

Syllabus for Research Methods (Biology 304)

Pacific University, Spring 2010

Professor Stacey Halpern

2:15 – 5:15 Mondays, Strain 220

Welcome to Research Methods! This course is dedicated to *doing* science, which requires learning how to use the scientific method to answer questions. This process is essential for advancing our understanding of biology; thus, these skills are among the most important ones you'll learn as a biology student. Luckily, doing science is also one of the most exciting parts of life as a biologist because it allows you to answer *your* scientific questions. The skills involved in doing science include careful observation, logical and critical thinking, thoughtful analysis and interpretation, and clear presentation. These skills will help you as both a citizen and a biologist.

This course is a workshop that will not run as a typical lecture course. Instead, occasional short lectures will be interspersed among activities that require you to prepare, think, and actively participate. I've designed the course this way because the only way to learn how to do science is to simply do it, repeatedly. For you and the class to succeed, you must come to each class, you must come prepared to participate, and you must work responsibly with your classmates. Please read more about class expectations on the next page.

Catalog course description

This course utilizes a hands-on, application-oriented approach to enhance student understanding of: framing scientific questions based on primary scientific literature; designing appropriate experiments; analyzing data statistically and graphically; writing technical reports; and presenting seminars. Course culminates in a student proposed, designed, and conducted independent research project. (3 credits)

Goals for the course

We have designed this course to help each student achieve three goals. Use these goals to check your learning periodically during the course. At the end of the course, you'll write a short reflection about how well you achieved these course goals.

By the end of this course, students will be able to:

1. Use the scientific method to answer a biological question in an unfamiliar system.
2. Professionally present the results of a scientific study orally and in writing.
3. Design and carry out an independent biological study from start to finish.

How to reach me

I enjoy talking with students and learn a lot from your questions, insights, and ideas. Please visit!

- Office location: **Strain 209**
- Office hours: **M & F 10:30 – 11:30 am, Th 10 – 11 am, and by appointment**. I encourage you to make an appointment or e-mail questions if my office hours don't work for you.
- e-mail: **shalpern@pacificu.edu**. This is the most reliable way to reach me.
- Mail: I have a mailbox in the division office, **Strain 102**.
- Telephone: **503-352-3109** (extension 3109 on campus).

How I will reach you

I will use your Pacific e-mail address to send out occasional but important course information, so you should check this account regularly or arrange to have messages forwarded to an account you use.

Texts & Required Readings

McKillup, M. *Statistics Explained*.

This book provides very useful background on principles of experimental design. It also walks you through the assumptions and calculations for some common statistical tests. It's very clearly written, and can be a reference for you in the future as well.

Pechenik, Jan A. *A Short Guide to Writing About Biology*, 6th or 7th ed. required

This book is very helpful guide to reading, writing, and thinking in biology. You will use it heavily when preparing your written and oral reports. It's a great reference for all your biology courses, and will be required for capstone.

Journal articles. *Available through Blackboard or handed out in class*

We will read papers from the primary literature related to our research projects. Usually, these papers will be available via Blackboard. You will also need to locate literature related to your independent research project.

My expectations for students

- I expect students to work responsibly in your research teams. This means that you will contribute time and intellectual effort to developing and completing the project. Working responsibly with classmates may involve meeting in between classes to complete assignments. I expect you to prioritize scheduling these meetings, attend them, and work well with your colleagues to make them productive and efficient. I expect you to divide work equitably among group members and complete assigned tasks by the deadlines agreed upon in the group. Finally, I expect that all group members will treat each other with respect, and will communicate responsibly (for example, notifying others if they are ill and cannot make a meeting).
- For each class, I expect you to come prepared; to participate cheerfully in activities; and to act in a respectful, professional, and responsible manner. In turn, you can expect the same from me. Preparation includes completing assignments ahead of time, and having a calculator and either a flash drive or laptop computer with you in every class.
- I assume that all students enrolled in this class are adults who take responsibility for their education. I will work hard to facilitate your learning, but ultimately only you can actually learn the material through focused time and effort. As a reminder, Pacific guidelines state that students should put in 2-3 hours outside of class for every credit; that means working at least 6-9 hours/week on this course outside of class time to pass.
- I also assume that all students in this course are interested in the topic, at the very least because they are biology majors. I will strive to encourage your enthusiasm for biology and scientific research.
- I expect you to arrive to class on time, and to leave class only during regular breaks. Our time is valuable, and I will start promptly.
- If you know you will miss class (e.g., for an approved, scheduled event), please let me know ahead of time. College notices are not sufficient—you must discuss these absences with me before hand. **It is extremely difficult to make up material missed in this class because so much is hands-on.**
- As part of respectful behavior in class, please be certain to turn off all cell phones during class. It is disrespectful to me and other students when cell phones go off in class, or when students text in class! Also, do not leave class to answer a cell phone call. If you have a valid reason to have your cell phone on—e.g., a family emergency—please let me know.

Please review these expectations carefully, and sign the form at the end of the syllabus.

Assessment of learning and grades

I will assess your learning in this course based on performance on individual assignments. You also will be evaluated on participation and your contributions to group projects (see handout).

Assessments: Total of 450 points for the course

- **Class research projects (190 pts)**

For each class investigation, you will write a proposal (20 points) and a final report (30-40 points).

For investigation 2, you and your partner will also give a 10-minute oral presentation (20 points)

- Investigation #1: Lily pollen germination (50 points)
- Investigation #2: Yeast population growth (80 points)
- Investigation #3: Taxis in brine shrimp (60 points)

- **Independent research project (170 points)**

The culmination of this course is an independent project that you will design and carry out.

- Written proposal: 40 points
- Final paper: 100 points
- Oral presentation of final project: 30 points

- **Class workshop assignments (50 points)**

Five class periods will be workshops on experimental design, data analysis, and interpretation.

Workshop assignments will be completed in class. Grading will be on accuracy and thoroughness of your work, as well as your active participation during the workshop periods. Each workshop assignment is worth 10 points.

- **Biology and Senior Projects Day Seminars (15 points)**

For this class, you must attend at least three biology seminars or senior capstone seminars. The last page of the syllabus has more information on seminar dates and what to hand in for each seminar.

- **Team work and Participation (25 points)**

Team work involves pulling your weight (with a good attitude) on tasks associated with each investigation. You may complete peer evaluations to provide additional information on team work.

Good participation involves:

- having a positive attitude about class activities, and actively engaging with them
- coming to class prepared with all required equipment and completed assignments
- contributing meaningfully to class discussions
- being a good listener and allowing space for others to speak in class discussions
- behaving responsibly, professionally, and safely during experiments
- attending class and arriving on time

Policies on assignments:

Assignments are due at the time noted in the syllabus or on the assignment handout. Some assignments must be submitted via e-mail for this course. They must be sent by the time deadline associated with the due date. I will accept late assignments with an automatic penalty of 10% per day (24 hour period, weekends count).

I will not accept assignments more than three days late without prior approval. Drafts for peer review may not be submitted late. Some other assignments may not be accepted late—I will note such exceptions on the handout for the assignment. Written or printed

assignments must be turned in at the beginning of class; if you are 1 – 5 minutes late to class, the

assignment will be considered tardy and will receive a 3% penalty. If you are more than 5 minutes late, the assignment will be considered late and will receive the full late penalty.

Obviously I can make accommodations for extraordinary situations (e.g., hospitalization, family emergency, etc.). Please let me know about emergencies in a reasonable time frame; college policy usually requires you to document these circumstances with the Dean of Students. If you have a planned, approved absence (e.g., off-campus athletic competition, performance, interview, etc.), you must let me know ahead of time. E-mail notifications from coaches, advisors, etc. are insufficient—you must communicate with me directly about these absences, and make mutually agreeable arrangements about turning in assignments.

Grades Final grades will be assigned based on the percentage of the total points you earn on individual and group work (after adjustment for peer evaluation), following this breakdown:

Final grade	Percentage	Final grade	Percentage	Final grade	Percentage
A	93% and higher	B-	80-82%	D+	67-69%
A-	90-92%	C+	77-79%	D	63-66%
B+	87-89%	C	73-76%	D-	60-62%
B	83-86%	C-	70-72%	F	less than 60%

Academic Honesty

I take academic honesty very seriously, and I expect you to as well. Academic misconduct is a betrayal of the trust that I have in students, which harms the learning environment for everyone. Most often, the academic misconduct cases I see are examples of unintentional plagiarism. Lack of intent does not excuse plagiarism, and I will penalize these cases. Please prepare written assignments carefully, and make sure you are familiar with the different kinds of plagiarism so that you avoid unintentional misconduct.

Briefly, I expect students to know and adhere to the university's "Code of Academic Conduct" policies; please carefully read them in the College of Arts and Sciences catalog. For this course, following the code includes proper attribution of ideas and information in written assignments and completing all individual work on your own. Academic honesty does not preclude discussing ideas with other students, working with others on problems, or providing each other feedback on written assignments **as long as the text, ideas, and problem solutions you turn in are in your own words.**

I have a zero-tolerance policy for academic misconduct, including plagiarism and cheating. It is university policy that all acts of misconduct be reported to the Dean's Office. Sanctions for documented cases of misconduct range from a zero on the assignment to failing the course or suspension or dismissal from the university. Please talk to me before you turn in assignments if you have a question about what constitutes dishonesty.

As a reminder, here are *some* examples of academic dishonesty and plagiarism:

- Writing text with someone else and then turning it in as your individual work;
- Cutting and pasting phrases or sentences from textbooks, articles, or websites without proper citation;

- Changing one or two words in a sentence from another source, or changing the order of phrases in a sentence (this is called mosaic or paraphrase plagiarism);
- Fabricating data;
- Self-plagiarism—i.e., re-using an assignment from another class without approval;
- Turning in some one else's work as your own;
- Presenting someone's ideas without giving them credit, so that it appears the ideas are your own.

College resources

There are many free services available at Pacific to help you succeed in your courses. I encourage you to take advantage of them! I can help connect you with these resources, including academic and non-academic support services. Some of these services are listed below.

Writing Resource Center The WRC provides a friendly, non-judgmental environment where students can receive free one-on-one help with their written assignments. In a writing session with one of our consultants, students may discuss their papers at any point in the writing process from brainstorming ideas or clarifying the points within their essays to finding strategies for improving organization, grammar, and punctuation. <http://pacificu.edu/wrc/index.cfm>, consultants available Sun-Thurs 12-3 p.m., 7-10 p.m. in UC 104

Student Counseling Center The counseling center offers individual counseling, crisis services, referrals, and workshops. They also have information on-line or in their office about issues such as stress management and sleep. 503-352-2191, Mon-Fri 9 a.m. – 5 p.m., <http://www.pacificu.edu/studentlife/counselingcenter/>

Reasonable accommodations for students with disabilities

It is the responsibility of student with disabilities to contact and work with the office of Learning Support Services (LSS). Students who wish to document needs should contact Edna K. Gehring, Director of Learning Support Services, at extension 2107 or gehringe@pacificu.edu. She will meet with such students, review the documentation of their disabilities, and discuss the services Pacific offers and any required ADA accommodations for specific courses. After LSS is satisfied with the documentation of a disability, the student must contact me and discuss the plans for accommodating special needs. To receive accommodation, you must make arrangements with me at least 1 week prior to the due date or exam. For more information contact Edna Gehring at gehringe@pacificu.edu or call extension 2107.

Topics, Readings, & Assignments

The schedule below summarizes readings and major assignments for the course. It is subject to change as the course unfolds. You will also read papers of your choice associated with each research project.

Week	Topic/Activities	Assignments due	Reading assignments
1 Feb 1	The Scientific Method <ul style="list-style-type: none"> • Case study • Data collection 		McKillup: Ch 1 & 2
2 Feb 8	Study 1a: Lily pollen germination Graphing & descriptive data analysis How to write a proposal	Publication quality graph due at end of class	Pechenik: Ch 5, p. 167-191, Ch. 10 McKillup: Ch. 3, 4, 6
3 Feb 15	Data analysis 1 <ul style="list-style-type: none"> • General principles • Chi Square test Avoiding plagiarism	Proposal 1	Pechenik: Ch. 3 McKillup: Ch. 5, 8, 17.1-17.4
4 Feb 22	Study 1b: Lily pollen germination How to write a results section Case study: non-statistical data analysis		Pechenik: p. 166-167, 191-199
5 Mar 1	Study 2a: Yeast population growth	Study 1 write-up	
6 Mar 8	Data analysis 2 <ul style="list-style-type: none"> • differences between groups • correlation analysis How to write a discussion How to give a presentation	Proposal 2	Pechenik: Ch. 6, p. 199-206. Ch. 14 McKillup: Ch 7, 14, 16, 18
7 Mar 15	Study 2b: Yeast population growth Introduce independent project		
Spring break!			
8 Mar 29	Study 3a: Taxis in brine shrimp larvae	Study 2 write-up Independent project topic & organism(s)	
9 Apr 5	Oral presentations of study 2 Data analysis 3 <ul style="list-style-type: none"> • Selecting a test Finding & evaluating information in biology	Oral presentation, study 2 Proposal 3 Paper for independent project (at end of class)	Pechenik: Chapter 2
10 Apr 12	Study 3b: Taxis in brine shrimp larvae	Supply list for independent project	
11 Apr 19	Meet with faculty to set up independent projects	Proposal 4: Independent project	
12 Apr 26	Independent projects	Study 3 write-up	
13 May 3	Independent projects	Status report on independent project	
14 May 10	Independent projects—data analysis workshop in class	Data from independent project, entered	Pechenik: Ch. 9
15 May 18	Oral presentations of final project during finals period (8:30 am)	Final paper Final oral presentation	

Biology Seminars, Spring 2010

You must attend 3 biology seminars or senior capstone presentations this semester. To receive credit (5 points each) for a seminar or a biology senior capstone talk:

1. Attend the seminar and sign in, so that I know you were there.
2. Either ask the researcher a question at the end of their seminar *or* submit a biologically meaningful question about the seminar via e-mail by the following Monday at noon.

Currently, there is one biology seminar scheduled:

Dr. Steven Austad, February 11, 5 pm, Taylor Auditorium, Marsh Hall.

On April 28th, 30 biology seniors will present their senior capstone talks. A schedule will be available closer to the date.

Please sign the section below, cut it off, and turn it in to me by Feb. 9th.

I have read the syllabus completely and understand course requirements. I understand the requirements for participation and commit to doing my best to meet them. I also understand the course policies, including those regarding academic honesty and group work.

Name: _____ Date: _____