WFU takes seriously the responsibility to provide our graduate students the tools by which to navigate and become leaders in the complex and rapidly evolving academic and societal environments of their future. WFU received an NSF award to develop an educational curriculum using the Problem-Based Learning (PBL) approach for ethics and professionalism education for science and engineering graduate students. This project has developed two required courses; Scientific Professionalism: Scientific Integrity and Scientific Professionalism: Bioethics and Social Responsibility which are taken during the first and second year of graduate school. The goal of these courses is to teach students how to identify ethical issues in science and engineering, develop ethical reasoning skills and explicitly learn the norms of science.

Scientific Professionalism: Scientific Integrity focuses on the norms and role obligations within the culture of science. For example the principles for the responsible conduct of science such as data acquisition, management, sharing and ownership, publication practices, and responsible authorship. Scientific Professionalism: Bioethics and Social Responsibility focuses on the interaction of science and the scientific community with society. For example, the entrance of bias into research, limits of scientific authority, conflicts of interest, peer review, human and animal subjects, commercialization and globalization of science, scientific freedom and responsibility, and right of conscience.

The courses use problem-based learning (PBL) an educational method that actively engages students in learning by asking them to solve authentic, "real world" problems. Students are presented with scenarios or cases during two class sessions. In the first session, students are introduced to a real world problem that provides the basis for driving the learning objectives. In between sessions, students have a self-directed learning portion. During the second session the students apply their new knowledge as the scenario continues. This format forces the students to direct their own learning and justifying their individual solutions teaches the skills necessary to solve ethical and social conflicts, rather than just learning the “answer”. In addition the questioning and tasks are shaped to incorporate four types of moral reflection: moral sensitivity, moral reasoning and judgment, moral motivation and commitment, and moral character and competence (Bebeau, Rest, & Narvaez 1999, Rest, Narvaez, Bebeau, & Thoma 1999). Moral Sensitivity is the ability to see things from the perspective of others, as well as legal, institutional, and national concerns. Moral reasoning and judgment involves learning ways to weigh principles, values, and consequences to make a judgment. Moral motivation and commitment emphasizes identifying oneself as a professional. Moral character and competence focuses on personal qualities, such as problem-solving skills and interpersonal interaction abilities.

Bebeau, M. J., J. R. Rest, and D. Narvaez (1999). Beyond the promise: A perspective for research in moral education. Educational Researcher 28(4): 18-26.

Rest, J. R., D. Narvaez, et al. (1999). "A neo-Kohlbergian approach to moral judgement: An overview of Defining Issues Test research." Educational Psychology Review **11**(4): 291-324.

Rest, J.R., D. Narvaez, M. J. Bebeau and Thoma (1999). Postconventional moral thinking: A neo-Kohlbergian approach. Mahwah, NJ:Erlbaum.

GRAD 713, 714 Scientific Professionalism: Scientific Integrity
(2 semesters, 1 credit each semester)

The students will use the Problem-Based Learning (PBL) method to identify discipline-specific and broad professional norms and obligations for the ethical practice of science. Content will include the norms and principles for the responsible conduct of science such as data acquisition, management, sharing and ownership, publication practices, and responsible authorship. Emphasis will be placed on learning the tenets of responsible conduct of research, the current regulatory and legal climate as well as the underlying norms and principles that shaped these concepts. Topics will include the student and advisor relationship, laboratory dynamics, collaborations in science, appropriate handling of data and appropriation of credit, plagiarism, conflicts of interest and financial responsibility. Students will acquire skills to recognize ethical issues in the practice of science, identify role obligations, and develop sound ethical reasoning to address these issues.

GRAD 715, 716 Scientific Professionalism: Bioethics and Social Responsibility
(2 semesters, 1 credit each semester, prerequisite of 1st year course)

New frontiers in science and technology are daily changing the social environment we inhabit. Consequently, the next generation of scientists faces new ethical situations that did not exist a few short years ago. Science's special place in society has immense freedom for discovery that is based on the integrity and social responsibility of science. Students will use the Problem-Based Learning (PBL) method to explore the ethical issues within the scientific profession and implication of science for society. Emphasis will be placed on not only learning the current policy, regulations and legal issues but also the underlying ethical principles, norms, and values at play. Topics will include entrance of bias into research, limits of scientific authority, conflicts of interest, peer review, human and animal subjects, commercialization and globalization of science, scientific freedom and responsibility, and right of conscience. Students will acquire skills to recognize ethical issues in the societal implications of science, identify role obligations for individual scientists and scientific societies, and use sound ethical reasoning to address these issues.

Scientific Professionalism: Scientific Integrity
(2 semesters, 1 credit each semester)

Course Director: Charles Eldridge, Ph.D., Professor of Physiology & Pharmacology

Co-Director: Nancy L. Jones, Ph.D., Adjunct Associate Professor of Public Health Sciences

Recommended Textbooks:

Scientific Integrity: An Introductory Text with Cases (3nd edition), Francis L. Macrina, 2005, Available in the bookstore

Website: On Being A Scientist: Responsible Conduct in Research
http://www.nap.edu/readingroom/books/obas/

Course Time: Second week of the month, 2 hrs M, 2hrs H (dates to be confirmed); 4 times per semester

Room: Small group rooms (to be determined)

Grading:
First year graduate students will be placed into small groups (6-8 students) with faculty facilitators. Each month, a new problem will be discussed during two sessions. A scenario with problems will be introduced in the first session and students will use the problem-based learning method (PBL) to develop collaborative learning objectives. Students will then work independently to develop a case briefing on the learning objectives that will be completed prior to the second session on the case. During the second session the students will discuss their solutions with their small group. Students will be graded on their case briefing, participation during the discussion sessions, development of collaborative learning skills and two commentaries on current events in scientific professionalism.

Attendance is Mandatory. An absence can only be excused by the course director. An example of excusable absence would be a health emergency. With prior approval of the course director(s), a written report on the case studies missed can be used to make up a session.

Objectives:
The goal is to provide framework and overview of scientific professionalism and research integrity. The Community of Science holds to its own cultural norms, specific principles for the ethical practice of science and virtues or character traits to which ethical scientists aspire. The emphasis is on transmitting the core principles and virtues to formalize the expectation of what an *ideal* professional scientist aims for. Topics covered include an introduction to ethics, role obligation of scientists, philosophies of sciences, principles for the practice of science and virtues of scientists. Students will also learn case study analysis using the methodology “Developing a Well Reasoned Response to Moral Problems in Science.” Student will also have overviews and case studies covering the core concepts of responsible conduct of research: data acquisition, management, sharing and ownership, mentor/trainee responsibilities, publication practices, and responsible authorship, peer review, collaborative science, human subjects, research involving animals, research misconduct and conflict of interest and commitment.

Scientific Professionalism: Bioethics and Social Responsibility
(2 semesters, 1 credit each semester)

Course Director: Charles Eldridge, Ph.D., Professor of Physiology & Pharmacology

Co-Director: Nancy L. Jones, Ph.D., Adjunct Associate Professor of Public Health Sciences

Recommended Textbooks:

Scientific Integrity: An Introductory Text with Cases (3nd edition), Francis L. Macrina, 2005, Available in the bookstore

Website: On Being A Scientist: Responsible Conduct in Research
http://www.nap.edu/readingroom/books/obas/

Course Time: Second week of the month, 2 hrs M, 2hrs H (dates to be confirmed); 4 times per semester

Room: Small group rooms (to be determined)

Grading:
Second year graduate students will be placed into small groups (6-8 students) with faculty facilitators. Each month, a new problem will be discussed during two sessions. The problem will be introduced during the first session and students will use the problem-based learning method (PBL) to develop collaborative learning objectives. Students will work independently to develop a case briefing on the learning objectives that will be due by the second session on the case. During the second session the students will discuss their solutions with their small group. Students will be graded on their case briefing, participation during the discussion sessions, development of collaborative learning skills and two commentaries on current events in scientific policy.

Attendance is Mandatory. An absence can only be excused by the course director. An example of excusable absence would be a health emergency. With prior approval of the course director(s), a written report on the case studies missed can be used to make up a session.

Objectives:
The goal is to develop skills in scientific professionalism and social responsibility. New frontiers in science and technology are daily changing the social environment we inhabit. Consequently, the next generation of scientists face new ethical situations that did not exist a few short years ago. The emphasis is to develop skills to recognize the ethical issues within in the societal implications of science, identify role obligations for individual scientists and scientific societies, and use sound ethical reasoning to address these issues. Topics will include entrance of bias into research, limits of scientific authority, conflicts of interest, peer review, human and animal subjects, commercialization and globalization of science, scientific freedom and responsibility, and right of conscience. Students will also learn about how to raise a question of conscience.