Elevating and Understanding Ethical Reasoning Skills through Undergraduate Research Activities: What We are Learning When We Assess

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Summary

• Academic misconduct among undergraduates has increased substantially in recent years

• One of the reasons is that they do not take academic misconduct in the class as seriously as faculty

• Yet, for many students, research and other creative activities fall on a different category. To them, misconduct in your profession is not acceptable

• This is particularly relevant when they see the cost to society resulting from these actions

• We propose that training in research ethics strengthens students’ moral foundation and should contribute to a decrease in the incidence of academic misconduct
Until the mid XX\textsuperscript{th} century, the assumption was that academicians could do no wrong. Scientists knew what they were doing and why. Basic research did not need regulations of any sort.

People simply expected them to behave ethically. After all, why shouldn’t they? In fact, there has never been a code of ethics for researchers.

In part because this lack of rules, sometimes scientists performed studies that intentionally hurt people or animals.
Use (and abuse) of Human Subjects in Research

1940-45  Nazi Germany Experiments
1937-45  Unit 731 in Manchuria
1946-48  Intentional infection of Guatemalan men and women with syphilis
1963-66  Willowbrook Hepatitis Experiments
1932-72  Tuskegee Syphilis Study
Common features in the design of these unethical experiments

• Rationalization: In their view some experiments had to be done “to help mankind” if they could find the experimental model to work on.

• Dehumanizing a community: Acceptance that a group of people may be considered inferior or “less capable”.

• Using the group for experimental purposes: acceptance that it is OK to experiment on them because they are “not like us”.

Furthermore, participants in the Tuskegee study were not allowed to receive treatment, although they were told they were receiving treatment.

“At the end of this project we shall have a considerable number of cases presenting various complications of syphilis, who have received only mercury and may still be considered untreated in the modern sense of therapy. Should these cases be followed over a period of from five to ten years many interesting facts could be learned regarding the course and complications of untreated syphilis”

Letter from Dr. Vonderlehr to Dr. Clark (PHS) , 1933
The New York Times

Syphilis Victims in U.S. Study Went Untreated for 40 Years

By JEAN HELLER
The Associated Press

WASHINGTON, July 25—For 40 years the United States Public Health Service has conducted a study in which human beings with syphilis, who were induced to serve as guinea pigs, have gone without medical treatment for the disease and a few have died of its late effects, even though an effective therapy was eventually discovered.

The study was conducted to determine from autopsies what the disease does to the human body.

Officials of the health service who initiated the experiment have long since retired. Current officials, who say they have serious doubts about the morality of the study, also say that it is too late to treat the syphilis in any surviving participants.

Doctors in the service say they are now rendering whatever other medical services they can give to the survivors while the study of the disease’s effects continues.

Dr. Merlin K. DuVal, Assistant Secretary of Health, Education and Welfare for Health and Scientific Affairs, expressed shock on learning of the study. He said that he was making an immediate investigation.

The experiment, called the Tuskegee Study, began in 1932 with about 600 black men.
Regulations are usually “reactive”. They are the response to previously unforeseen problems.
The Nuremberg Code
1949

Basic Principles:

• Informed consent
  - Full disclosure
  - Patients must be able to give free consent (no coercion)
  - Competent researchers
  - Protection of participants
  - Right to withdraw at any time
As a result the Tuskegee scandal, the Department of Health, Education and Welfare (HEW, later was renamed the department of Health and Human Services, HHS) appointed the “National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research” (1974–1978) charged with identifying the basic ethics principles for research in humans.
A few scandals involving animal experimentation and misconduct gained public attention. Congress took over. The result was the creation of the OSI (Office of Scientific Integrity, later renamed ORI).

Eventually ORI (and also other federal agencies) recommended that scientists had to have training in Responsible Conduct of Research (RCR).
What is RCR?

- RCR encompasses a set of rules and recommendations that are essential for the progress of research
- Not only establishes rules and procedures but also protect all subjects involved
- The institution is responsible for monitoring and enforcing these rules
- Violation of some of these basic general principles may cost individuals their careers and the institution all federal funding
What are issues discussed in RCR?

- **Planning research**
  - Research Compliance (protection of human and animal subjects, conflict of interest), collaboration

- **Conducting research**
  - Data management, collaboration, mentoring

- **Reporting research**
  - Authorship, publication, peer review

- **Research misconduct**
  - Fabrication, falsification, plagiarism
Why do we need to train undergraduate students in ethics

- Students (particularly those who plan to pursue post graduate education) are under a lot of pressure to receive good grades.

- Millennials are used to multitasking and, therefore, easily distracted. Deadlines quickly catch up with them.

- Millennials grew up with Internet → almost infinite access to all kinds of information.

- You can download anything you need in a few seconds.

- Cheating is a reality for them: “if other do it, why should I be honest?”
Examples of arguments brought up by undergraduates that we would have considered unthinkable in previous generations

- Oberlin Students Want Below-Average Grades Abolished, Midterms Replaced with Conversations. Robby Soave | May. 24, 2016

- Brown student protesters complain homework is interfering with their activism Peter Fricke. on Feb 19, 2016
Undergraduate Academic Cheating as a Risk Factor for Future Professional Misconduct

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Irene M. Staik, Behavioral and Social Sciences, Univ. of Montevallo, Montevallo, AL.
D. Kristen Gilbert, Behavioral and Social Sciences, Univ. of Montevallo, Montevallo, AL.
W. Curtis Small, Biomedical Sciences, Univ. of South Alabama, Mobile, AL.
John W. Burling, Behavioral and Social Sciences, Univ.of Montevallo, Montevallo, AL.

ORI Research Conference on Research Integrity, Bethesda, MD 2000

http://ori.hhs.gov/documents/proceedings_rri.pdf

In this study we show that students (n = 140) and faculty (n=108) have a different perception of what is unacceptable behavior in academia.

Examples (Scale 1-5, with 1 being acceptable behavior):

- Lying to a teacher about why you are not prepared in class
  4.22 ± 1.98 (f) vs. 3.27 ± 1.31 (s)
- Taking money for doing someone’s work
  4.58 ± 1.01 (f) vs. 3.62 ± 1.33 (s)
Undergraduates have a lot of respect for scholarly activities in their discipline

Data Manipulation in the Undergraduate Laboratory: What are we teaching?
Elizabeth W. Davidson, Department of Biology, Arizona State University, USA
Heather E. Cate, College of Liberal Arts and Sciences, Arizona State University, USA
Cecil M. Lewis, Jr., Department of Anthropology, University of New Mexico, USA
Melanie Hunter, Department of Biology, Arizona State University, USA

ORI Research Conference on Research Integrity, Bethesda, MD 2000

http://ori.hhs.gov/documents/proceedings_rri.pdf

Major findings:

• Students think they may have to “cheat” in lab reports to receive a good grade
• The same students indicate that they would not cheat in a research project because that is not for a grade.
Why is Undergraduate Research a great tool to instill ethical behavior?

• In all disciplines (from the humanities to engineering and sciences) our undergraduates know that creative activities provide the building blocks of knowledge.

• Public funds and trust are put in the hands of the researcher. New ideas come off from previous findings. Trust is central in academia.

• For example, patients trust their physicians. Nobody wants to be treated by a physician who “cheated” in med school.
It is important to tailor presentations to address specific learning outcomes for every discipline

For example, an engineering student may not need to explore the same topics as a pre-med student
At our institution training on RCR occurs at all levels

These topics can be adapted to every level of education, and could easily be included in the requirements of Associate Degrees

- Undergraduate sophomores taking a general course entitled Seminars in Biomedical Sciences (BMD 201) (1 hour)

- Summer research program for medical students (1 hour)

- Undergraduate seniors taking bioethics course entitled Issues in Biomedical Sciences (BMD 493) (1 semester/3 credit hours)

- Undergraduates participating in a summer research program (NSF-REU) (1 hour weekly meetings over 10 wks)

- Graduate students taking a course on “Responsible Conduct of Research (GIS 501) (1 semester, 1-2 hours/week)
What are issues discussed in RCR?

- **Planning research**
  - Research Compliance (protection of human and animal subjects, conflict of interest), collaboration

- **Conducting research**
  - Data management, collaboration, mentoring

- **Reporting research**
  - Authorship, publication, peer review

- **Research misconduct**
  - Fabrication, falsification, plagiarism
What topics are covered in different programs?
1 Hour presentations

- Data Acquisition, Management, Sharing and Ownership
- Conflict of Interest and Commitment
- Human Subjects
- Animal Welfare
- Research Misconduct
- Publication Practices and Responsible Authorship
- Mentor / Trainee Responsibilities
- Peer Review
- Collaborative Science
Bioethics course

• Introduction to ethics and ethical decision making
• Data Acquisition, Management, Sharing and Ownership
• Conflict of Interest and Commitment
• Human Subjects
• Animal Welfare
• Research Misconduct
• Publication Practices and Responsible Authorship
• Mentor / Trainee Responsibilities
• Peer Review
• Collaborative Science
Summer Undergraduate Research program (NSF-REU)

- Introduction to ethics and ethical decision making
- Data Acquisition, Management, Sharing and Ownership
- Conflict of Interest and Commitment
- Human Subjects
- Animal Welfare
- Research Misconduct
- Publication Practices and Responsible Authorship
- Mentor / Trainee Responsibilities
- Peer Review
- Collaborative Science
- Technology transfer/Intellectual property
The topics discussed in the Graduate course could easily be included in professional Associate Degrees

- Introduction to ethics and ethical decision making
- Data Acquisition, Management, Sharing and Ownership
- Conflict of Interest and Commitment
- Human Subjects
- Animal Welfare
- Research Misconduct
- Publication Practices and Responsible Authorship
- Mentor / Trainee Responsibilities
- Peer Review
- Collaborative Science
- Technology transfer
- Intellectual property
- Forensic Analysis of scientific data
- Expert witness
- Genetics and Human Reproduction
- Harassment in the workplace
Measuring Learning Outcomes


In this report, the authors present ideas for pre-training and post-training evaluation as well as a list of 35 learning outcomes. For example,

- Recognize landmark cases and key historical events relevant to research ethics (2a).
- Recognize key codes of research ethics (2c).
- Apply main principles of bioethics to ethical issues in human subjects research (3b).
- Identify ethical principles/requirements in conflict (4c).
- Justify an ethical course of action (4f).
- Appreciate why honesty is critical to science and/or an important ethical value (10a).
- Learn appropriate standards for integrity and honesty in science (10b).
- Identify types of conflicts of interest (10c).
- Understand international standards with regard to authorship (10d).
- Explain and elucidate the differences between privacy and confidentiality (11a).
Evaluations
<table>
<thead>
<tr>
<th>Statements</th>
<th>Agree %</th>
<th>No opinion %</th>
<th>Disagree %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I have never heard about the topic of Responsible Conduct for Research (RCR)</td>
<td>29.5</td>
<td>4.9</td>
<td>65.6</td>
</tr>
<tr>
<td>2. I found the topics covered on RCR quite interesting</td>
<td>45.9</td>
<td>32.8</td>
<td>21.3</td>
</tr>
<tr>
<td>3. Although I find the topics covered on RCR boring, I think we need to learn about this</td>
<td>59.0</td>
<td>29.5</td>
<td>11.5</td>
</tr>
<tr>
<td>4. I think RCR should be covered later in College</td>
<td>42.6</td>
<td>24.6</td>
<td>32.8</td>
</tr>
<tr>
<td>5. I think discussing RCR several times during our undergraduate education may prevent future mistakes and/or misconduct when we become professionals</td>
<td>72.2</td>
<td>18</td>
<td>9.8</td>
</tr>
<tr>
<td>6. I enjoyed listening about data acquisition and record keeping</td>
<td>31.2</td>
<td>34.4</td>
<td>34.4</td>
</tr>
<tr>
<td>7. I enjoyed listening about research involving human subjects (IRBs)</td>
<td>80.3</td>
<td>14.8</td>
<td>4.9</td>
</tr>
<tr>
<td>8. I enjoyed learning about Conflict of Interest</td>
<td>57.4</td>
<td>27.8</td>
<td>14.8</td>
</tr>
<tr>
<td>9. I enjoyed the discussion on Research misconduct</td>
<td>50.8</td>
<td>34.4</td>
<td>14.8</td>
</tr>
</tbody>
</table>
BMD 493  
Questionnaire Falls 06-08 (n = 54)  
78% of the students returned the questionnaire

<table>
<thead>
<tr>
<th>Statements</th>
<th>Agree (%)</th>
<th>No opinion (%)</th>
<th>Disagree (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. My approach to thinking and dealing with ethical issues has changed as a result of this course</td>
<td>87</td>
<td>11.1</td>
<td>1.9</td>
</tr>
<tr>
<td>2. I am better able to articulate my views concerning ethical issues as a result of this course</td>
<td>85.2</td>
<td>12.9</td>
<td>1.9</td>
</tr>
<tr>
<td>3. I was not aware of the variety of ongoing bioethical issues</td>
<td>68.5</td>
<td>11.1</td>
<td>20.4</td>
</tr>
<tr>
<td>4. I already knew that cheating in College was a serious problem</td>
<td>83.3</td>
<td>5.6</td>
<td>11.1</td>
</tr>
<tr>
<td>5. I believe that in a competitive world one may be a little unethical in order to survive</td>
<td>38.9</td>
<td>20.4</td>
<td>40.7</td>
</tr>
<tr>
<td>6. Learning about the “Slippery Slope” concept through a historical perspective (Nazi Germany) helped me analyze current issues more objectively</td>
<td>90.7</td>
<td>5.6</td>
<td>3.7</td>
</tr>
<tr>
<td>7. After taking this course I find it more difficult to decide on an ethical issue</td>
<td>48.2</td>
<td>22.2</td>
<td>29.6</td>
</tr>
<tr>
<td>8. The material presented in this course has helped prepare me for a professional career.</td>
<td>92.6</td>
<td>7.4</td>
<td>0</td>
</tr>
<tr>
<td>9. I am less likely to indulge in unethical behavior as a result of this course</td>
<td>55.6</td>
<td>25.9</td>
<td>18.5</td>
</tr>
<tr>
<td>10. I am more likely to question my initial reactions when faced with an ethical dilemma as a result of this course</td>
<td>81.5</td>
<td>16.7</td>
<td>1.8</td>
</tr>
<tr>
<td>11. Regardless of my initial opinion, I will look at both sides of an issue as a result of this course</td>
<td>87</td>
<td>11.1</td>
<td>1.9</td>
</tr>
<tr>
<td>12. I have a better idea of what constitutes unethical behavior as a result of this course</td>
<td>88.9</td>
<td>9.3</td>
<td>1.8</td>
</tr>
</tbody>
</table>
### Topics covered in 2006 NSF-REU and students’ perception of relative relevance on every topic (n = 10)

<table>
<thead>
<tr>
<th>Topic</th>
<th>Important</th>
<th>No opinion</th>
<th>Irrelevant</th>
<th>I already knew</th>
</tr>
</thead>
<tbody>
<tr>
<td>Why do we teach Responsible Conduct of Research?</td>
<td>7</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Data Acquisition, Management, Sharing and Ownership</td>
<td>8</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ethics in Research. Research Integrity and Misconduct</td>
<td>7</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mentoring and Collaborative Research</td>
<td>6</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Technology Transfer. Conflict of Interest</td>
<td>6</td>
<td>3</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Institutional Animal Care and Use Committee (IACUC)</td>
<td>8</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Institutional Review Boards (IRBs)</td>
<td>9</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Publication and Authorship. Peer Review</td>
<td>7</td>
<td>2</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Case studies presented by students</td>
<td>7</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Studies assessing learning outcomes and RCR compliance among professionals


• **Compliance Disengagement in Research: Development and Validation of a New Measure.** James M. DuBois, John T. Chibnall and John Gibbs. Sci Eng Ethics, 2015


Important Definitions about misconduct for Assessment Purposes

If we search the literature concerning assessment of Research Compliance, we will find discrepancies. The reason is that different reports are looking at various aspects within the area of Responsible Conduct of Research (RCR). Here are some definitions:

- **RCR**: Encompasses Rules and Regulations in research
- **Research Misconduct**: Fabrication, Falsification and Plagiarism
- **QRPs**: Questionable Research Practices (deletion of an outlier, poor statistics, selective citations, authorship disputes, etc.)
### Measuring the Prevalence of Questionable Research Practices With Incentives for Truth Telling


#### Incidence of misconduct and of QRPs

<table>
<thead>
<tr>
<th>Item</th>
<th>Self-admission rate (%)</th>
<th>Odds ratio (BTS/control)</th>
<th>Two-tailed p (likelihood ratio test)</th>
<th>Defensibility rating (across groups)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. In a paper, failing to report all of a study’s dependent measures</td>
<td>63.4</td>
<td>1.14</td>
<td>.23</td>
<td>1.84 (0.39)</td>
</tr>
<tr>
<td>2. Deciding whether to collect more data after looking to see whether the results were significant</td>
<td>55.9</td>
<td>1.08</td>
<td>.46</td>
<td>1.79 (0.44)</td>
</tr>
<tr>
<td>3. In a paper, failing to report all of a study’s conditions</td>
<td>27.7</td>
<td>0.98</td>
<td>.90</td>
<td>1.77 (0.49)</td>
</tr>
<tr>
<td>4. Stopping collecting data earlier than planned because one found the result that one had been looking for</td>
<td>15.6</td>
<td>1.57</td>
<td>.00</td>
<td>1.76 (0.48)</td>
</tr>
<tr>
<td>5. In a paper, “rounding off” a p value (e.g., reporting that a p value of .054 is less than .05)</td>
<td>22.0</td>
<td>1.07</td>
<td>.58</td>
<td>1.68 (0.57)</td>
</tr>
<tr>
<td>6. In a paper, selectively reporting studies that “worked”</td>
<td>45.8</td>
<td>1.18</td>
<td>.13</td>
<td>1.66 (0.53)</td>
</tr>
<tr>
<td>7. Deciding whether to exclude data after looking at the impact of doing so on the results</td>
<td>38.2</td>
<td>1.23</td>
<td>.06</td>
<td>1.61 (0.59)</td>
</tr>
<tr>
<td>8. In a paper, reporting an unexpected finding as having been predicted from the start</td>
<td>27.0</td>
<td>1.45</td>
<td>.00</td>
<td>1.50 (0.60)</td>
</tr>
<tr>
<td>9. In a paper, claiming that results are unaffected by demographic variables (e.g., gender) when one is actually unsure (or knows that they do)</td>
<td>3.0</td>
<td>1.52</td>
<td>.16</td>
<td>1.32 (0.60)</td>
</tr>
<tr>
<td>10. Falsifying data</td>
<td>0.6</td>
<td>2.75</td>
<td>.07</td>
<td>0.16 (0.38)</td>
</tr>
</tbody>
</table>

**Note:** Items are listed in decreasing order of rated defensibility. Respondents who admitted to having engaged in a given behavior were asked to rate whether they thought it was defensible to have done so (0 = no, 1 = possibly, and 2 = yes). Standard deviations are given in parentheses. BTS = Bayesian truth serum. Applying the Bonferroni correction for multiple comparisons, we adjusted the critical alpha level downward to .005 (i.e., .05/10 comparisons).
Fanelli looks at meta-analysis and concludes that the incidence of misconduct (self-reported) is less than 3% while the incidence of QRPs ins up to 76%.
DuBois uses a series of instruments that measure Professional Decision-making in Research (PDR) with various traits.

There is a negative correlation between PDR and:

- Compliance Disengagement
- Moral Disengagement
- Cynicism
- Narcissism
- Social Desirability
Resources
The Lab

http://ori.hhs.gov/thelab
The book may be downloaded as PDF for free on line or purchased and distributed to students

The book may be downloaded as PDF for free on line or purchased and distributed to students

http://www.nap.edu
Other sources

Scientific Integrity
Third Edition
Francis L. Macrina

Responsible Conduct of Research
Second Edition
Adil E. Shamoo David B. Resnik
Websites

- http://grants.nih.gov/training/responsibleconduct.htm
- Ethics CORE: www.nationalethicscenter.org
- Online Ethics Center for engineering and research: www.onlineethics.org
- Resources for Research Ethics Education: research-ethics.net/
- ORI resources: http://ori.hhs.gov/general-resources-0
Conclusions

• Training students on RCR gives them tools to meet professional expectations both within and outside the research enterprise
• RCR/Ethics training needs to be adapted to each field and academic level. The topics need to be meaningful to our students
• Training alone does not guarantee honest behavior but lack of training is potentially an “accident waiting to happen”
Questions?