HONESTY IN SCIENCE

We live in a world where ethical dilemmas abound, and where people with good lawyers can get away with, well, murder. Even scientists, a group of people once regarded as beyond reproach, are being accused of data fabrication, plagiarism, and the like. This section is intended to be a guide to navigating some of the ethical dilemmas you might encounter in Biology 110 and future Biology courses.

Always check with your instructor to determine whether they have a course policy that is more specific than the guidelines presented here.

Data Fabrication

Students in science classes are sometimes tempted to create or alter their data. The varieties of possible temptations are numerous, ranging from the truly heinously criminal "I didn't have time to do the study, so why not just make up some results?" to the tragic "I wrote my results down on a scrap of paper towel and now I can't find them anywhere and the report's due tomorrow" to the oh-so reasonable sounding "This one data point is way off from the others and I could make a lot more sense out of the results if I just left it out." Is it wrong to succumb to these temptations? Why or why not? How should one deal with these and similar situations?

It is **always** wrong to fabricate data, no matter what the reason. The value of a scientific study depends on the quality of the data that it contains and the care with which the data are interpreted. Making up data makes a study worthless, turning an honest inquiry into an empty exercise.

How then to deal with the situations described above? Obviously, organizing your time so that you can accomplish all the assigned steps is essential. In Bio 110, where investigations are collaborative, it seems unlikely that situation one (running out of time) will even arise, since lab partners will watch over one another's progress. What about situation two (lost data)? To avoid such a crisis, make sure that you always record your data in your lab notebook. If despite these precautions you find yourself in this situation, these solutions, ask your lab instructor for advice.

What about leaving out an outlier? Is it ever okay to leave out a point that doesn't conform to the trend? Well, it <u>is</u> sometimes okay to leave out a point. For example, if you are doing a bacteriological study and you sneeze onto one of the Petri dishes, you can be pretty confident that that dish is going to differ from the non-sneezed-on ones. Throw it out before you even collect the data from it. Explain in your methods that you discarded one plate because it was accidentally contaminated. But what if you had no reason to expect that one of your samples was going to be odd, and then you found that it gave you a weird result? Well, you're stuck with it. Include it, discuss it, speculate about why it was odd, decide to dismiss it if you can make a reasonable case for doing so – **but leave it in your report! Remember that your**

grade does not depend on how "pretty" your data are, but rather on the integrity and the logic, thought, and good sense you apply to their interpretation.

Plagiarism

This term applies broadly to any activity in which a person represents another's work, words, or ideas as their own. The most obvious examples of plagiarism include:

- Taking a sentence or more from a source without putting it in quotes.
- Copying another student's paper (or part of their paper), with or without their permission.
- Submitting work that was written by a paper-writing service.
- Submitting work created, even in part, by using Chat GTP or another AI tool.

But you may not be aware that there are quite a few more varieties of plagiarism, and that these are also unethical. **Plagiarism is considered a very serious breach of academic honesty, and committing plagiarism has serious consequences, so be sure you are thoroughly familiar with its varieties.** Here are some other instances of plagiarism:

1. You take several sentences from a book on invasive species and insert them into a report you are writing, being careful to put them in quotes, and to list the name of the book in your References section. That's okay, isn't it? **NO.** Why not? In college, you are supposed to be learning to do your own thinking. Writing is thinking. Using someone else's ideas, no matter how apt, doesn't demonstrate that you've learned how to do anything but be a parrot. It certainly doesn't demonstrate that you really understand the ideas you're writing about. In most scientific writing, the only time it makes sense to quote a source verbatim is when you want to draw attention to the specific words an author has chosen to use.

2. The Office of Technology Assessment has produced a great reference for your report, Harmful Non-Indigenous Species in the United States. It reads, in part,

> Distinguishing between "good" and "bad" nonindigenous species is not easy. Some species produce both positive and negative consequences, depending on the location and the perceptions of the observers. Purple loosestrife, *Lythrum salicaria*, for example, is an attractive nursery plant but a major wetland weed.

Knowing that you should not quote it word-for-word, you write in your report:

> Telling the difference between "good" and "bad" alien species is difficult. Some species create both beneficial and harmful effects, depending on the place and the viewpoints of the observers. For example, purple loosestrife is a pretty garden plant that is a major weed of wetlands (Office of Technology Assessment, 1993).

Have you solved the problem? No, not in a way that has intellectual integrity. You've demonstrated that you know how to use a thesaurus, but not that you've learned how to

compose original ideas. Paraphrasing such as this, while not technically illegal, doesn't involve thinking. Unless you can express an idea in your own words, neither your instructor nor you can be certain that you understand it. To remove all doubt, digest the information and incorporate it into your paper in your own original way, without using its words or sentence structure. For example, with the above, you might write:

> The effects of alien species often depend on the situation. A species that is considered attractive in a garden may be considered a noxious weed when it occurs in a nature preserve (Office of Technology Assessment, 1993).

Notice that you still need to cite the source of this information, because this information is something you did not know before you read the report.

3. You prompt Chat GPT (or a similar program) to write a paragraph about the different kinds of invasive species, and then paraphrase it for your paper. You do not acknowledge the use of this tool. Here, you have lied about the authorship of the work, and you have squandered the opportunity to learn and develop your own thinking about this topic. Writing is thinking.

4. You can't decide how to interpret your data. Your TA Serena says "It looks to me like there's a negative relationship between the dependent and the independent variables. Look, graph them against each other and see what you see." Well, lo and behold, you see a clear negative relationship. What should you do? In your paper, it is fine to describe this relationship and discuss it. But in the Acknowledgments section, be sure to say "Serena pointed out the relationship between variable x and variable y". If you don't acknowledge Serena's insight, you are committing an act of intellectual dishonesty – you are pretending that her idea was yours. Great scientists don't come up with all their own ideas; honest scientists admit that they don't.

To avoid plagiarizing or paraphrasing accidentally, be careful how you take notes from the sources you read. If while reading the source you write phrases or sentences from the source into your notes, you might reread them later, and think you made them up yourself. If you're copying quotes, put them in quotation marks to remind yourself who the author was (i.e. not you!). Then, when you write your report, read your notes, then close your notebook, and compose from scratch, without having your notes in front of you. Then there will be a much greater chance that the words **and** organization will be your own.

What are the penalties for data fabrication or plagiarism? There are psychic penalties, of course. In addition to those, there are academic penalties, ranging from a reprimand to a failing grade on the assignment or in the course. You will need to appear before the Honor Board to plead your case. The penalties depend on how serious the instructor and the Board judge your offense to be. Because this section on Scientific Honesty is included in your lab manual, which you are expected to have read, little mercy is shown to violators of this policy in Bio 110.

See the Lewis & Clark Academic Integrity Policy (http://college.lclark.edu/student_life/-our-departments-/student-rights-responsibilities/student-code-of-conduct/college-

policies/academic-integrity-policy/) for a description of the policy and how charges that a student has violated it are handled.

In the wider world, published authors are sometimes (rightly) accused of plagiarism, including the use of Chat GTP. Quotes from their books and from their plagiarized sources are printed side-by-side in newspapers. It causes a scandal, brings shame on the guilty author, and has financial repercussions.