

Biology Summer Research Program Concerning Ethics and training for responsible conduct of research.

Our plan for training in ethics and responsible conduct of research will incorporate two primary activities: workshops required of all undergraduate students involved in research at Hope College and in-course discussions of ethical issues within our three biology core courses, taken by all Hope Biology majors.

Workshops

As in years past we will dedicate a 1.5-hour workshop to ethical training. The workshop will be conducted in the summer, during our summer research program, and at the beginning of the fall semester, to provide students conducting research over the academic year the essential training.

The session on training in ethics and responsible conduct of research is designed to be a formal addition to the ethical discussions that faculty mentors have within their own research programs. Using scenarios directly related to the types of research students are doing, students and faculty will be asked to describe what they would do in each situation followed by a general discussion with the faculty of the ethical problems presented and possible solutions. Students will be given written descriptions of the scenarios one week prior to the workshop to allow them to prepare for the discussion. Individual labs will be assigned to lead the discussion for one or more of the scenarios. An example of such scenarios used previously is: Your research supervisor is up for tenure and has just submitted a manuscript that will probably ensure that tenure is awarded. You know, however, that the one of the graphs in the manuscript is based on faulty, if not fraudulent data. What should you do? Consideration of the use and misuse of the scientific evidence for government organization/community policy decisions using examples provided by the research supervisors will also occur at this weekly meeting. In sum the scenarios cover the following topics: data acquisition, management, sharing, and ownership, mentor/trainee responsibilities, publication practices and responsible authorship, peer review, collaborative science, and conflict of interest and commitment.

A second workshop in the summer will include the topic of keeping a research notebook (this will be combined with other topics, like reading the primary literature). Guidance on how to keep a notebook, the importance of doing so, and the legal and ethical implications of the activity will be discussed. Examples will be examined. All students will be furnished with a research notebook from their research advisor. This lab notebook discussion will be incorporated into the fall ethics training workshop in the fall semester.

For assessment, we utilized a questionnaire that had one question concerning the students' perception of ethical conduct in science: SEE NUMBER 6. This will be administered at the end of each summer and academic year to all undergraduate research students.

Statement For each statement, circle the response that most accurately represents your level of agreement with the statement.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1. I have the factual knowledge to be successful at research.	SA	A	N	D	SD
2. I know the experimental techniques I need to know to be successful at research.	SA	A	N	D	SD
3. I know what it means to be a research scientist.	SA	A	N	D	SD
4. I am interested in a career as a research scientist.	SA	A	N	D	SD
5. I have a good understanding of statistical techniques used in biological research.	SA	A	N	D	SD
6. I am well aware of the major ethical issues related to scientific research.	SA	A	N	D	SD
7. Scientific research is primarily something that is done by scientists working alone.	SA	A	N	D	SD
8. I am able to make decisions and recommendations based on research even though there is uncertainty about the data/information.	SA	A	N	D	SD
9. I understand the strengths and limitations of approaching a scientific problem from more than one scientific perspective/discipline.	SA	A	N	D	SD
10. I have a good understanding of my own beliefs about how scientific knowledge is obtained and used.	SA	A	N	D	SD
11. The hardest part about research is learning facts.	SA	A	N	D	SD
12. The hardest part about research is developing good technical skills.	SA	A	N	D	SD
13. The hardest part about research is coming up with ideas for experiments.	SA	A	N	D	SD
14. I am confident in my ability to obtain information by reading the scientific literature (such as journal articles).	SA	A	N	D	SD
15. I am confident in my ability to communicate the results of my research in a written report/paper.	SA	A	N	D	SD
15. I am confident in my ability to prepare and make presentations about research I have performed.	SA	A	N	D	SD

Training within the Curriculum

In addition, Hope College students will receive additional training in our three biology core classes. Which are required for all Biology Majors. In Cells and Genetics (BIO 240) topics of the use of biotechnology, its impact on society and the ethical issues surrounding biotechnology, like stem cell research, will be discussed. In Organismal Biology (BIO 260) ethical issues related to animal use in research will be discussed. In Ecology and Evolutionary Biology (BIO 280) we discuss the ethical implications of anthropogenic environmental degradation in many parts of the course.