

Perspectives on Ethics in Engineering Education



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Engineer of 2020 workshop
Purdue U., 30 Sep 2008

Overview

1. Why is teaching ethics important?
2. What methods of teaching foster development of ethical behavior?
3. What instruments measure progress in ethical reasoning?



1. Why is teaching ethics important?

- A culture of cheating
- A technical approach to education
- Apathy



COMMENTARY

Scientists behaving badly

To protect the integrity of science, we must look beyond falsification, fabrication and plagiarism, to a wider range of questionable research practices, argue **Brian C. Martinson**, **Melissa S. Anderson** and **Raymond de Vries**.

Serious misbehaviour in research is important for many reasons, not least because it damages the reputation of, and undermines public support for, science. Historically, professionals and the public have focused on headline-grabbing cases of scientific misconduct, but we believe that researchers can no longer afford to ignore a wider range of questionable behaviour that threatens the integrity of science.

We surveyed several thousand early- and mid-career scientists, who are based in the United States and funded by the National Institutes of Health (NIH), and asked them to report their own behaviours. Our findings reveal a range of questionable practices that are striking in their breadth and prevalence (Table 1). This is the first time such behaviours have been analysed quantitatively, so we cannot know whether the current situation has always been the case or whether the challenges of doing science today create new stresses. Nevertheless, our evidence suggests that mundane 'regular' misbehaviours pre-

Table 1 | Percentage of scientists who say that they engaged in the behaviour listed within the previous three years (n = 3,247)

Top ten behaviours	All	Mid-career	Early-career
1. Falsifying or 'cooking' research data	0.3	0.2	0.5
2. Ignoring major aspects of human-subject requirements	0.3	0.3	0.4
3. Not properly disclosing involvement in firms whose products are based on one's own research	0.3	0.4	0.3
4. Relationships with students, research subjects or clients that may be interpreted as questionable	1.4	1.3	1.4
5. Using another's ideas without obtaining permission or giving due credit	1.4	1.7	1.0
6. Unauthorized use of confidential information in connection with one's own research	1.7	2.4	0.8 ***
7. Failing to present data that contradict one's own previous research	6.0	6.5	5.3
8. Circumventing certain minor aspects of human-subject requirements	7.6	9.0	6.0 **
9. Overlooking others' use of flawed data or questionable interpretation of data	12.5	12.2	12.8
10. Changing the design, methodology or results of a study in response to pressure from a funding source	15.5	20.6	9.5 ***
Other behaviours			
11. Publishing the same data or results in two or more publications	4.7	5.9	3.4 **
12. Inappropriately assigning authorship credit	10.0	12.3	7.4 ***
13. Withholding details of methodology or results in papers or proposals	10.8	12.4	8.9 **
14. Using inadequate or inappropriate research designs	13.5	14.6	12.2
15. Dropping observations or data points from analyses based on a gut	15.3	14.3	16.5

Federal offenses: research misconduct

Fabrication -- making up data or results and recording or reporting them.

Falsification -- manipulating research materials or research subjects, equipment, or processes, or changing, or omitting data or results, such that the research is not accurately represented in the research record.

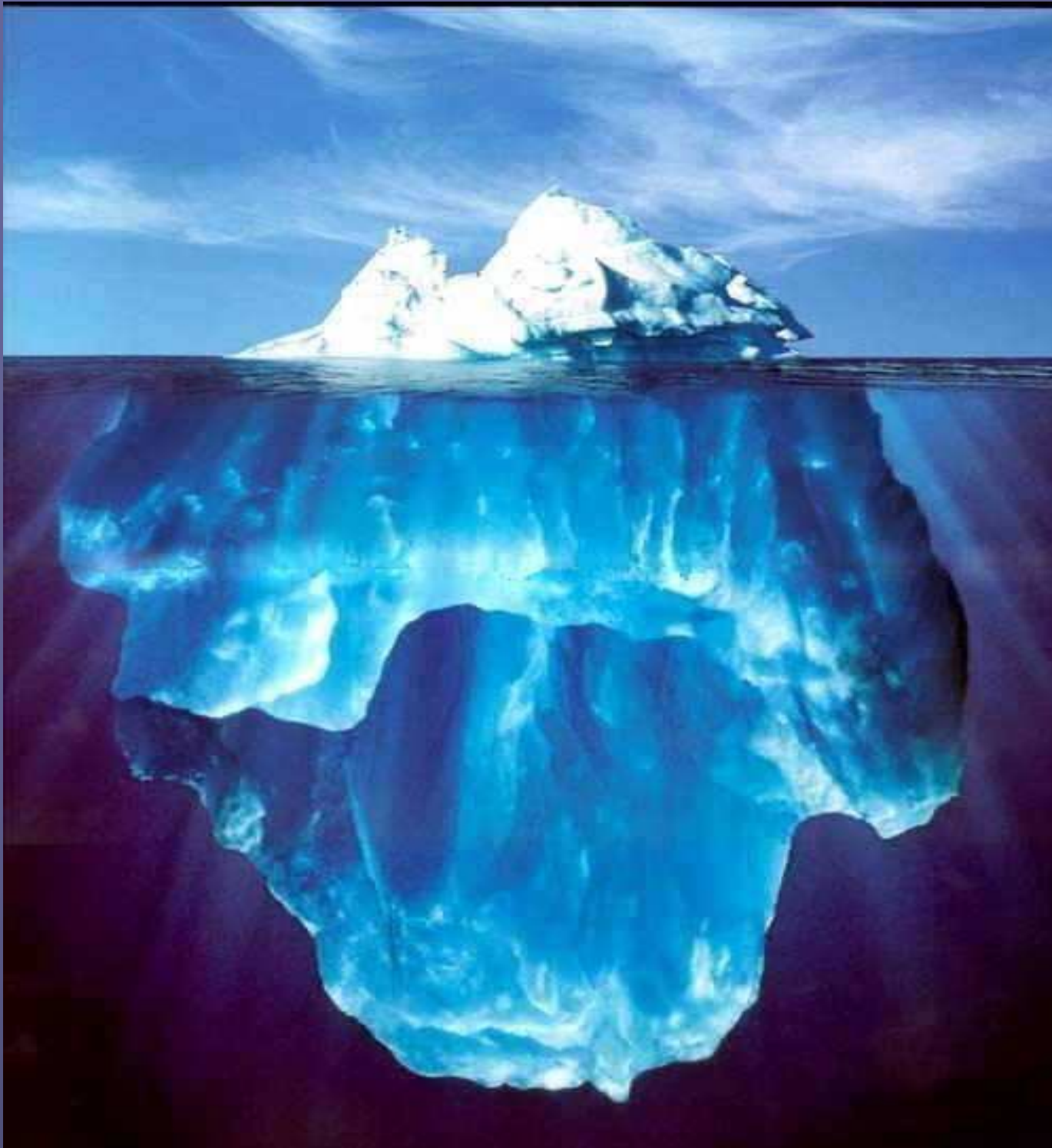
Plagiarism -- appropriating and using as one's own the documented ideas, processes, results, or words of another without giving appropriate credit

How common?

Graduate students:

Business	56%
Engineering	54%
Physical sciences	50%
Medical and health-care	49%
Law	45%
Social science and humanities	39%

- Donald McCabe, Center for Academic Integrity, Duke U.

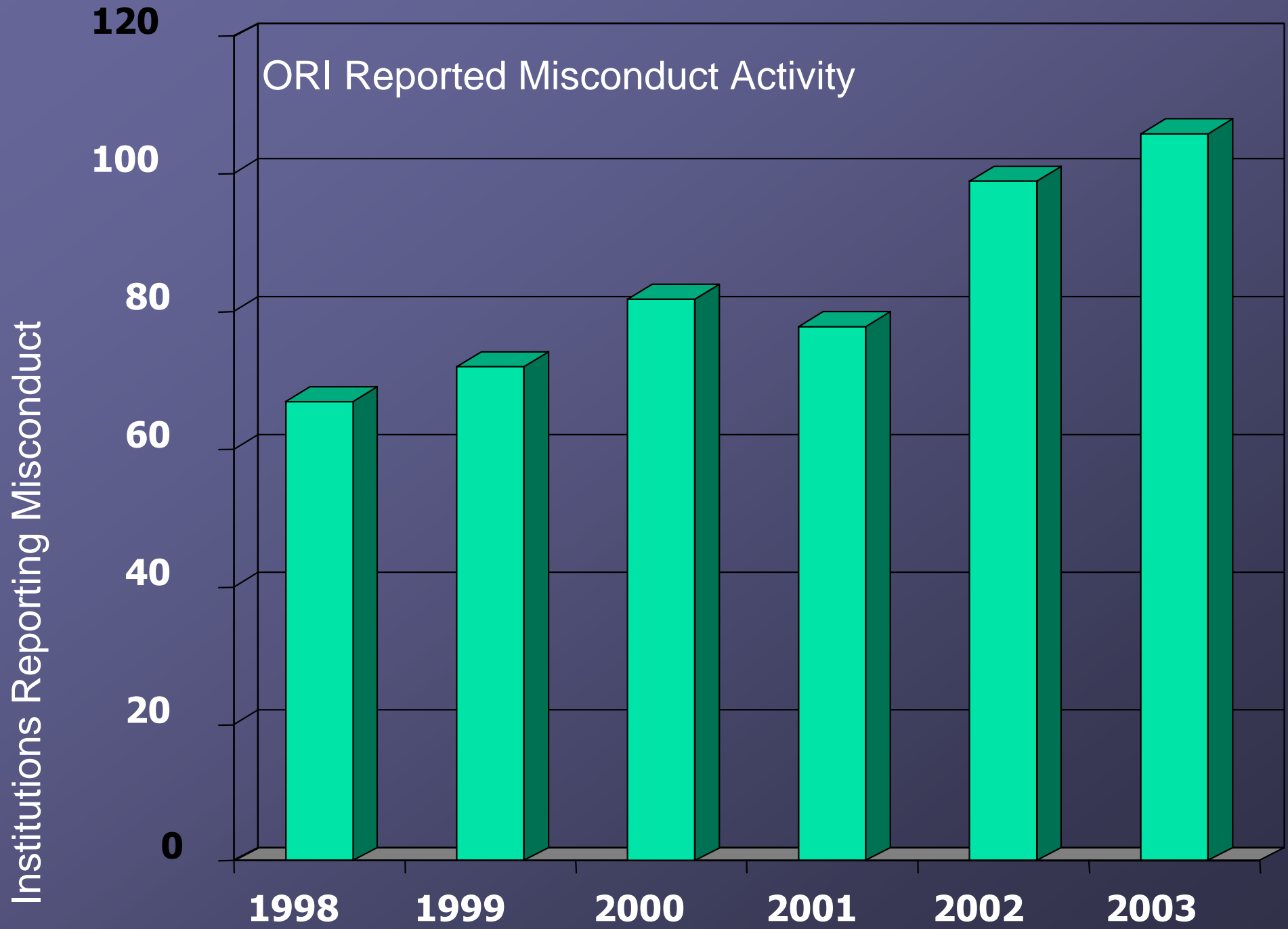


“Less than 1%
reported?”

Paul Cousins, Director
Office of Student
Conduct

“One case can
cost a million
dollars.”

Matt Ronning, Director
Sponsored Programs



44% of faculty say they have ignored cheating.

52% have never reported cheating to anyone else.

Donald McCabe, Sociology, Rutgers and Center for Academic Integrity, Duke
75,000 students; 125 institutions; 2 decades; self-reported data using paper and
now online survey; 2001-02 data

www.lib.washington.edu/about/events/academic/Pres_2-24.ppt

1. Why is teaching ethics important?

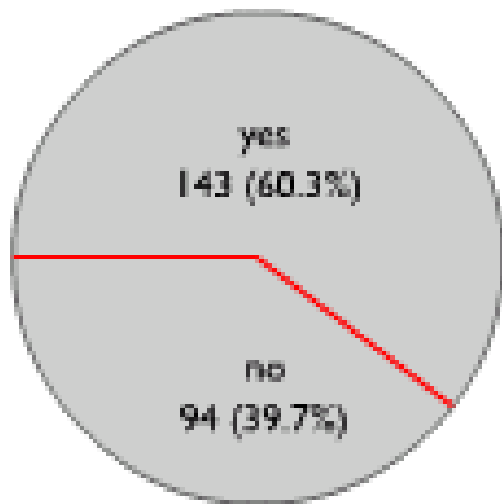
- A culture of cheating
- A technical approach to education
- Apathy



1. “In ... your engineering education ... have you ever gotten [the] message ... there is more to being a good engineering professional ... than being a state-of-the-art technical expert ?”

Prof. Robert McGinn 3-yr survey of Stanford engineering students, N = 700

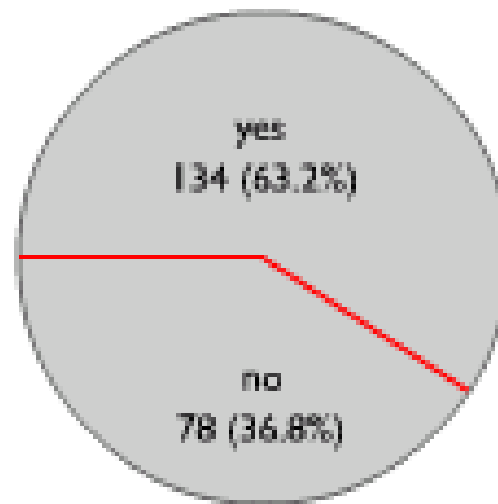
2001



no opinion: 1

no answer: 4

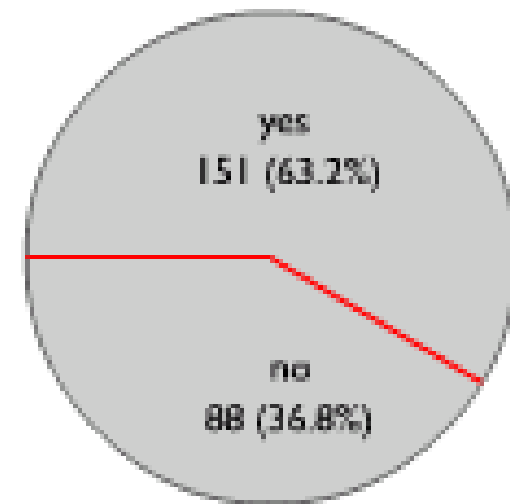
1999



no opinion: 0

no answer: 0

1997



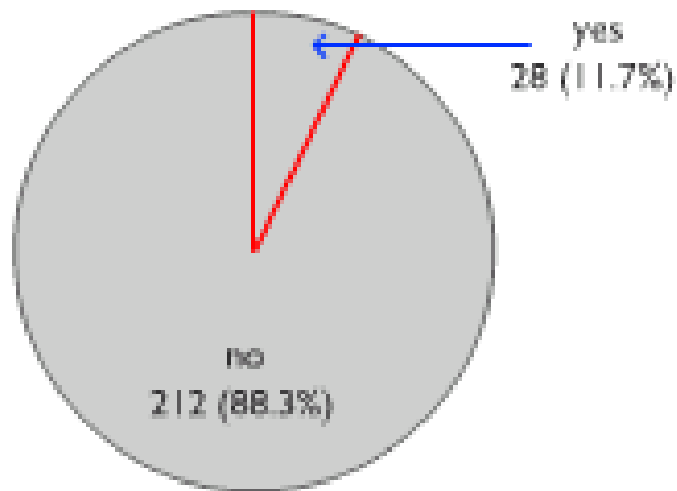
no opinion: 1

no answer: 2

2. “Have any of your engineering instructors ever conveyed anything specific to you about what is involved in being ethically ... responsible ...?”

http://ethics.stanford.edu/engin_ethics/tutorials.htm

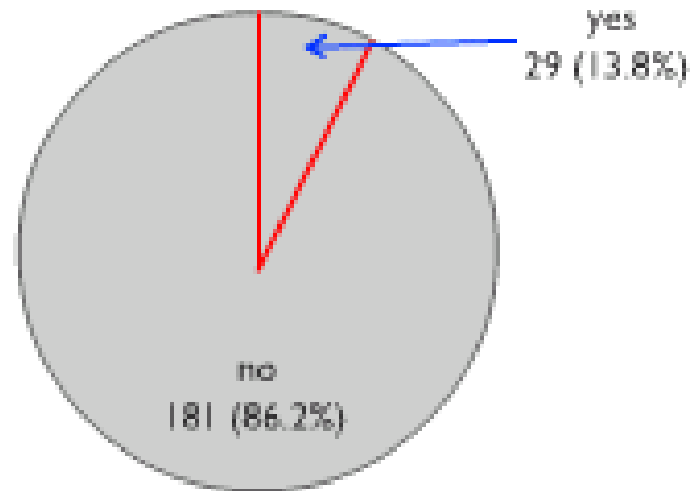
2001



no opinion: 0

no answer: 3

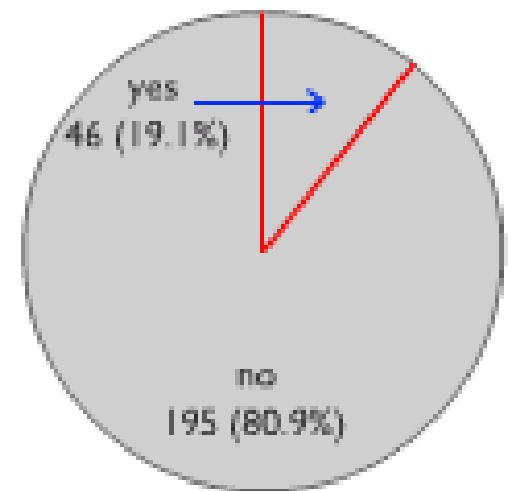
1999



no opinion: 0

no answer: 2

1997



no opinion: 0

no answer: 1

1. Why is teaching ethics important?

- A culture of cheating
- A technical approach to education
- **Apathy**



Apathy

Who cares?

“What's important is getting the job done. How you get it done is less important.”

“All I'm doing is emulating the behavior I'll need when I get out in the real world.”

- Donald McCabe http://today.reuters.com/news/articlenews.aspx?type=oddlyEnoughNews&storyid=2006-09-21T120800Z_01_N20379527_RTRUKOC_0_US-LIFE-CHEATING.xml&src=rss

2. What methods foster development of ethical behavior?

- Teaching rules
- Developing communities
- Case studies



VI. Core Instructional Areas

To the extent applicable to the research programs at the institution, any RCR program of instruction shall contain the following core areas of instruction:

1. Data acquisition, management, sharing, and ownership
2. Mentor/trainee responsibilities
3. Publication practices and responsible authorship
4. Peer review
5. Collaborative science
6. Human subjects
7. Research involving animals
8. Research misconduct
9. Conflict of interest and commitment
10. Compliance with existing PHS and institutional policies
11. Responsibility for determining whether to require a demonstration of competency in the core areas rests with the institution. However, PHS recommends that any program of instruction contain practice and evaluative components to reinforce learning and attitudes, practice new skills, and test for information transfer.

How many rules are there?

<http://onlineethics.org/reseth/phspolicy.html#corins>

Teaching rules

Strengths

- a) Clear guidance on how to behave
- b) Protection for subjects used in research (IRB, etc.)
- c) Penalties for non-compliance

Weaknesses

- a) Junior researchers supported and empowered?
- b) Emotions and self-interests engaged?
- c) Generalizable method for ethical decision making?
- d) Topics coherent?



Weaknesses

Some rules not clear.

Some rules contradictory.

For many cases there is no rule.

Is rule-following the behavior we seek?

Teach a method for making ethical decisions

START HERE: What are the facts? Which of my interests might be harmed?
What courses of action are open to me?

3. All interests

How do we maximize the ratio of all interests satisfied over unsatisfied?

3



1

1. Self interests

What course of action is best for me in the long run?

2

2. Professional interests

What course of action is best for us in the long run? How do we respect the implicit and explicit promises made to each other in the group?

2. What methods foster development of ethical behavior?

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Where do students learn ethical decision making?

1. Mentor, advisor
2. Fellow graduate students
3. Family
4. Friends not in graduate school
5. Other faculty
6. Religious beliefs
7. Discussions in courses, labs, seminars
8. Professional organizations
9. Courses dealing with ethical issues

- J. P. Swazey, K. S. Louis, and M. S. Anderson, "The ethical training of graduate students requires serious and continuing attention," *Chronicle of Higher Education* 9 (March 1994):B1-2; J. P. Swazey, "Ethical problems in academic research," *American Scientist* 81(Nov./Dec. 1993):542-53.

What is the most effective way to teach it?

1. Interaction with faculty in research
2. Informal discussion of ethical problems as they occur
3. Discussion of ethics in regular courses
4. Brown bag sessions
5. Special courses devoted to ethics
6. Department / university policies
7. Codes of ethics of professional organizations



J. P. Swazey, K. S. Louis, and M. S. Anderson, "The ethical training of graduate students requires serious and continuing attention," *Chronicle of Higher Education* 9 (March 1994):B1-2; J. P. Swazey, "Ethical problems in academic research," *American Scientist* 81(Nov./Dec. 1993):542-53.

OpenSeminar in Research Ethics

Global

Basic Info

Type: Organizations - Academic Organizations

Description: Welcome!

This is one of two online meeting spaces for the OpenSeminar in Research Ethics, an international group of researchers--mostly faculty and graduate students--dedicated to exploring ethical issues in research.

Our main goal is to support and empower junior researchers, welcoming them and helping them to become acculturated in the scholarly community.

We're committed to strengthening responsible conduct of research, believing research is more effective and productive--not to mention socially responsible--when researchers share a common moral vocabulary, similar educational experiences and are virtually linked. Toward this end, we invite you to work through our asynchronous, self-directed course, the OpenSeminar in Research Ethics, freely available here:

<http://www.openseminar.org/ethics>. Allow 14 hours to complete it.

If you are a student, search inside for two sorts of online colleagues:

* Faculty Mentor. These are typically university faculty members. Look for someone in your field--ideally, someone in your department. Self-identified faculty mentors have agreed to consider accepting students as informal mentees. They will respond as best they can to your ethics questions.

* Peer Mentor. Typically these will be other students in your field who have completed the OSRE course and are willing to discuss ethics with you and to help you find your way around this community and the online course.

Faculty: please consider volunteering as a mentor. Students: if you have completed the OSRE course, think about serving as a peer mentor.



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Events

There are no events.
[Create Events.](#)

Officers

Annie Antón (N.C. State)

2. What methods foster development of ethical behavior?

- Teaching rules
- Developing communities
- Case studies



Mentoring case study: Mary Allen

What kinds of relationships are appropriate between mentor and mentee?

What are my duties as a mentor? as a mentee?

How and when do I blow the whistle on a supervisor?



CREDIT: COURTESY OF MARY ALLEN

3. What instruments measure progress in ethical reasoning?

- James Rest's "Defining Issues Test"
- OpenSeminar in Research Ethics
 - Pre-test
 - Post-test



Course overview

A) My interests

- 1) Avoid misconduct (Heroes and heels, FFP)
- 2) Join community (REOC)

B) Our interests

- 1) Rights, rules, and professional codes
- 2) Authorship and peer review
- 3) Mentoring
- 4) Statistics and experimental design
- 5) Women and under-represented minorities
- 6) Intellectual property
- 7) Conflicts of interests; collaborative research
- 8) Use of humans

C) All interests

- 1) Animals
- 2) Future generations, the environment
- 3) Social responsibilities (researchers and universities)



The OpenSeminar in Research Ethics

Sponsored by NSF

Three steps:

1. MY interests: I ought always to do what is in *my* long-term, categorical interests.
2. OUR interests: I ought always to do what is in *my profession's* best interests. Follow the rules: Respect persons and property; be honest; treat others fairly.
3. ALL interests: I ought always to do what is in the best interests of *all morally considerable beings*. Try to make the world a better place: Maximize the ratio of good over evil.



OpenSeminar Modules

Social responsibilities of engineers

1. Engineering
2. Nuclear Engineering
3. Computer Engineering
4. Construction Engineering
5. _____

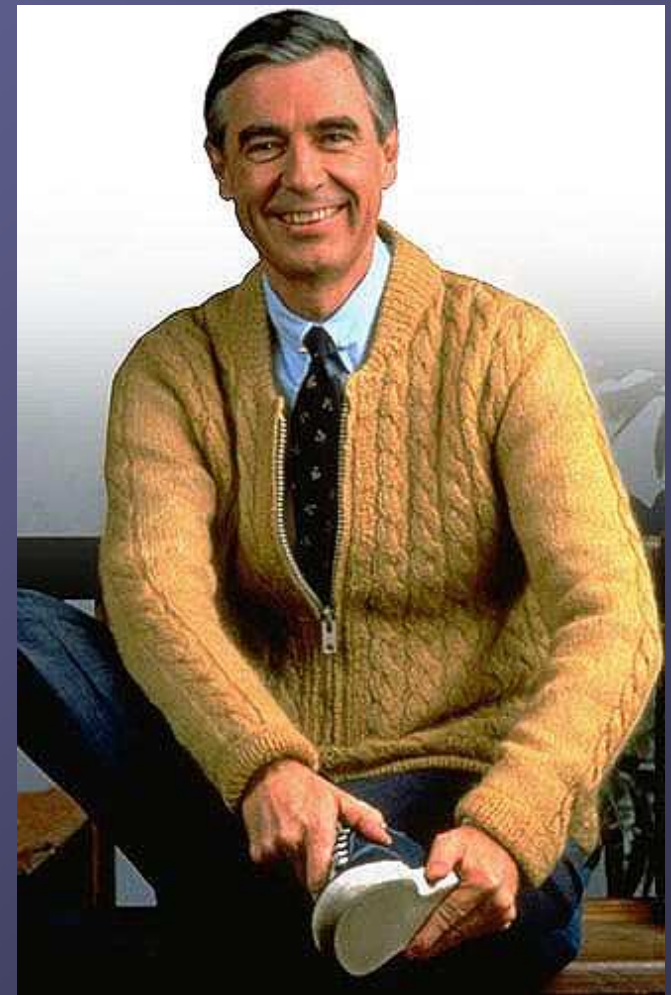
Plagiarism

1. Electrical and computer Engineering
2. Bioengineering
3. Biochemistry
4. _____



“You know it’s not the honors and prizes and the fancy outsides of life which ultimately nourish our souls.”

“It’s the knowing that we can be trusted, that we never have to fear the truth, that the bedrock of our very being is good stuff.”



- *Fred Rogers*



Please join us!

Project ARCHER

Achieving Responsible Conduct in Higher Education Research

Purpose: To infuse research ethics education into the undergraduate and graduate STEM programs at Purdue

Contact: Prof. A.G. Rud, Dept. of Educational Studies, Purdue, rud@purdue.edu

