# Educating Competent, Responsible, and Successful Researchers

Melissa S. Anderson
University of Minnesota
USA

# NOTE

These slides contain all the material presented at the conference. They also include additional material:

1. Explanatory notes for the charts

2. A list of related publications

3. Charts (at the end) that show the full numerical versions of some of the charts presented

# Training in the Responsible Conduct of Research (RCR)

# 3 Basic Questions about RCR Training

1. Should RCR training be delivered

by instruction or by mentoring?

# 3 Basic Questions about RCR Training

2. Should RCR instruction be

   separate

   or

   combined with other courses?

# 3 Basic Questions about RCR Training

3. Does RCR training improve

   knowledge?

   attitudes?

   behavior?

# Our Research Project

- 2002 survey (Martinson, Anderson, De Vries)
- U.S. scientists funded by the National Institutes of Health (NIH)
- Survey was supported by the Office of Research Integrity and NIH

- Mid-Career: 1,768
- Early-Career: 1,479

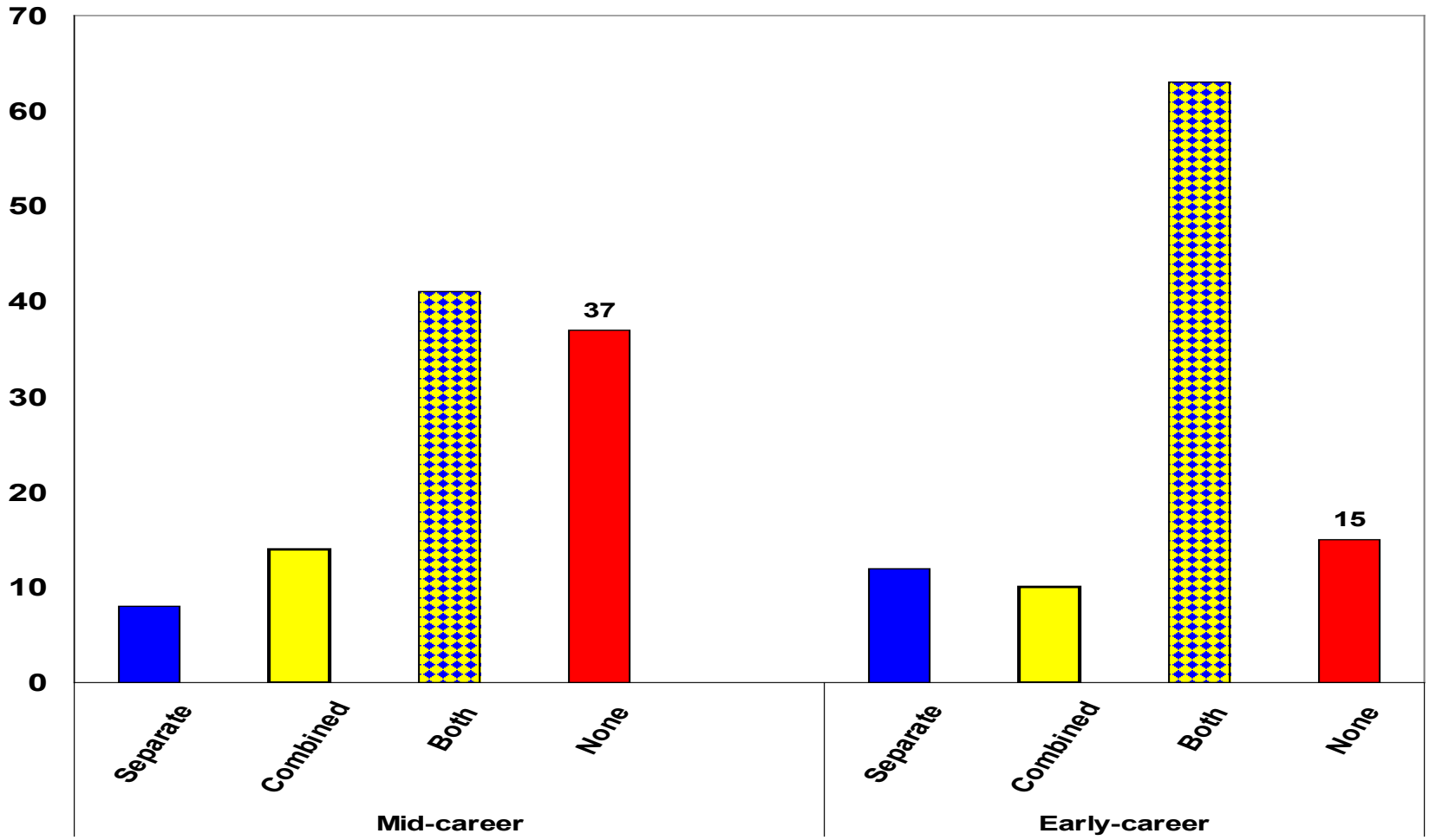
# Instruction in RCR

- Separate
- Combined

## Notes on the following figure:

- The bars show the percentage of respondents (mid-career and early-career) who reported having received separate instruction only (blue), combined instruction only (yellow), both separate and combined instruction (blue and yellow), or no instruction (red) in ethical issues and the responsible conduct of research.

# Instruction



# Mentoring

- Ethics
- General:

  Research
  Financial
  Survival
  Personal

# Are Scientists with Training More Likely to ...

| | Know Policies? | | Feel Prepared? | Agree with Norms? |
|---|---|---|---|---|
| Instruction | YES | | YES | NO |
| Ethics Mentoring | NO | YES | YES | NO |
| General Mentoring | (Some) | | NO | NO |

# Misconduct and Questionable Research Practices

- Their own misconduct in the previous 3 years
- Yes or No
- Discussions with 51 scientists

# Misconduct and Questionable Research Practices

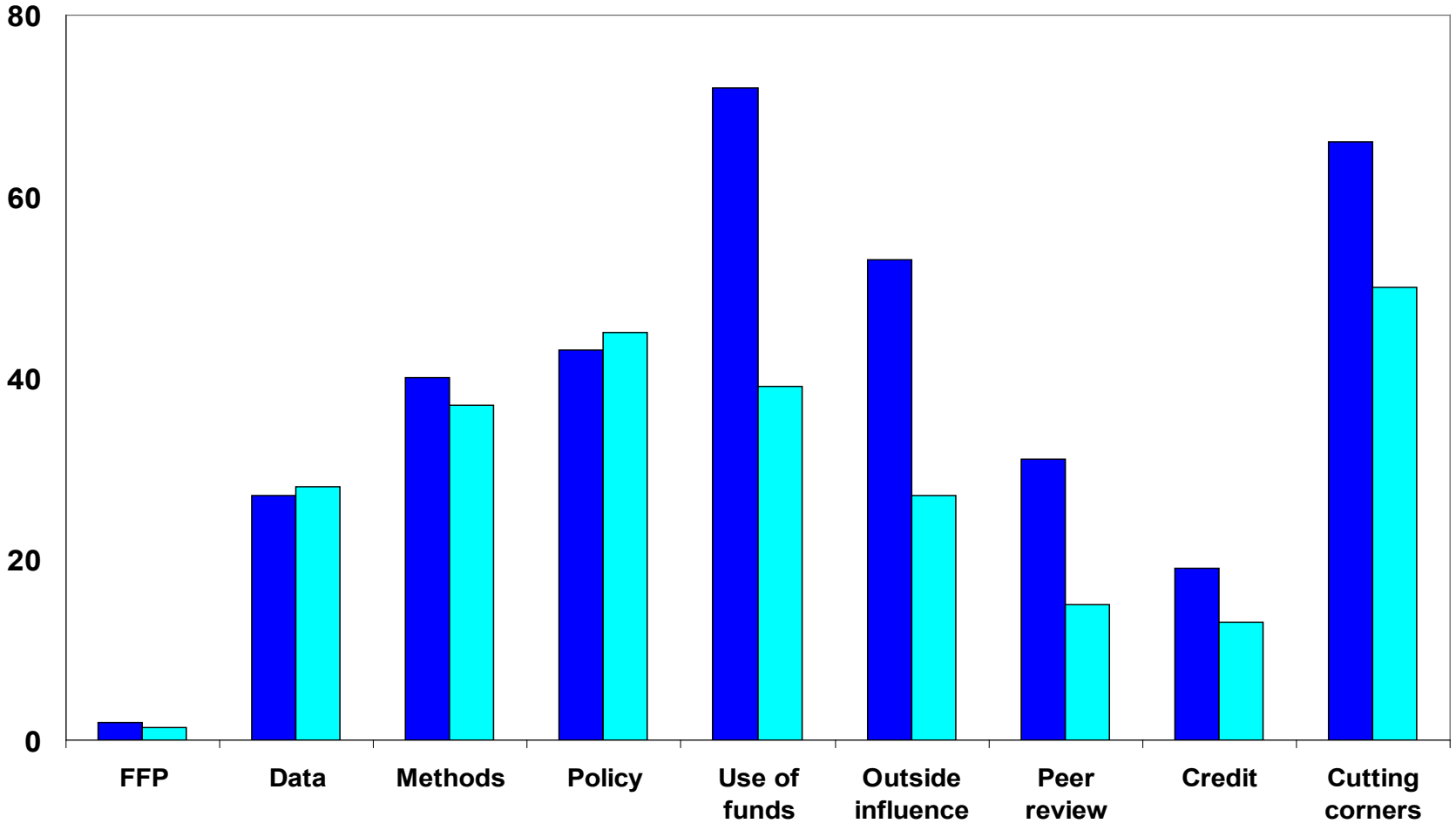
FFP

| | |
|---|---|
| Data | Outside influence |
| Methods | Peer review |
| Policy | Intellectual credit |
| Use of funds | Cutting corners |

## Notes on the following figure:

- The bars show the percentages of respondents (mid-career , blue;  early-career, teal) who reported having engaged in at least one form of misbehavior in the indicated category during the previous 3 years.

# Misconduct and Questionable Research Practices



Are scientists with RCR training less likely to engage in misconduct and questionable research practices?

| MID CAREER | FFP | Data | Method | Policy | Use of Funds | Extern. Influen. | Peer Review | Intell. Credit | Cutting Corners |
|---|---|---|---|---|---|---|---|---|---|

**Instruction**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Separate | | | | | | | | | |
| Combined | | | | | | | | | |
| Both | | | | LESS | LESS | | | | LESS |

**Mentoring**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Ethics | | | | LESS | | | | | |
| Research | | | | | | | | | |
| Financial | | | | | | | | | |
| Survival | | | | | | | | | |
| Personal | | | | | | | | | |

| EARLY CAREER | FFP | Data | Method | Policy | Use of Funds | Extern. Influen. | Peer Review | Intell. Credit | Cutting Corners |
|---|---|---|---|---|---|---|---|---|---|

**Instruction**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Separate | | MORE | | | | | | | |
| Combined | | | | | | | | | |
| Both | LESS | MORE | | | | | | | |

**Mentoring**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Ethics | | | LESS | | | | | | LESS |
| Research | LESS | LESS | LESS | | LESS | | | | LESS |
| Financial | LESS | | | | MORE | | | | |
| Survival | MORE | | MORE | | MORE | | MORE | | |
| Personal | | | LESS | | | LESS | LESS | | |

What else besides instruction and mentoring is associated with scientists' misbehavior?

Collaboration?  Competition?

| MID CAREER | FFP | Data | Method | Policy | Use of Funds | Extern. Influen. | Peer Review | Intell. Credit | Cutting Corners |
|---|---|---|---|---|---|---|---|---|---|

**Environ.**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Collabor.** | | LESS | | **LESS** | **LESS** | | | | **LESS** |
| **Competit.** | MORE | | **MORE** | **MORE** | **MORE** | **MORE** | **MORE** | **MORE** | |

| EARLY CAREER | FFP | Data | Method | Policy | Use of Funds | Extern. Influen. | Peer Review | Intell. Credit | Cutting Corners |
|---|---|---|---|---|---|---|---|---|---|

**Environ.**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Collabor. | | | | | | | | | LESS |
| Competit. | | | MORE | | | | MORE | MORE | MORE |

# Original 3 Questions

1. Instruction or mentoring?
2. Separate or combined instruction?
3. Knowledge, attitudes, behavior?

# Recommendations

- Good instructional practice
- Collective mentoring
- Preparation for survival in science
- Collective openness in research culture

# Contact:

**Melissa S. Anderson**
**mand@umn.edu**

**For details, see Anderson et al. in the September, 2007 issue of *Academic Medicine***

# Related Papers

Anderson, Melissa S., Horn, Aaron, Risbey, Kelly R., Ronning, Emily A., De Vries, Raymond, and Martinson, Brian C. (2007). What do mentoring and training in the responsible conduct of research have to do with scientists' misbehavior? Findings from a national survey of NIH-funded scientists. *Academic Medicine, 82*(9), 853-860.

Anderson, Melissa S., Martinson, Brian C., and De Vries, Raymond. (In press; publication date 12/2007). Normative dissonance in science: Results from a national survey of U.S. scientists. *Journal of Empirical Research on Human Research Ethics.*

Anderson, Melissa S., Ronning, Emily A., De Vries, Raymond, and Martinson, Brian C. (In press; publication date 12/2007). The perverse effects of competition on scientists' work and relationships. *Science and Engineering Ethics.*

(continued)

# Related Papers


Anderson, Melissa S., Martinson, Brian C., and De Vries, Raymond. (In press). Extending the Mertonian norms: Scientists' subscription to norms of research. *Journal of Higher Education.*

Anderson, Melissa S., Martinson, Brian C., and De Vries, Raymond. (Under review). Competition, cooperation and normative behavior in the research environment: Associations with misbehavior among NIH-funded scientists (working title).

Anderson, Melissa S., Holdsworth, Janet M., and Shultz, Joseph B. (2006). Cultivating interpretive mentorship: A role for research administrators. In Elliott C. Kulakowski and Lynne U. Chronister (Eds.), *Research Administration and Management*, Sudbury, Mass.: Jones and Bartlett.


(continued)

# Related Papers


Anderson, Melissa S. (2000). Normative orientations of university faculty and doctoral students. *Science and Engineering Ethics*, *6*(4), 443-461.

De Vries, Raymond, Anderson, Melissa S., and Martinson, Brian C. (2006). Normal misbehavior: Scientists talk about the ethics of research. *Journal of Empirical Research on Human Research Ethics*, *1*(1), 43-50.

Martinson, Brian C., Anderson, Melissa S., and De Vries, Raymond. (2006). Scientists' perceptions of organizational justice and self-reported misbehaviors. *Journal of Empirical Research on Human Research Ethics, 1*(1), 51-66.

Martinson, Brian C., Anderson, Melissa S., and De Vries, Raymond. (2005). Scientists behaving badly. *Nature, 435*, 737-738.

## Notes on the following tables:

- The tables present the logistic regression parameter estimates of effects of instruction and mentoring on the odds of the early-career (first chart) and mid-career (second chart) respondents' engaging in behavior in each category of misconduct (FFP) or questionable research practices within the previous 3 years.
- The logistic regressions control for gender, type of highest degree (PhD or other), location of degree-granting institution (US or other), and discipline.

(continued)

## Notes on the following tables:

- Numbers greater than 1 (red) indicate increased odds of having engaged in the given behavior; numbers less than 1 (green) indicate lowered odds.
- Statistical significance is indicated by asterisks:

  * p<.05 ** p<.01 *** p<.001
- Note that the FFP items are represented in the first column as well as in the data (fabrication, falsification) and intellectual credit (plagiarism) columns. The first column is included simply to highlight the FFP items separately.

(continued)

# Notes on the following tables:

- The complete results appear in:

**Anderson, Melissa S., Horn, Aaron, Risbey, Kelly R., Ronning, Emily A., De Vries, Raymond, Martinson, Brian C. (2007). What do mentoring and training in the responsible conduct of research have to do with scientists' misbehavior?: Findings from a national survey of NIH-funded scientists. *Academic Medicine*, 82(9), 853-860.**

| MID CAREER | FFP | Data | Method | Policy | Use of Funds | Extern. Influen. | Peer Review | Intell. Credit | Cutting Corners |
|---|---|---|---|---|---|---|---|---|---|
| **Instruction** | | | | | | | | | |
| Separate | .62 | 1.23 | .94 | 1.09 | .86 | .82 | .71 | 1.21 | 1.37 |
| Combined | .50 | 1.06 | 1.08 | 1.24 | 1.16 | 1.24 | .88 | .93 | 1.11 |
| Both | .67 | .97 | .82 | .63 ** | .61 ** | .91 | .91 | 1.20 | .74 * |
| **Mentoring** | | | | | | | | | |
| Ethics | 1.31 | .97 | .89 | .88 * | .90 | .95 | .92 | .89 | .94 |
| Research | 1.08 | 1.09 | .98 | .99 | .90 | 1.04 | 1.00 | .93 | .96 |
| Financial | .86 | .98 | 1.03 | 1.01 | 1.04 | .98 | 1.01 | 1.08 | 1.04 |
| Survival | 1.38 | 1.01 | 1.03 | 1.13 | 1.05 | .98 | 1.07 | 1.09 | 1.04 |
| Personal | 1.04 | .98 | 1.03 | .99 | .99 | 1.04 | .98 | .98 | 1.02 |

| EARLY CAREER | FFP | Data | Method | Policy | Use of Funds | Extern. Influen. | Peer Review | Intell. Credit | Cutting Corners |
|---|---|---|---|---|---|---|---|---|---|
| **Instruction** | | | | | | | | | |
| Separate | 1.01 | 1.86 ** | 1.39 | .91 | 1.09 | 1.10 | .96 | 1.26 | .78 |
| Combined | .24 | 1.36 | 1.50 | .87 | 1.07 | 1.37 | 1.30 | 1.28 | 1.16 |
| Both | .24 * | 1.54 * | 1.22 | .82 | 1.02 | 1.45 | .96 | 1.39 | 1.07 |
| **Mentoring** | | | | | | | | | |
| Ethics | 1.46 | .91 | .88 * | .91 | .94 | 1.09 | .93 | .90 | .88 * |
| Research | .52 * | .84 * | .81 ** | .91 | .84 ** | .99 | .93 | .92 | .87 * |
| Financial | .60 * | .99 | 1.12 | 1.06 | 1.13 * | 1.08 | .95 | 1.09 | 1.08 |
| Survival | 2.60 ** | 1.10 | 1.25 ** | 1.12 | 1.27 ** | 1.08 | 1.33 ** | 1.08 | 1.11 |
| Personal | .88 | 1.00 | .87 * | .91 | .92 | .86 * | .83 * | .85 | .94 |