

Responsible Conduct of Research: BMR 644. Spring 2022



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COURSE OBJECTIVES

Goal: train students in the practice of scientific investigation with integrity.

The responsible conduct of research involves the awareness and application of established professional norms and ethical principles in the performance of all activities related to scientific research.

Definition of Integrity - the quality of being honest and having strong moral principles

MY VIEW: ETHICS IS ACTION

My View: Ethical behavior cannot be taught by lecturing but only by action and interaction. Students effectively learn what is good scientific conduct in the lab by doing research and seeing how other scientists act.



**“Science and everyday life cannot and should not be separated” -
Rosalind Franklin, in a letter to her father, summer 1940.**

This course allows you to interact with a number of excellent scientists to learn how they do science, including dealing with ethical problems.

COURSE ORGANIZATION

BMR 644 is a team-taught, 1 credit hour course.

Classes taught on line. Sessions will be held from 12:00 noon to 1 pm on one day (typically Thursday). If face-to-face classes resume, sessions will be held in Room 102 at the Byrd Biotechnology Science Center (BBSC) on Thursdays.

Attendance is required for all class sessions.

COURSE REQUIREMENTS/GRADES

Completion of the course is required for all BMR graduate students.

No letter grade. Credit/No credit is based upon attendance, completion of reading and writing assignments and class participation.

A STUDENT WHO MISSES MORE THAN TWO SESSIONS SHOULD NOT EXPECT TO PASS THE COURSE

IF YOU GOING TO MISS A CLASS, LET ME KNOW BY EMAIL (PREFERABLY IN ADVANCE)

UNIVERSITY POLICIES IN SYLLABUS

Class Policies

University policies can be viewed at: <http://www.marshall.edu/academic-affairs/forms-policies/>

Academic Dishonesty

Academic dishonesty will not be tolerated. See above link to University policies.

Inclement Weather

The authoritatively correct statement of the University's condition (Huntington) is stipulated to be the message on the main page of the website at: <http://www.marshall.edu/>.

Students with Disabilities Policy

The link describing this policy is <http://www.marshall.edu/disabled>.

University Computing Services Acceptable Use Policy This policy is described in the following document:

<https://www.marshall.edu/board/files/MUBOG-IT-1-IT-Acceptable-Use-proposed-2019-10.pdf>

Required Textbook (distributed as pdf with syllabus):

On Being a Scientist: A Guide to Responsible Conduct in Research: Third Edition (2009), by the Committee on Science, Engineering and Public Policy, National Academy of Sciences, National Academy of Engineering, and Institute of Medicine of the National Academies. (Available free on-line at <https://www.nap.edu/catalog/12192/on-being-a-scientist-a-guide-to-responsible-conduct-in>)

Readings

Individual faculty assign readings. Readings will be emailed before the sessions. These assignments should be completed before class. **YOU SHOULD BE READY TO PARTICIPATE IN DISCUSSIONS OF THE MATERIAL AT EACH CLASS SESSION.**

Required Reading: On Being a Scientist

- Obligations of Researcher
- Advising and **Mentoring**
- The **Treatment of Data**
- Mistakes and Negligence
- **Research Misconduct**
- Responding to Suspected Violations of Professional Standards
- **Human Participants and Animal Subjects** in Research
- Laboratory Safety in Research
- **Sharing of Research Results**
- **Authorship** and the Allocation of Credit
- **Intellectual Property**
- Competing Interests, Commitments, and Values
- The **Researcher in Society**

PARALLELS SPECIFIC GOALS OF COURSE

Understand:

- 1. The Marshall University Policy on Integrity in Scientific Research**
- 2. Research involving human subjects and live vertebrate animals**
- 3. Conflict of interest: personal, professional and financial**
- 4. Peer review**
- 5. Mentor/mentee responsibilities and relationships**
- 6. The scientist as a responsible member of society, ethical issues in research, and the environmental and societal impacts of scientific research**
- 7. Responsible authorship and publication, e.g. copyright issues concerning insertion of published articles as part of dissertation**
- 8. Collaborative research, including that with other scientists and with industry**
- 9. Data acquisition and laboratory tools: management, sharing and ownership**
- 10. Research misconduct and policies for handling misconduct**

LECTURE SCHEDULE: TOPICS FOLLOW GOALS

Overview of responsible conduct of research Dr. Sasha Zill
Scientist as a responsible member of society Dr. Todd Green
Peer review Dr. Gary Rankin
Research on human subjects and live vertebrate animals Dr. Todd Green
Responsible authorship and publication Dr. Maria Serrat
Conflict of interest Dr. Tracy LeGrow
Mentor/mentee relationships Dr. Larry Grover
Collaborative research Dr. Vincent Sollars
Research misconduct and policies Dr. Emine C. Koc
Data acquisition and tools: ownership Dr. Jung Han Kim

Lectures are interesting and informative; useful information provided by excellent and experienced scientists

On-line Resources

The NIH Office of Research Integrity (ORI) has a website with a number of valuable resources. The main web page includes links to **Misconduct Case Summaries, Actions taken by the NIH in Cases of Misconduct, a Newsletter about Research Integrity and Comments on Social Media.**

The link to the ORI main page is <https://ori.hhs.gov/>

<https://ori.hhs.gov/>

The screenshot shows the ORI website interface. At the top, there is a navigation bar with the ORI logo and the text 'THE OFFICE OF RESEARCH INTEGRITY'. Below this is a search bar and a 'Contact Us' link. The main content area features a large banner with the text 'ORI Operating Status' and 'ORI Operations Status during Public Health Emergency (COVID-19)'. To the right of the banner is a large image of a virus particle with a red arrow pointing to it. Below the banner is a section titled 'ORI Updates' with a 'Read More' button and a 'Subscribe' button. On the right side of the page, there is a sidebar with several links: 'Misconduct Case Summaries' (highlighted with a red box), 'Newsletter', 'Follow Us on Twitter', 'PHS Administrative Action Bulletin Board', 'Annual Report System', and 'Social Media' (with links to 'Twitter' and 'ORI Blog').

**Cases:
Post-docs,
Full
Professors,
Adjunct**

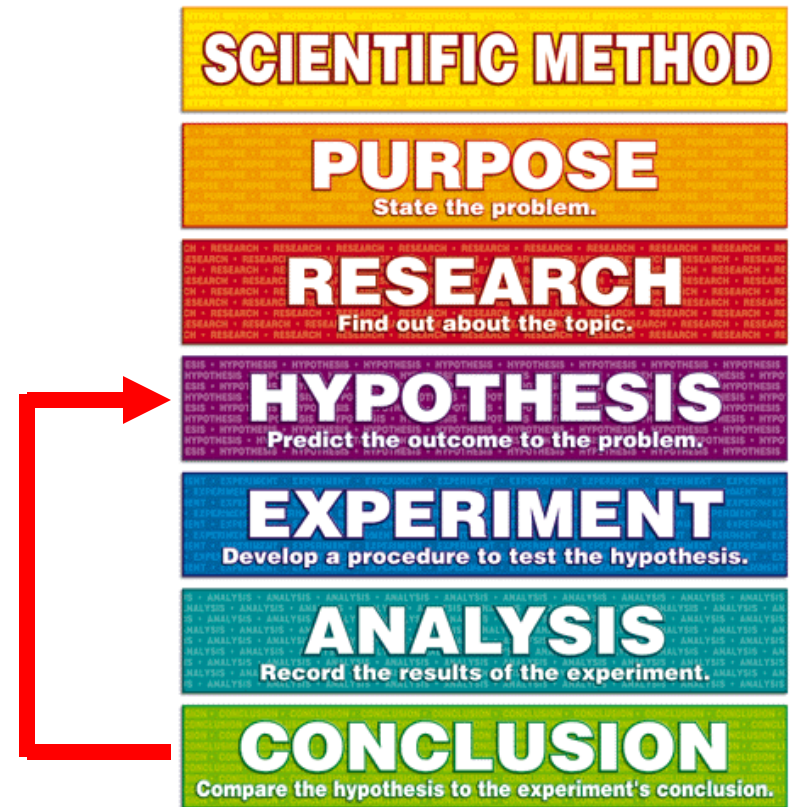
**Many
papers
contain
falsified
data**

Research Misconduct Findings - scientists cited for ethical violations

WHY BE ETHICAL IN SCIENTIFIC RESEARCH?

Very practical reason:

- **Science builds on itself. Your discovery of today forms the basis for your experiments tomorrow.**
- **If your data are inaccurate or your conclusion are false, you jeopardize your future experiments.**
- **If you are ethical and your conclusions are wrong, just do the experiments, say that you were wrong, publish a correction and apply for another grant.**



Accuracy of Data is more important than Correct Interpretation of Data.

ACCURACY IS NOT EASY AS YOUR WORK IS BASED UPON PUBLISHED RESULTS: SHOULD PUBLICATIONS BE TRUSTED?

SCIENTIFIC LITERATURE

Information overload

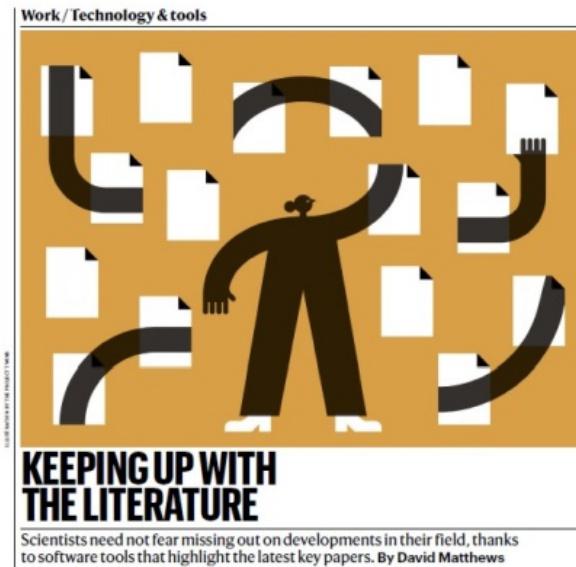
How to manage the research-paper deluge?

Landhuis, E. Nature
535:457, 2016

THE NUMBER OF NEW PUBLICATIONS IS UNMANAGEABLE

- The number of scientific papers published has increased annually by 8-9%
- **In biomedical research, over 1 million new papers are published each year (as of 2016)**
= 2 new publications/minute
- **Updated current estimates approaching 2 million/year.**
- A number of 'scientific' journals (predatory) have appeared that require little editorial or peer review

Matthews D.
Drowning in the literature? These smart software tools can help. Nature. 2021 Sep;597(7874):141-142. doi: 10.1038/d41586-021-02346-4. PMID: 34471270.

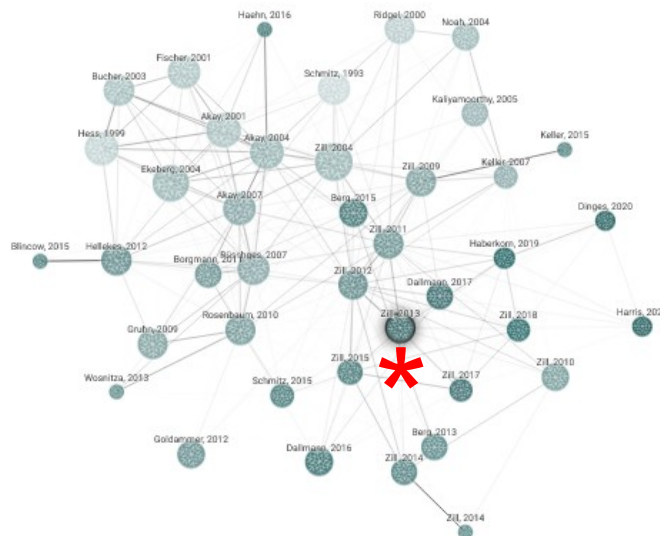


NEW APPROACHES FOR DEALING WITH INFORMATION OVERLOAD

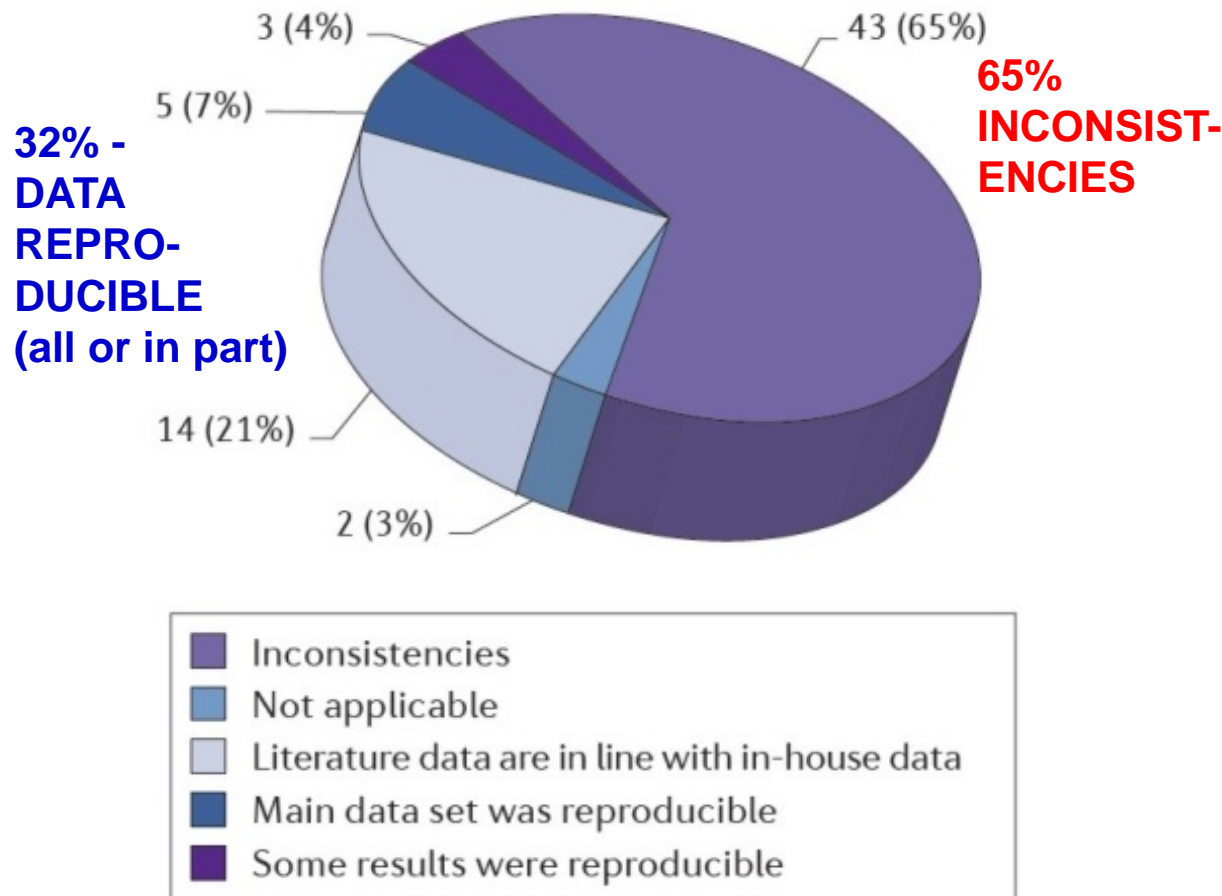
- Scientists have recognized the problem of information overload.
- Developing new software (directed search engines) to identify publications most important to specific field (ex. <https://www.connectdpapers.com/>)

CONNECTEDPAPERS.COM

LITERATURE SEARCH FOR CONNECTED CITATIONS FOR ZILL, ASD, 2013



ACCURACY IS NOT EASY AS YOUR OWN WORK IS BASED UPON THE WORK OF OTHER: CRISIS IN REPRODUCIBILITY OF RESULTS



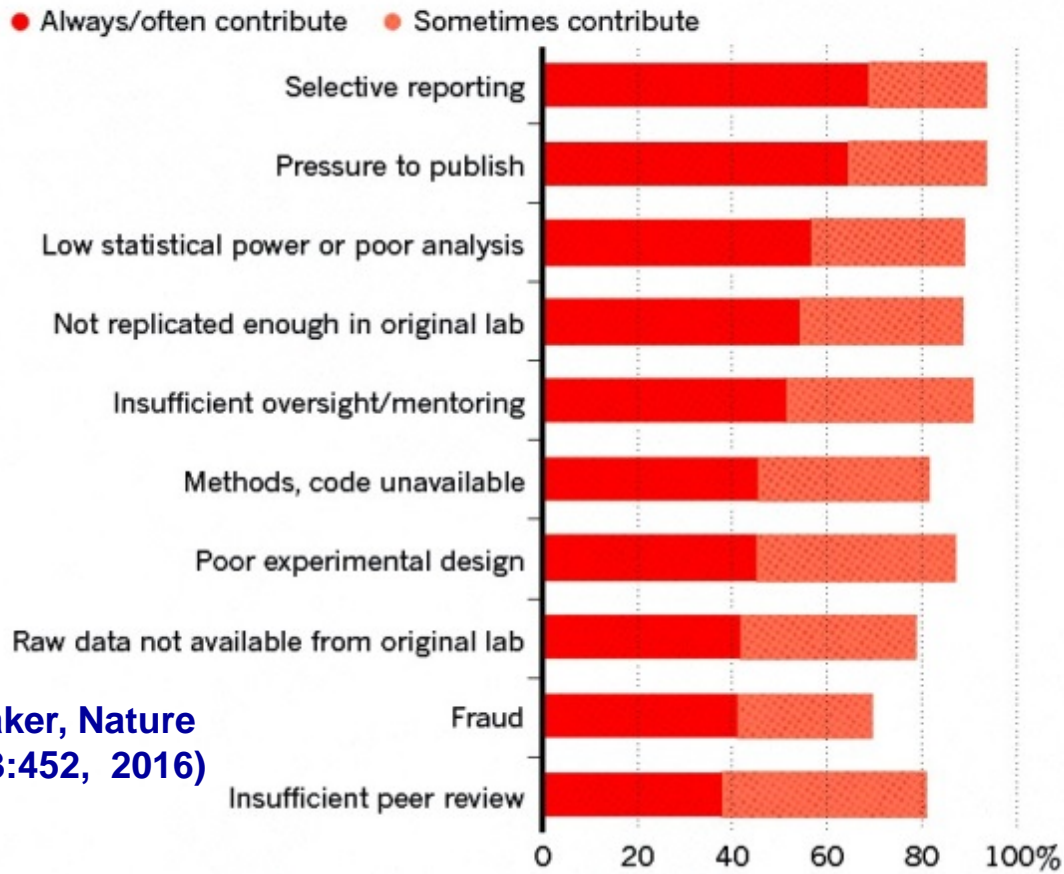
Prinz et al., Nature Rev 2011

1. Few studies examine reproducibility of published results
2. Pharmaceutical companies re-test published findings before commercial development of new drugs for sale and profit.
3. Prinz et al. 2011 - 32% reproducible; Arrowsmith 2011- 18% reproducible
4. Why? Financial incentives of translational research

FACTORS CONTRIBUTING TO CRISIS IN REPRODUCIBILITY OF RESULTS

WHAT FACTORS CONTRIBUTE TO IRREPRODUCIBLE RESEARCH?

Many top-rated factors relate to intense competition and time pressure.



(Baker, Nature
533:452, 2016)

The journal Nature surveyed

1,576 researchers about reproducibility

2 Majority agreed there is a crisis in reproducibility

(52% significant crisis, 38% slight)

3. Factors considered important (always contribute):

- 68% Selective reporting (cherry picking of data)

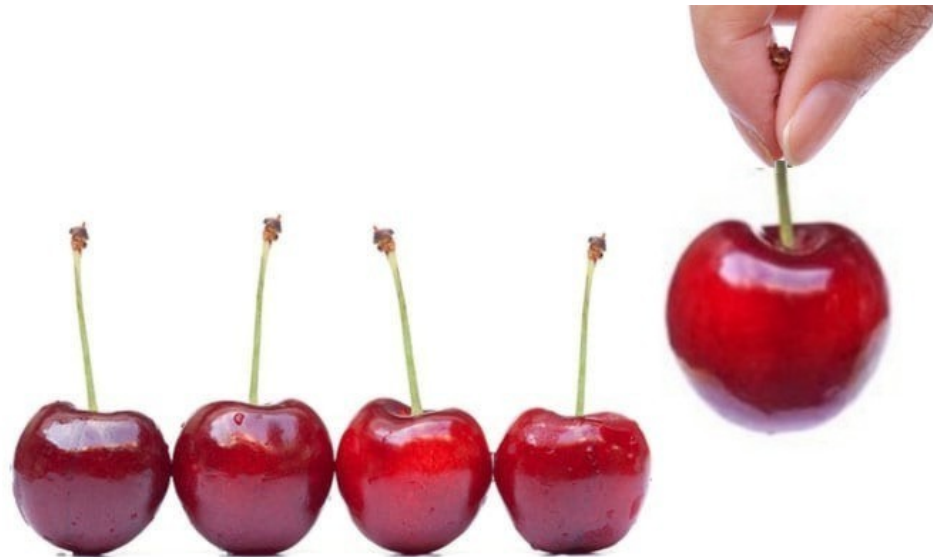
- 64% pressure to publish

- 40% fraud

4. One cause: rise of 'predatory' journals

DATA SELECTION = CHERRY PICKING OF DATA

Cherry picking - selecting limited data to support a hypothesis, while ignoring data that contradict the hypothesis.



Not over-exaggeration: arguably, we are now in an era of Academic Fraud in Biomedical Science

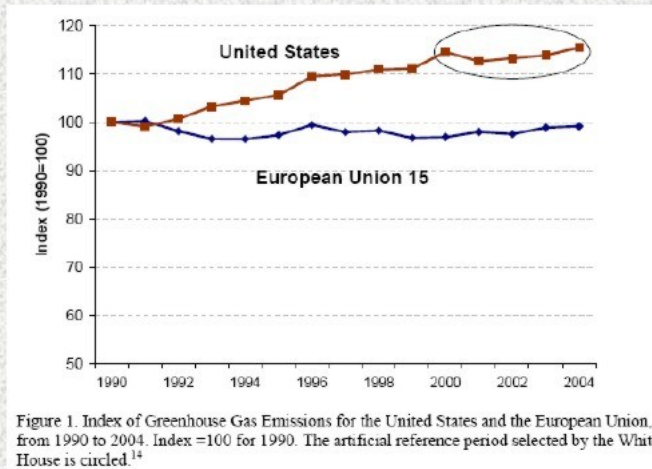
CHERRY PICKING OF DATA ON CLIMATE CHANGE

The Political and Selective Use of Data: Cherry-Picking Climate Information in the White House

- The claim – the United States was doing better than the European Union in reducing greenhouse gas emissions
- The fact:

URL:

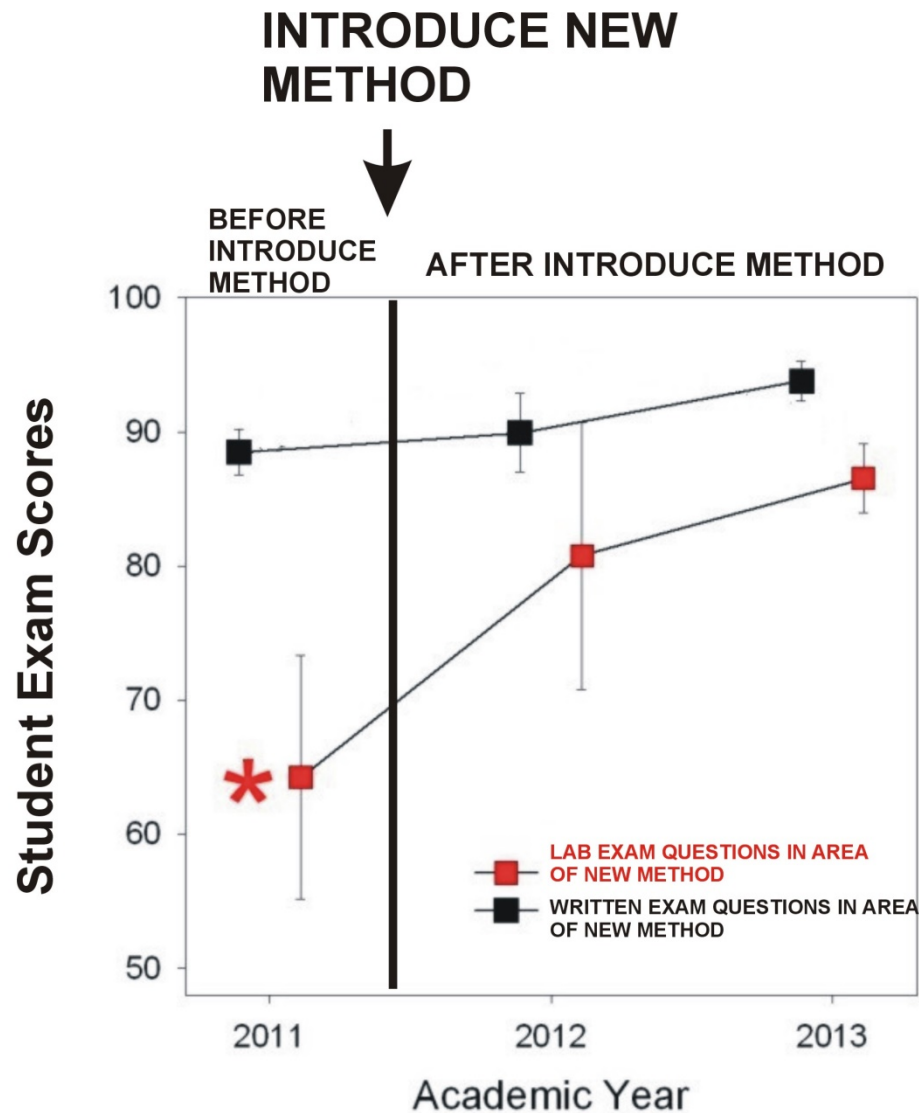
https://globalchange.umich.edu/globalchange1/current/lectures/klings/carbon_cycle/carbon_cycle.html



‘Our emissions performance since 2000 is among the best in the world. According to the International Energy Agency, from 2000-2004, **as our population increased and our economy grew by nearly 10%, U.S. carbon dioxide emissions increased by only 1.7%.** During the same period, **European Union carbon dioxide emissions grew by 5%, with lower economic growth.** – Tony Snow White house press secretary, George W. Bush

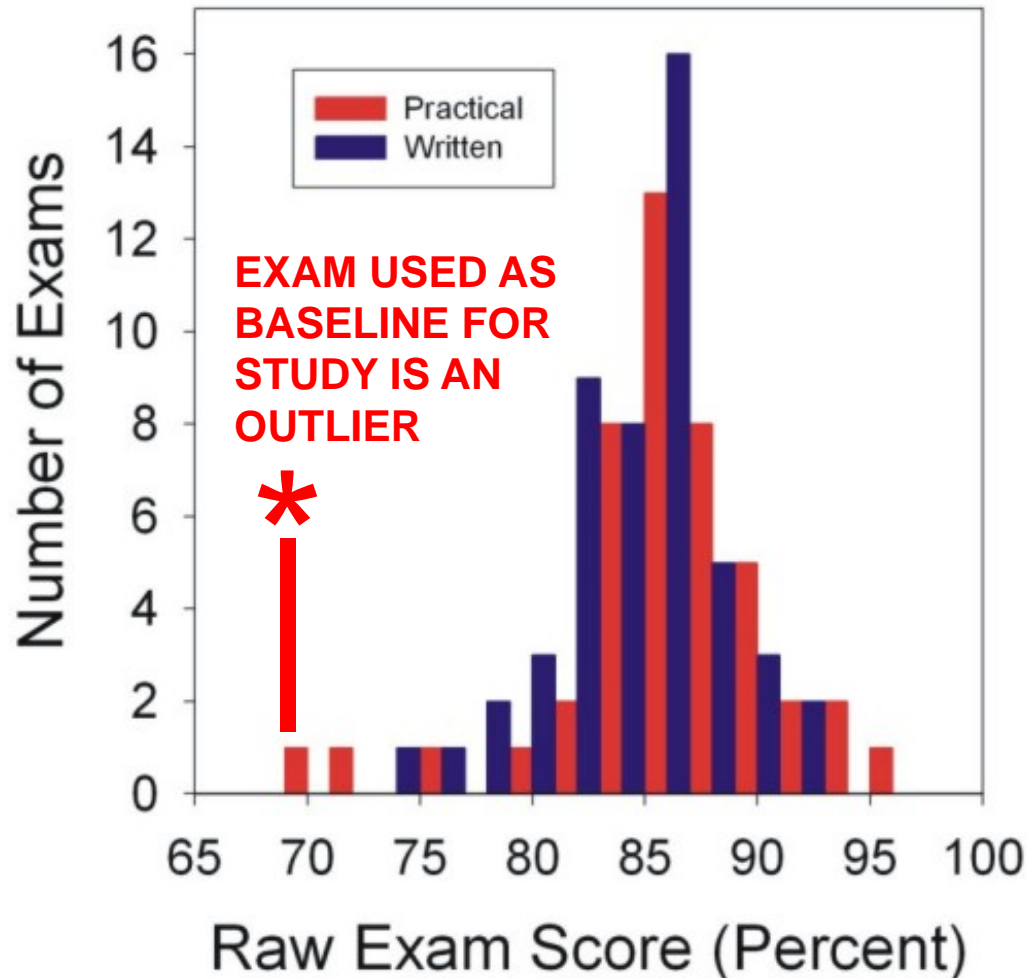
- In the debate on climate change, data were present showing that the net change in Greenhouse gas emissions was lower for the US than for the European union for the period of years 2000-2004.
- Comparison was in **ONLY** those years; index actually measures emissions compared to 1990.
- However, comparison of levels in all years showed large growth in US emissions.

CASE STUDY: METHOD THAT IMPROVES STUDENT PERFORMANCE AND LEARNING



Professor X teaches in a major course that is team taught. Professor Y is colleague of Professor X who also teaches in the same course. Professor Y introduces a new teaching technique into one subject in his part of the course. Professor Y and Professor Maraschino (department head but not part of the course) publish a paper on the teaching technique that states that the **pedagogical method dramatically increased student performance** in examinations on the material. The paper includes this figure to support the conclusion.

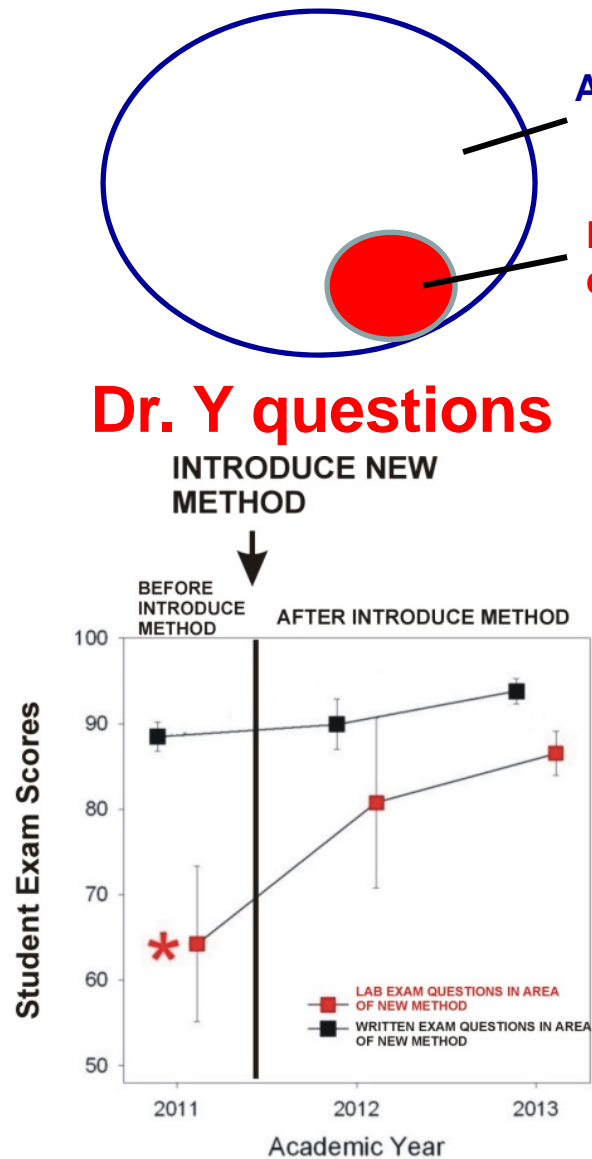
CASE STUDY: METHOD THAT IMPROVE STUDENT PERFORMANCE AND LEARNING



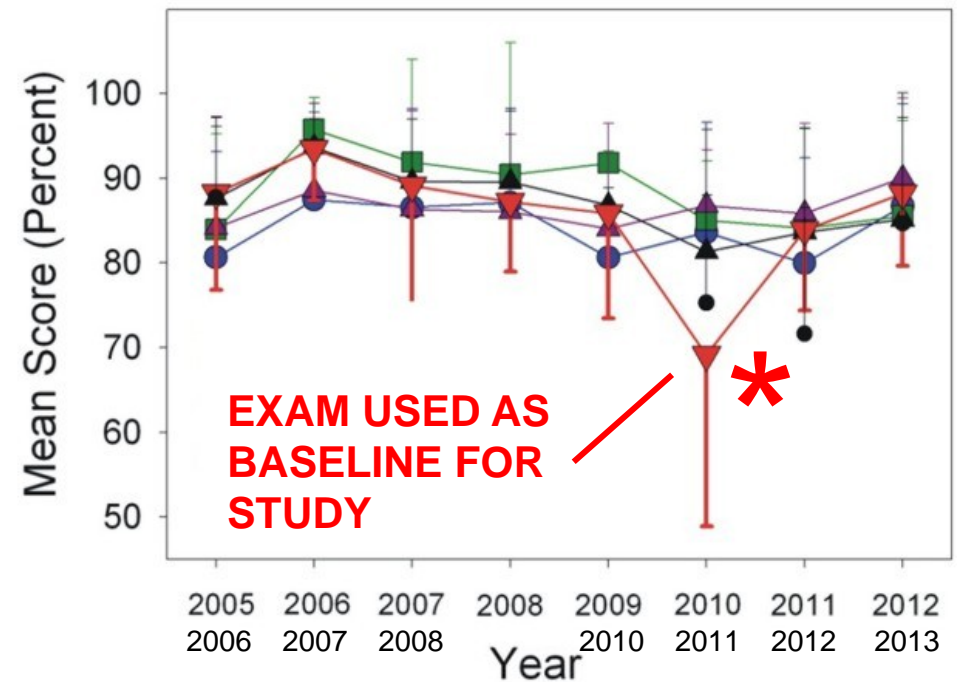
Professor X (who was not shown the paper prior to its publication) is reading the literature and finds the published paper. Professor X does not have the data on the subset of questions cited in the paper. However, Professor X has data on all exam scores over a number of years (plot , left). This shows that the exam chosen as a baseline is an outlier.

He writes Dr. Y and tells him that he has apparently used an outlier exam as the baseline but Professor X is pressured to drop the issue.

DATA ON SUBSET OF QUESTIONS vs DATA ON ALL QUESTIONS



All questions



- Data indicate that change in score was not specific to instructional method
- only variation in overall performance
- Cherry picking: limit data sampled and range of time examined in study

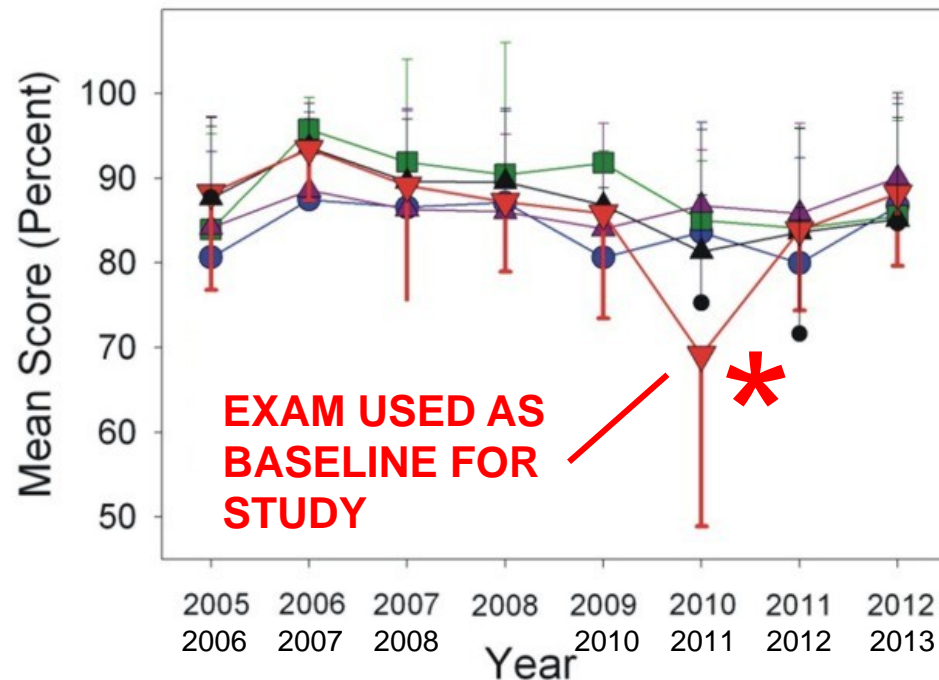
QUESTIONS

What are Dr. X's responsibilities as an educator and scientist?

How might the reviewers have detected the data selection of an outlier score as the baseline for the study?

How might the reviewers of the paper have detected the data selection of an outlier score as the baseline for the study? **Ask for data on all questions as well as those related to instructional method.**

**SCORES ON
ALL QUESTIONS
IN LAB EXAM**



**DATA SELECTION (INADVERTENT OR INTENTIONAL)
CAN BE DIFFICULT TO DETECT.**

QUESTIONS TO ANSWER, SURVEY FORMAT:

**Likert Scale : Score 1-5: Strongly agree 5,
strongly disagree 1**

1- Do Dr. X's data support the idea that Dr. Y's data are flawed and may represent (inadvertent) data selection (cherry picking)?

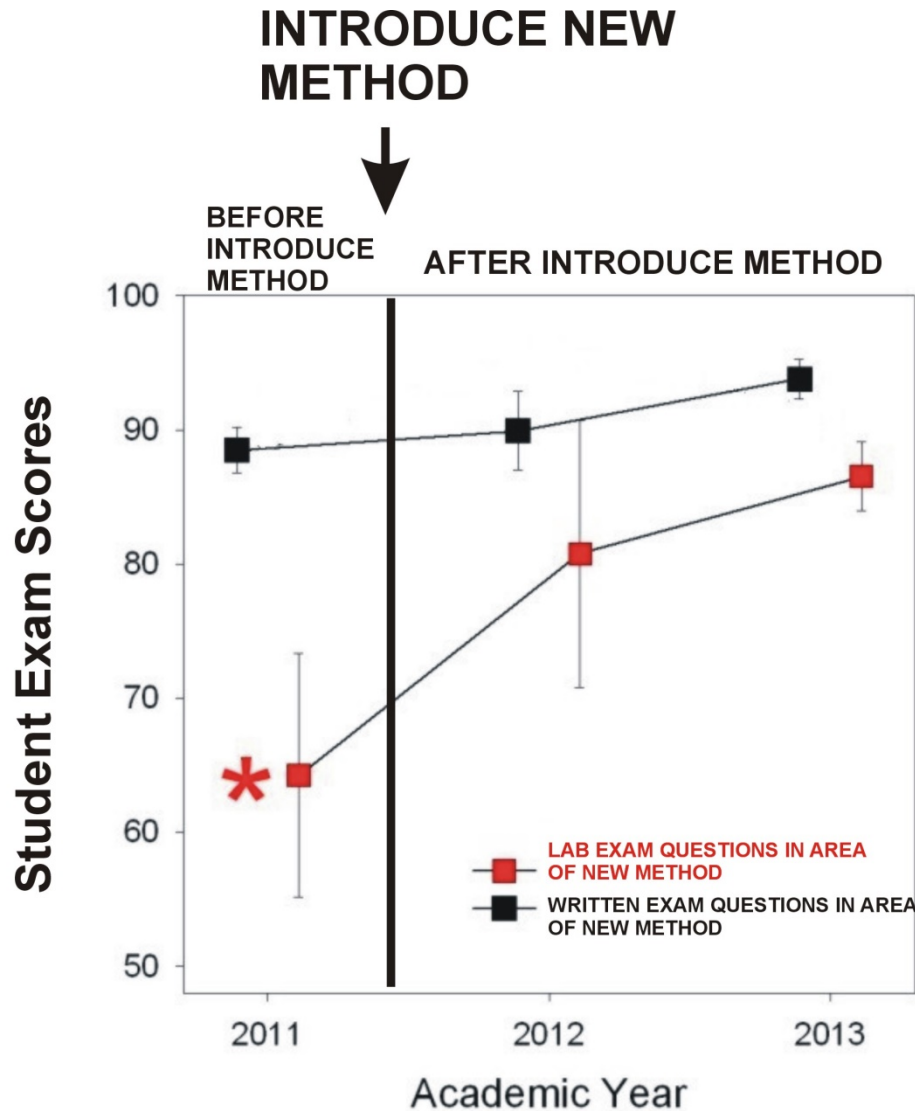
2- Should Dr. Y publish a correction to the paper?

**[Email answers to sensillum@aol.com or](mailto:sensillum@aol.com)
zill@marshall.edu**

**PLEASE CONTACT ME IF YOU HAVE ANY
PROBLEMS WITH THE COURSE OR IF
YOU WILL BE UNABLE TO ATTEND A
SESSION.**

ZILL@MARSHALL.EDU

POSSIBLE ANSWER TO QUESTION: HOW TO DETECT CHERRY PICKED (DISHONEST) DATA?



DATA SELECTION (INADVERTENT OR INTENTIONAL) CAN BE DIFFICULT TO DETECT WITHOUT ACCESS TO PRIMARY DATA;

AS A READER: **LOOK AT ERROR BARS** (IN THIS PLOT BARS INDICATE STANDARD ERRORS). THE STANDARD ERRORS ARE EXTREMELY LARGE FOR LAB EXAMS IN YEARS 2011 AND 2012 (NOT 2013) OR WRITTEN EXAMS (ASK WHY?)

AS A REVIEWER: ASK FOR COMPARISON WITH OTHER YEARS.