BB 317/BI 317: Scientific Theory and Practice, Spring 2007.

Class meetings
MWF 1200-1250, ALS 2018

Instructor information
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Aims of the course
BB 317 / BI 317 is a course designed to help students approach problems scientifically, sharpen their critical thinking and analytical skills, learn the nuts and bolts of how science operates, and guide them to actively planning their careers. It is a WIC class and will have numerous writing opportunities (assignments) during the term. The course aims to prepare students for scientific/technical careers by teaching them
• To think critically and analyze information presented to them
• To communicate information effectively, and
• To design a plan to achieve their career goals.
We will use discussions (in class and *via* an online discussion board) as well as written assignments to accomplish these goals.

Learning Resources
There is no textbook for this course. Materials used in the course will be made available either as handouts, or on the Web at the following URL:

http://www.oregonstate.edu/instruction/bb317/

It is each student's responsibility to check the website for new materials on a regular basis. I may also e-mail the class assigned readings or articles to be used in discussion, so it is your responsibility to check your mail daily. *Only OSU e-mail addresses will be used for this purpose, so be sure to check your onid accounts even if you use other addresses for your personal e-mail.*

I have posted office hours, but please feel free to come by at other times if you need to. I will be happy to talk to you as long as I don't have prior commitments. Or you may e-mail me your questions or request an appointment (my e-mail address is on the first page of this handout).

Course Philosophy and Class format
This course is primarily concerned with the development of some basic skills and capacities that everyone trained in the sciences should possess and with informing students about the practice of science.

The first skill is scientific thinking. Most people, including many who major in the sciences, never learn to think scientifically. Their ideas about the physical world have been uncritically constructed. Most of their ideas have come into their minds without their having thought about it. They unconsciously absorb what the people around them think. They pick up impressions from television or the movies. In studying for classes, they memorize information with little questioning. To become a scientific thinker is to reverse that process by learning to practice skills that enable one to think consciously, carefully and deliberately.

The second skill we will focus on is writing. There are two major reasons for this. First, good writing is inextricably linked to clear and critical thinking. If you cannot reason well, you cannot write well. Second, each discipline has its own vocabulary and conventions for communication. As a person trained in the life sciences, you must be able to use the language of your discipline accurately and in keeping with the educated usage of terms in your field. You must demonstrate knowledge of the conventions of scientific writing. Even if you do not plan to make science your career you must be able to communicate your ideas clearly, logically and in a manner appropriate to the readership or audience.

In addition to developing the two skills mentioned above, BB 317/BI 317 will also help you understand science as an enterprise- what is its place in society, who determines what research gets funded, how does one get money to do research, how are the discoveries of science used in medicine and technology, and last, but not least, what can you, as a person trained in science, do with your training and knowledge?

BB 317/BI 317 is primarily a discussion-based course. The class will focus on practice not on lecture. It will emphasize your figuring out things using your own mind, not memorizing what is in a textbook. I will regularly assign reading that you must complete before coming to class. You may also be required to bring in a short written assignment for the reading. Using the readings and your own analysis of the topic, we will have class discussions on the topic. On some days, we will devote a portion of class time to a short written exercise based on the readings. There will also be longer writing assignments that I will post from time to time on the class website. There are no "fact-testing" exams, but there are several criteria on which student performance in this class will be evaluated (see below).

Grading Policies

Students will be evaluated on the basis of

1. Attendance, preparedness and professionalism (10%)
2. Participation in class and online discussions (quality and extent of contributions to discussions) (25%)
3. Performance on written assignments (50%)
4. Final term paper (15%)

These are discussed in greater detail below.

Attendance, preparedness and professionalism

Since one of the aims of this class is to prepare you for your chosen career, you will be expected to behave in a professional and mature manner at all times. This includes, but is not limited to, being punctual and prepared for class. Being late or failing to do the required background work are not

attributes that lead to success in the workplace or in professional or graduate school. Punctuality, personal responsibility and consideration for other people are qualities that will earn you respect. I will accordingly, emphasize the development of these traits in this class.

While punctuality and general professionalism are easy to assess, preparedness will be evaluated by the nature of your contributions to the discussion and by short assignments which may be assigned in or out of class time. These may vary from summaries of the main points of the reading to answers to questions on the assigned materials. Professionalism is also expected in the written assignments (specific guidelines will be provided).

Participation

One of the aims of the course is to make you an active participant in learning. With this in mind, I will expect a significant amount of instructor-student and student-student interaction *via* discussions - in class and on the online forum. Since you will be graded on both the *extent* and the *quality* of your contributions to the discussions, you will need to practice thinking critically about the topics that we are discussing. I will provide guidelines in class that will help you to critique thinking, so that you can assess your own and others' ideas for accuracy, clarity, relevance, etc. *Thinking that is vague, nebulous, confused, imprecise, sloppy, or indeterminate is what you must learn to avoid*. If you learn nothing else in the class, learn to be clear, precise, definite, specific, concrete, distinct, and exact in what you say and write.

Participation in class discussions and in the online forum will be graded on various criteria. These include plus points for productive contributions demonstrating good scientific/critical thinking skills, (e.g., taking a position on a topic, presenting evidence to support a position, making a relevant response to someone else's remarks, recognizing errors in someone else's or your own reasoning, listening actively, making a connection to another reading or topic previously discussed); and negative points for non-productive or disruptive behavior (such as not answering a direct question, not paying attention, interrupting others, monopolizing discussion time, being rude or disrespectful to another speaker). You are also encouraged to bring to the group's attention other sources that you may find that provide food for thought (articles related to the topic under discussion, for example).

One of the skills that class discussions aim to develop in you is the ability to critically analyze and discuss a topic in a civil and reasonable manner. It is vital that educated people, especially those educated in the sciences, be able to conduct discussions respectfully and without animosity, even on controversial topics. I hope to foster this skill in all of you. *I understand that many of you are not accustomed to speaking up in class and that some students may be nervous about participating*. It is important to get over your fear of speaking in front of others, so I will encourage you all to make an effort. This class is a safe and non-threatening place where you can gradually overcome your hesitancy and learn to enjoy a good discussion. But to help out the terminally shy, I will count contributions to the online discussion in determining your participation. *Please note that contributions to the online forum must meet the same standards for thinking and writing as your written assignments, even if the tone is more informal. So, while humorous responses may be appropriate, sloppy thinking or poor writing are not acceptable.*

Please note that to get the *minimum* participation grade, you will need to make **at least 3 significant postings** per week (equal to one productive contribution per class period). Also,

please note that this means you must participate every week (i.e., you can't make 30 contributions to the online forum in the last week of class and hope to pass). To score *well* on this part of your grade, I encourage you to join in both in class and online.

Assignments

Assignments will be posted on a regular basis. You will be provided with detailed and explicit instructions for each assignment. *All out of class writing assignments must be typed*. One of the expectations of Writing Intensive Classes (WIC) is that students learn to improve their writing skills by revising their work based on feedback from instructors. Assignments will therefore be graded on the quality of the work (e.g., scientific thinking, clarity, accuracy, readability, completeness) and on the way in which the instructor's feedback is incorporated in revised work. You may opt to revise any 2 assignments of your choice during the term for a better grade. *This excludes the final assignment (take home final) which is graded separately (see below).*

Some Notes on Writing Assignments:

If you are to develop as a thinker, you will need to develop as a writer, as well. A key question I will ask in evaluating your written work is "What does your writing demonstrate about your ability to reason?"

I will look for evidence that will indicate that you can think critically and communicate clearly and in ways that are appropriate for a person trained in the life sciences. "Evidence" is something that makes something else "evident" or obvious. The question is "What specifically does your writing make evident?"

For example:

-When you write sentences that can be interpreted in many different ways, you make evident that you are thinking in a vague way.

-When you do not give concrete examples and illustrations to make your point clear, you make evident that you do not know how to clarify your thought.

-When you do not make clear-with appropriate transitional words and critical vocabulary-the logical relations between the sentences you write, you make evident that you do not fully understand the structure of your own reasoning.

-When you do not analyze key concepts and demonstrate how to lay bare the logic of them, you make evident that you are weak at conceptual analysis.

Finally, it is important to remember that good scientific writing requires attention to proper grammar, spelling, punctuation, sentence construction, etc. You cannot be clear, credible or effective in communication if your grammar, punctuation, syntax or spelling are sloppy.

I will give you tips to help you assess your own work and to avoid pitfalls in thought and in writing. I understand that your writing will not be perfect in the beginning, but if you regularly apply these guidelines, your writing and thinking will improve as you go along.

Due dates for assignments and policy on deadlines

• When an assignment is posted, the due date will be clearly indicated.
• To allow for periods during the term when demands on you may be particularly heavy, you may request to delay by *2 school days* up to 2 regularly assigned deadlines during the quarter. These requests must be negotiated no later than two days *before* an assignment is due.
• No other excused delays are permitted for any reason short of a documented hospitalization of the student. *Assignments that are turned in late without prior permission will lose 10% of the points for the assignment for each day that they are late.*

Final term paper

Instead of a final exam you will have a take home paper to write. I will post the instructions for the final paper in the 4th or 5th week of classes. You may consult with me anytime thereafter about the paper till the week before it is due. I will gladly look over drafts of any of the sections of this paper and give you feedback, subject to the following conditions:

• You allow at least one week for me to provide you with feedback.
• You do not bring me your completed paper at the end of the term and ask me to critique the entire paper.

Grading Policies

The class will not be graded on a curve. It is theoretically possible for the whole class to get an A or an F. No letter grades will be given before the final grade, although *you may discuss your standing with me at any time during the term*. You should focus on improving your performance, increasing your strengths and diminishing your weaknesses, not on looking for a grade. I am providing at the website an explanation of the criteria used in assigning letter grades. Please read these carefully, and make sure that you understand them. You should use these criteria to monitor your own work during the term.

General OSU and Departmental Policies

Disabilities/ Special Accommodations

"Students with documented disabilities who may need accommodations, who have any emergency medical information the instructor should know, or who need special arrangements in the event of evacuation, should make an appointment with the instructor as early as possible, no later that the first week of the term. In order to arrange alternative testing, the student should make the request at least one week in advance of the test. Students seeking accommodations should be registered with the Office of Services for Students with Disabilities."

Student Conduct

The Department of Biochemistry/Biophysics and the Biology Program follow the university policies on student conduct. These can be found at http://oregonstate.edu/admin/stucon/regs.htm.

Cheating or plagiarism by students is subject to the disciplinary process outlined in the Student Conduct Regulations. Students are expected to be honest and ethical in their academic work. Academic dishonesty is defined as an intentional act of deception in one of the following areas:

* cheating- use or attempted use of unauthorized materials, information or study aids

* fabrication- falsification or invention of any information
* assisting- helping another commit an act of academic dishonesty
* tampering- altering or interfering with evaluation instruments and documents
* plagiarism- representing the words or ideas of another person as one's own

Behaviors disruptive to the learning environment will not be tolerated and will be referred to the Office of Student Conduct for disciplinary action.

"The goal of Oregon State University is to provide students with the knowledge, skill and wisdom they need to contribute to society. Our rules are formulated to guarantee each student's freedom to learn and to protect the fundamental rights of others. People must treat each other with dignity and respect in order for scholarship to thrive. Behaviors that are disruptive to teaching and learning will not be tolerated, and will be referred to the Student Conduct Program for disciplinary action. Behaviors that create a hostile, offensive or intimidating environment based on gender, race, ethnicity, color, religion, age, disability, marital status or sexual orientation will be referred to the Affirmative Action Office.

Schedule

The schedule we will use is flexible and will be driven by student interest. If a topic is especially stimulating and thought provoking we will spend more time on it. Below is the provisional schedule of topics.

Week 1 - Background, The Investigative Approach/ The Nature of Science
Week 2 - Finding information and assessing sources. Asking questions, formulating hypotheses
Week 3 - Designing and performing experiments/interpreting results
Week 4 - Reading a Scientific Paper
Week 5 - Scientific Communication I
Week 6 - Scientific Communication II
Week 7 - Funding of Science/ Writing Research Proposals
Week 8 - Ethics/Law/Standards/Practices
Week 9 - Career Options (How can I use my scientific training?)
Week 10 - Planning a Career

Student Understanding Form

Name:_____

I have carefully read the syllabus and understand:

1. That the work for this course requires consistent classroom attendance, active participation, regular preparation and professionalism.

2. That the class will focus on discussion and writing and not on lectures. I understand that there will be assigned readings that I am responsible for completing before coming to class.

3. That there are intellectual standards for this course and that I am responsible for monitoring my own learning based on these standards.

4. That there will be written assignments and that these will be graded based on the quality of the thinking as well as on the quality of the writing.

5. That I may postpone by 2 school days the due date for up to 2 assignments, provided that I make a request to this effect at least 2 days before the assignment is due.

6. That I may request to redo up to 2 assignments in the term for a re-grade. I understand that the instructor will provide a new assignment(s) for this purpose. I also understand that the due dates for these will be set by the instructor and are subject to the same late penalties as regular assignments.

7. That there will be no fact-testing exams.

8. That there is a take home final which will be due during finals week on a date that will be indicated when the final is made available.

9. That I may discuss my standing in the class with the instructor at any time if I feel unsure of my grade.

10. The criteria on which my grade in the class will be based.

Signed:_____

Date: