Hi everyone! Let’s get started.

I am Dr. Williams, and you have found Section F of Bio 93. I’m going to talk about the format and philosophy of this course, and then we’ll start a bit of biology. Ready?
Surveys and Research

Turn in surveys...

Biology education research occurs in all Bio 93 classes. If you do not want your data included, or are under 18 on Dec. 5, send an email requesting to be removed from the study:

Dr. Lei Sun leis1@uci.edu

Your instructor will not know who has opted out, and your grade will not be affected. More info is posted under “Research” on the class website.

If you still have a copy of the survey, I’m going to pass out some envelopes and you can stick it inside and pass it on. Here you go.

Because you are at a research university, you will often be asked to participate in a research study. It’s important for you to know that surveys are always optional, and whether or not you participate will never affect your final grade.

All of the Bio 93 classes are often part of different research projects. If you are under 18 still on December 5th, or do not wish to have your class data added to the research, please contact the researcher listed here. No instructor will know if you have opted out, and it will never affect your grades.
I am a lecturer and a researcher here at UCI, and my main work is in biology education research. I started my undergrad as a premed major at UC Davis, but decided I wanted to focus on biology itself, so I got a degree in Zoology. I went to Fresno State for a Masters, and then came here to UCI for a PhD in comparative animal physiology. My office is on the first floor of NatSci 1, and email is the best way to reach me.

We have three undergraduate tutors associated with this course, and they will be working closely with me in lecture, discussion, and in their own office hours. I’m going to have each one stand up and introduce themselves. Jocelyn? Jared? Bryan?

Thank you!

Your Instructors
Instructor: Dr. Williams
- Lecturer and biology education researcher
- UC Davis, Fresno State, UC Irvine
- Office: 1204 NatSci 1
- adriw@uci.edu

Undergraduate Tutors: eee.uci.edu/programs/biotutor
- Jocelyn Argueta 3rd year Mol Bio / Biochem
- Jared Su 2nd year Bio Sci
- Bryan Xie 3rd year Mol Bio / Biochem
As you saw in the basics video before class, the format for this course consists of the following:

1. Learning from the basics video
2. Taking an online basics quiz
3. Using class time for practice and deeper learning
4. Discussing concepts online
You might be thinking that this doesn’t seem like how most college classes are organized, where you come to class, take notes, and then study afterwards.

But I’ve watched students take Bio 93 for about eight years now, and this is what tends to happen in a regular lecture class. If we graph the day of class on this axis, and the amount of studying on this axis, a traditional lecture student does this. They come the first few days after doing all the reading, and they take notes in class, and then they rewrite all their notes afterwards and make flash cards. But that begins to decline as all your other classes make demands, and so pretty soon students don’t really do any studying until an exam. Then week five hits, and your weekend is completely shot. No studying again until finals week, and then bam, cram city.

To counter this, our class will require a small amount of work every day of lecture. Because you will be studying throughout the week, you will always be caught up. We’ll have exams, but you won’t have to cram.
My main work here at UC Irvine is in biology education research. So I’d like to show you what the research says about teaching.

In this experiment, an introductory biology class at the University of Washington was taught in either a low structure way, with just lectures, in a medium structure way, with clickers and practice exams added, or in a high-structure with pre-class reading quizzes, group work in lecture, clickers, and practice exams.

The researchers found that the number of students who failed the class dropped when more structure that was added.
In this experiment, students in a traditional physics class at Harvard, with just lectures, were compared to students in a class that used peer instruction. A teacher would pose a difficult problem, students would respond by clicker, and then if the response was poor the students would work together to figure out the correct answer. When both classes were given the same final exam, the peer instruction students, on average, performed better than the traditional students.
This experiment was done by my research group here at UCI, in introductory biology. For several lectures, course content was move out of the lecture time and into a pre-class assignment. This figure shows their performance on final exam questions on topics students learned without a pre-class assignment, and with a pre-class assignment. The performance on final exam questions when they studied before class was significantly higher than when they only had lecture material.
Lastly, in another experiment at UCI, students were allowed to choose whether to take notes on paper, or on a laptop. When asked why they chose their technique, paper users most often said because it would help them learn, and laptop users said because it was more convenient.

At the end of the term, the researchers looked at final grades. A higher proportion of paper users received A grades than the laptop users.
So, that’s why the course is set up this way. And, not only does this explain why I teach the way I do, but it also shows you what education research is like, which is what I do when I’m not teaching.

Now, let’s talk about a few more details about the class..
We are using clickers in this class so you can participate instead of just listening.
In order to get credit for your clicker participation, you need to:
1. Register your clicker. How many of you have registered it so far?
2. Click in to the majority of questions each day

There’s a bit of wiggle room so that you can be absent or forget your clicker on about 2 days with no penalty. You should NOT come up and tell me you forgot your clicker. It isn’t attendance.

There generally will not be any penalty for answering incorrectly, but I may make an occasional exception to keep you on your toes.

Lastly, different rooms have different frequencies, so pull out your clicker and let’s set yours up for this room. First, try turning over the clicker and reading the instructions on the back. Can you figure it out?
No? Okay, press and hold the power button until the blue light flashes, then press the keys for the frequency.
Now let’s practice using your clicker. I perused the Welcome Week calendar and came up with a list of possible events. Which one is NOT one you can attend today after class?

All are events that happen today, but the Women’s Soccer is at 5 at CSU Fullerton.
Most every day in lecture I will be having you turn in some sort of assignment or take a tiny quiz. Generally you will turn in these assignments on a 3x5 card, so please make sure you have a few in your binder every day.

Please DON’T use a bigger index card, or try to fold a piece of paper to be roughly the right size. Anything that isn’t an actual 3x5 card will not receive credit.

These assignments will require you to know your personal “Class ID” that is only used for this class. You should follow the instructions in the basics video to get this ID.
Each of you has enrolled in a discussion associated with this class. I am leading the discussions, and will use that time to answer questions about the material and talk about effective learning and studying for exams.

You should ALWAYS bring your notes and your book to discussion. And see how happy students are in discussion?
Lastly, a word on academic honesty. How many of you read or heard about the recent outcry about the students at Harvard where students copied each other’s answers on a take home exam?

Many times, students are accused of cheating because they don’t know exactly what counts as “cheating.” So I want to be sure we are clear here. In this class, you are encouraged to work together in class, study together outside of class, and discuss questions on Piazza. But if there are any points associated with the activity, or quiz, or question, then you are expected to do the work yourself and not share your results with other students. So should you ask someone to click in for you? No. Should you show someone your online quiz answers? No. I’m passing out an academic honesty pledge, please sign it and then send them to the left and I will have the tutors pick them up.
Here is the information from the official syllabus on classroom behavior for Bio 93. In general, these rules make it possible to maximize the attention and learning of everyone in the room.

Classroom Behavior

- No videotaping (audio is fine)
- No laptop / tablet use in class.
- Phones silent and invisible
- Arrive on time and stay until the end
- Beverages yes, food no
- Quiet when someone else is addressing the class
Okay, has everyone had enough of the introductory stuff? Me too. Let’s actually talk about some biology now.
In the basics video, you learned about the main themes of biology, and about the first theme of structural hierarchy.
So let’s apply this as a clicker question, to give you an example of the sorts of things we will be doing in class. Ready? Go ahead!

Very nice. The vast majority of you answered correctly on this question.

**Structural Hierarchy**

Which of the following is correctly ranked from highest to lowest in complexity?

A. Organ>Cell>Atom>Tissue>Molecule  
B. Tissue>Organ>Cell>Molecule>Atom  
C. Organ>Tissue>Cell>Molecule>Atom  
D. Cell>Tissue>Molecule>Organ>Atom
Now, a different sort of interaction we will do are lecture assignments, generally on an index card. We have some extras here in case you aren’t prepared.

Your first assignment is to find one or two neighbors, introduce yourselves, and learn each others’ names.

Now, this is your biology question.
You have this list of words in your lecture outline, right?
Here is your assignment.
Put those words in order, highest to lowest, in terms of structural complexity.
You and your new friends can talk about it, but each of you should submit your own card, and you are welcome to disagree.

The tutors and I will walk around and answer any questions you have, except the question, “Is this right?” You have five minutes, and then you will turn in your cards and we will discuss the answer.
Go!

(17 min)
Okay, let’s discuss what happened.
What is the most complex item on the list?
Heart? Ostrich egg? Why would you say that?
Why is heart higher than muscle? Right, other cells.
What is next – neuron and sperm. These are pretty similar, right? Sperm has less DNA, but is also more motile. What if we put them on the same line? An an unfertilized ostrich egg would go here as well, yes?
Mitochondria and nucleus are both cell organelles, so they are pretty similar.
And a phospholipid – you might not even know what that is yet. But it is a single molecule, definitely simpler than a whole cell.
And what was least complex? Yes, a hydrogen ion would certainly be pretty low. And if you decided the nucleus was of an atom, it would go even lower.
So my goal is to present you with activities that make you think and process. The more you talk about material here, the more you will be able to process difficult questions on the exams.
Here is another old exam question for you to practice:

**Practice**

White blood cells are higher than phospholipids in terms of structural hierarchy because they:

A. Have more mass  
B. Are fewer in number  
C. Are present in more organisms  
D. Contain phospholipids  
E. Are larger