation based on shared ethical principles and generally accepted practices. Interest in the teaching of responsible conduct of research (RCR) has surged in response to federal requirements for PHS-funded researchers to receive RCR training. Recent national attention to highly publicized cases of fraud, plagiarism, and other instances of professional misconduct have only elevated the importance of teaching RCR.

Blatant forms of research misconduct have included cases of fabrication, falsification or plagiarism, resulting in political attention and intense reaction. The consequences of such wrongdoing are not only lost opportunities in science, but also a risk for decreasing public trust. At the opening of hearings on scientific fraud before the Committee on Science and Technology, Subcommittee on Investigations and Oversight, Chairman Albert Gore of Tennessee stated, "At the base of our investment in research lies the trust of the American people and the integrity of the scientific enterprise"(US Congress, House, 1981).

Representative John Dingell (1993) in his Shattuck lecture summarized high profile cases of medical research misconduct that resulted in political scrutiny in the 1980s and 1990s, leading to federal policies and guidelines requiring RCR instruction. Research fraud became a governmental concern, "a matter of politics not science" due in part to the reactions of the scientific leadership to instances of research fraud and misconduct (LaFollette, 1994).

In response to the many instances of research misconduct and questionable research practices at major research institutions in the 1980s, the Institute of Medicine in a 1989 report noted "[I]nstruction in the standards and ethics of research is essential to the proper education of scientists." Following implementation by the NIH of a requirement that training grant programs provide training in the responsible conduct of research, many formal RCR training programs have now been established. Although NIH mandated instruction in RCR, specific goals and core competencies were not defined. Nor does the requirement specify a particular format or curriculum. Other governmental and non-governmental advisory bodies have endorsed RCR education and training. These agencies recognize the need for curriculum and core competency development (DHHS, 1995; Korenman,SG, Shipp, AC, 1994; National Academy of Sciences, 1992). More recently, a legislative mandate calls for the National Science Foundation (NSF) to "... provide appropriate training and oversight in the responsible and ethical conduct of research to undergraduate students, graduate students and postdoctoral researchers participating in" grant proposals funded by the NSF (P.L. 110-69, The 21st Century Competitiveness Act of 2007).

Knowledge

Knowledge about the responsible conduct of research would include the facts, guidelines, policies, data and other sources of information that answer "what" questions. Examples include:

- Written rules and guidelines, including regulations for PHS-funded research and specific guidelines for specific practices.
- Unwritten standards such as principles that guide opinions on unresolved ethical issues and standards of practices that make up RCR.
- Processes for dealing with misconduct, such as procedures for investigating concerns, handling misconduct or perceptions of misconduct, or where to turn if misconduct has occurred.
- Resources for making ethical decisions, e.g. where to access RCR regulations.

Mastroianni and Kahn (1998) described a core competency in RCR as "the achievement of a satisfactory level of proficiency in mastering a specified knowledge base or skill." Additionally, they recommended that students gain "a fuller understanding of ethical issues that may arise in research careers."

Among the core competencies that have been discussed are:

- Knowledge of, and sensitivity to, issues surrounding the responsible conduct of research and research misconduct.
- Appreciation for accepted, normative scientific practices for conducting research.
- Awareness of the gray areas and ambiguities of ethical issues, including differences between compliant and ethical behavior in the conduct of research, or the range of acceptable and unacceptable practices.
- Awareness that rules change over time and vary across disciplines or nations.
- Information about the regulations, policies, statutes, and guidelines that govern the conduct of research in PHS-funded institutions.
- Resources for additional study on topics related to scientific integrity, responsible conduct of research, and research misconduct.

Although it is important that students learn the conventions and rules for appropriate research conduct, knowing the rules and conventions of science is not sufficient to ensure responsible research conduct (Bebeau et al, 1995). It is important, therefore, that students develop skills and habits that prepare them to effectively resolve ethical conflicts they may encounter in professional life.

Skills

Skills to promote ethical practice in science include specific proficiencies, for example:

- Ethical decision-making, including recognizing problems, identifying and examining assumptions underlying practices, using analytical skills and strategies in addressing issues and problems, and exploring implications of different courses of action.
- Critical thinking and problem solving
- Conflict resolution
- Arbitration and mediation
- People management
- Stress management
- Communication skills

A goal described by many authors is to enhance students' ability to recognize and identify ethical issues and conflicts, analyze and develop well-reasoned responses to the kinds of ethical problems they are likely to encounter in the future (Sachs and Siegler, 1993; Bebeau, Pimple, Muskavitch, Borden, and Smith, 1995; Swazey and Bird, 1997).

Attitudes

Attitudes that promote RCR can be defined by an acceptance and understanding of the value of acting in ways that foster responsible conduct. Attitudes are closely related to opinions and beliefs, and are based upon personal experiences, and can be influenced by interactions with others. Examples of such attitudes include:

- Importance: understanding the importance of thinking through cases; understanding why good research ethics are important; appreciation for why both high crimes and misdemeanors matter
- Morality: sense of solidarity and identification with others, e.g. research subjects; sense of moral obligation and personal responsibility regarding practices in general and specific

- Practical Considerations: sensitivity regarding ethical issues and RCR in the practice of science; sense of appreciation for the range of acceptable practices; sense of empowerment
- Interest: continued interest and positive attitude toward continued learning.

An intrinsic assumption for discussing the goals and core competencies for teaching RCR is that ethics can be taught. One must first believe that RCR instruction can influence the thinking processes that underlie behavior, and that students can learn the conventions and rules for appropriate research conduct, to reflect on choices and decisions regarding RCR, to develop ethical sensitivity and critical thinking skills, and can learn to effectively resolve ethical conflicts in new situations. In a review of The University of Chicago's program on scientific integrity, Sachs and Siegler (1993) discussed this question of benefits in teaching research ethics. They cited similar discussions relative to teaching medical ethics to medical students and residents (Miles et al, 1989; Clouser, 1975). Critics of teaching medical ethics said that a trainee's character and moral constitution were determined by his or her upbringing many years before reaching medical school or residency training. However, in a study of the benefits of medical ethics courses, a large number of practicing physicians responded that ethics courses were beneficial for teaching physicians to identify values conflicts, for increasing sensitivities to patients' needs, for increasing their understanding of their own values, and dealing more openly with moral dilemmas (Pellegrino et al, 1985).

There has been increased focus on developing moral awareness about ethical issues in scientific research. Rest and colleagues (1986) demonstrated that a person's moral development—the way the person approaches and resolves ethical issues—continues to change throughout formal education. They proposed a Four-Component Model of Morality, posing the question: When a person is behaving morally, what must we suppose has happened psychologically to produce the behavior?

- Moral sensitivity: person made interpretation of situation in terms of what actions were possible, who (including oneself) would be affected by each course of action, and how the interested parties would regard such effects on their welfare.
- Moral reasoning: person must have been able to make a judgment about which course of action was morally right...what he ought to do.

- Moral commitment: person must give priority to moral values above other personal values - to do what is morally right.
- Moral perseverance or implementation: person must have sufficient perseverance, ego strength, and implementation skills to be able to follow through on his/her intention to behave morally, to withstand fatigue and flagging will, and to overcome obstacles.

From this work, Bebeau (1994) suggests that training in ethical reasoning can be effective in increasing the ability of emerging professionals to engage in ethical behavior in scientific research (Rest, 1986; Rest et al, 1986; Bebeau, 1991; Piper et al, 1993; Bebeau et al, 1995). RCR instruction, which includes training in ethical reasoning and decision-making, can help trainees become more sensitive to and more capable of recognizing areas of ethical conflict in research and scientific training. It can help encourage students to reflect on and understand their own values in a deeper way, and this may be beneficial when faced with real-life pressures of publishing, obtaining grants and advancing up the academic ladder (Sachs and Siegler, 1993).

Behavior

Ideally, RCR instruction changes not only attitudes, but also behavior. Examples of altered behaviors consistent with responsible conduct are:

- Use of ethical principles/moral reasoning in decisions in the gray areas
- Acting in a manner consistent with having identified with those who are suffering and/or vulnerable
- Taking an active role to keep current with policy changes

Many believe that ethics instruction can influence the thinking processes that relate to behavior. Others have stated "it is unlikely that we will detect any behavioral change from having students take our course" (Sachs and Siegler, 1993).

A hope of many has been that training in the responsible conduct of research would decrease the incidence of serious research misconduct. This may be the case, but it is not supported by the evidence (Kalichman and Friedman, 1992; Eastwood et al,

1996; Brown and Kalichman, 1998; Kalichman, 2009).

A study by Laczniak and Inderrieden (1987) showed that organizations that create an ethical environment and enforce their codes of ethics have higher levels of ethical decision-making. This study supports organizational efforts to foster ethical behavior.

Ultimately the goal is to cultivate thinking processes that develop moral behavior, which in turn leads to professionally ethical behavior. "A person must have sufficient perseverance, ego strength, and implementation to be able to follow through on his/her intention to behave morally, to withstand fatigue and flagging will, and to overcome obstacles" (Rest et al, 1986).

If one believes that ethics can be taught, then one aims to influence thinking processes that relate to behavior -- that is, to change student minds about what they ought to do and how they wish to conduct their personal and professional lives (Bebeau et al, 1995).

An additional dimension for behavioral change is to develop community; that is, to make changes not only in individual behavior but in the relationships among individuals and to develop a sense of solidarity with others. Some examples of this sense of community include:

- To increase conversations among researchers about the ethical dimensions of the practice of research
- To identify with other researchers
- To decrease the gulf between researchers and subjects
- To know the institution believes this is an important goal
- To define and refine community standards

One perspective is that an important goal of RCR programs is to help trainees understand the relationship of science to society (Reiser and Heitman, 1993).

Swazey, Anderson, and Lewis (1993) surveyed doctoral candidates and faculty from 99 of the largest graduate departments in chemistry, civil engineering, microbiology, and sociology to measure the rates of exposure to perceived misconduct in academic research. Their study highlights the significant influence that a faculty member's behavior may have on the formation of a student's values and standards. Equally important, graduate students' perceptions about the position of their

universities relative to RCR are formulated by the university's willingness, or lack of it, to undergo self-examination.

Sachs and Siegler (1993) believe that teaching scientific integrity and the responsible conduct of research may benefit the research community in general, not just course participants. Science itself is fundamentally grounded in ethical values, notably truthfulness and benefiting others. The involvement of an individual in producing knowledge creates an ethical responsibility for its outcome.

Resources

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Resources for Research Ethics Education

Topics

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Teaching Ethics in STEM

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