

BIEB 146: GENOME DIVERSITY AND DYNAMICS

LIVE VIA ZOOM: MON + WED, 5-6:20 PM

INSTRUCTOR: DR. KATHERINE PETRIE

kpetrie@ucsd.edu

OFFICE HOURS: FRI 1-3 PM

sign up at: <https://calendly.com/kpetrie>



WE'RE NOT GOING TO LET COVID STOP US! HOW ARE SCIENTISTS, DOCTORS, AND CONSUMERS USING BIG DATA TO UNDERSTAND HUMAN HEALTH AND THE ENVIRONMENT? WHY ARE "OMICS" TECHNOLOGIES KEY FOR UNDERSTANDING BIOLOGY IN THE 21ST CENTURY, AND HOW DO THEY WORK? WHAT SKILLS AND STRATEGIES WILL BE NEEDED TO MAKE SENSE OF THE MILLIONS OF GENOMES BEING SEQUENCED? DURING THIS COURSE WE'LL COVER ANSWERS TO THESE QUESTIONS AND MORE.

IAS: JOY GUO EMILY OKAMOTO YOORI CHO
ABEGAIL BIGASIN JUN RAO JAYDE FERNANDEZ
JESSICA PHAM NICHOLAS LEE CHELSEA HU

SEE CANVAS FOR...

IA contact info

IA discussion section assignments

IA office hours

WHAT WILL YOU BE DOING IN THIS CLASS?

LECTURES: WE'LL HAVE LIVE MEETINGS VIA ZOOM ON MONDAY + WEDNESDAY. THESE WILL BE INTERSPERSED WITH QUESTIONS AND BREAKOUT DISCUSSION WITH YOUR FELLOW STUDENTS. THESE WILL BE RECORDED, AND ATTENDANCE IS NOT REQUIRED.

COURSE STRUCTURE:

DISCUSSION SECTION: IAS WILL GO OVER QUIZ RESULTS AND ANY QUESTIONS YOU HAVE FROM LECTURE. YOU ARE STRONGLY ENCOURAGED TO ATTEND THE SECTION YOU ARE OFFICIALLY ENROLLED IN (BUT EMAIL DR. PETRIE IF YOU HAVE SCHEDULING CONCERNS). THESE WILL NOT BE RECORDED, AND ATTENDANCE IS NOT REQUIRED.

ASSIGNMENTS: THERE WILL BE WEEKLY TAKE-HOME QUIZZES, WEEKLY DISCUSSION FORUM PARTICIPATION, AND ONE SCIENTIFIC PAPER PRESENTATION PROJECT.

MATERIALS NEEDED TO SUCCEED:

WHAT DO YOU NEED FOR THIS CLASS?

INTERNET ACCESS: ALL COURSE DOCUMENTS WILL BE POSTED ON CANVAS, SO YOU'LL NEED THE INTERNET TO GET THEM. IF YOU DO NOT HAVE ACCESS TO A COMPUTER OR RELIABLE INTERNET ACCESS AT HOME, PLEASE CHECKOUT THE RESOURCES AT [HTTPS://VCSA.UCSD.EDU/NEWS/COVID-19/](https://VCSA.UCSD.EDU/NEWS/COVID-19/).

ZOOM ACCESS AND A MIC: WE WILL HOST LIVE MEETINGS AT OUR REGULARLY SCHEDULED CLASS TIME ON MON + WED (THEY WILL BE RECORDED IF YOU CAN'T MAKE IT). WE WILL ALSO USE ZOOM FOR OFFICE HOURS. YOU ARE NOT REQUIRED TO SHARE VIDEO, BUT A MIC WILL ALLOW US TO TALK TO YOU, SO PLEASE MAKE SURE YOU HAVE A MIC (IF YOU DON'T, SEE THE NOTE ABOUT RESOURCES ABOVE).

PACKBACK ACCESS CODE: WE'LL BE USING THIS AI-MODERATED DISCUSSION FORUM TO DIVE DEEPER INTO THE TOPICS WE COVER IN CLASS. BY ENROLLING IN THIS CLASS, YOU ARE SET UP TO PURCHASE PACKBACK (\$28), VIA INCLUSIVE ACCESS AT THE BOOKSTORE. SEE CANVAS FOR MORE INFO.

ASSESSMENTS AND BASIS FOR FINAL GRADE:

THERE ARE OPTIONS FOR P/NP THIS QUARTER; CONSULT BIO ADVISING FOR MORE INFO.

NO BELL CURVE: YOU WON'T BE COMPETING AGAINST EACH OTHER!

ASSESSMENT	% OF GRADE
WEEKLY PACKBACK	10 %
WEEKLY QUIZZES	40 %
SCIENTIFIC PAPER PRESENTATION PROJECT	10 %
MIDTERM EXAM	15 %
FINAL EXAM	25 %

FOR ASSIGNMENT DETAILS, STAY TUNED TO CANVAS!

GRADING SCALE

97-100	A+	(4.0)
93-97	A	(4.0)
90-93	A-	(3.7)
87-90	B+	(3.3)
83-87	B	(3.0)
80-83	B-	(2.7)
77-80	C+	(2.3)
73-77	C	(2.0)
70-73	C-	(1.7)
60-70	D	(1.0)
<60	F	(0)

KEY ASSESSMENTS IN BRIEF:

WEEKLY PACKBACK (10% OF GRADE)

THIS AI-MODERATED DISCUSSION FORUM WILL HELP YOU MAKE CONNECTIONS BETWEEN WHAT WE LEARN IN CLASS AND THE REAL WORLD. EVERY WEEK, YOU ARE REQUIRED TO: MAKE 2 POSTS, AT LEAST 1 OF WHICH MUST BE A RESPONSE. TO EARN CREDIT, YOUR POSTS MUST MEET CERTAIN GUIDELINES. PACKBACK WILL ASSIGN A CURIOSITY SCORE TO EACH POST BASED ON ITS DEPTH, CREDIBILITY, AND PRESENTATION. CONSISTENTLY HIGH CURIOSITY SCORES ARE AN OPPORTUNITY TO EARN EXTRA CREDIT. YOU CAN MISS 2 PACKBACK WEEKS DURING THE QUARTER.

WEEKLY QUIZZES (40% OF GRADE)

THESE QUIZZES ARE DESIGNED TO TEST YOUR ABILITY TO APPLY WHAT YOU'VE LEARNED IN THE PREVIOUS WEEK. THEY WILL BE OPEN NOTE, HOWEVER, ONCE YOU START THE QUIZ YOU WILL ONLY HAVE 1 HOUR TO COMPLETE IT, SO YOU WILL NOT HAVE ENOUGH TIME TO LOOK UP EVERYTHING. YOU ARE ENCOURAGED TO PREPARE A 'CHEAT SHEET' (SMALL 1 PAGE SUMMARY OF IMPORTANT INFORMATION) BEFORE STARTING EACH QUIZ. YOU ARE NOT ALLOWED TO WORK WITH OTHERS OR ASK FOR HELP DURING THE QUIZ. TO DISCOURAGE COLLABORATION, QUESTIONS WILL BE PULLED FROM A BANK AND THEY WILL BE RANDOMIZED IN ORDER. YOUR LOWEST QUIZ WILL BE DROPPED.

SCIENTIFIC PAPER PRESENTATION PROJECT (10% OF GRADE)

YOU WILL BE REQUIRED TO SELECT AND READ ONE CURRENT SCIENTIFIC PAPER THAT USES A METHOD COVERED IN THIS CLASS, AND RECORD A SHORT VIDEO THAT EXPLAINS THE PAPER. VIDEOS WILL BE POSTED ON A CANVAS DISCUSSION BOARD AND YOU WILL BE REQUIRED TO RESPOND TO A SET NUMBER OF VIDEOS OVER THE COURSE OF THE QUARTER

EXAMS (40% OF GRADE)

EXAMS WILL BE TAKE-HOME STYLE, AND MAY REQUIRE ADDITIONAL RESEARCH AND APPLICATION OF WHAT YOU'VE LEARNED. MORE DETAILS WILL BE PROVIDED CLOSER TO THE TIME OF THE EXAMS.

LOGISTICS AND FAQs:**PARTICIPATION:**

THESE ARE DARK AND DIFFICULT TIMES, AND NONE OF US WISHED FOR THIS TO BE HAPPENING. BUT IT IS UP TO US TO DECIDE WHAT TO DO WITH THE TIME WE ARE GIVEN, AND IT IS MY GOAL TO ENABLE YOU ALL TO LEARN AND GROW THIS QUARTER. WE MAY BE IN UNIQUE LIVING SITUATIONS, DIFFERENT TIME ZONES, OR FACING DIFFICULT RESPONSIBILITIES AND WORRIES. BECAUSE OF THIS, I AM TRYING TO MAKE THIS CLASS AS FLEXIBLE AS POSSIBLE, WHILE STILL ENSURING WE MAKE PROGRESS TOWARDS OUR LEARNING GOALS. WE ARE HAVING LIVE SESSIONS TO HELP YOU LEARN AS BEST AS WE POSSIBLY CAN, AND TO CREATE A SENSE OF ACADEMIC COMMUNITY DURING THIS TIME OF SOCIAL DISTANCING. YOU ARE NOT REQUIRED TO ATTEND OUR LIVE LECTURES, BUT YOUR PRESENCE IS REQUESTED, IF YOU ARE ABLE TO MAKE IT. IF YOU ARE NOT, PLEASE WATCH THE VIDEOS AND GET ANY QUESTIONS ANSWERED AT OFFICE-HOURS AND DISCUSSION SECTION, OR EMAIL YOUR IA. (IF YOU STILL HAVE QUESTIONS OR CONCERNS AFTER EMAILING YOUR IA, YOU CAN EMAIL THE INSTRUCTOR).

WHAT IF I DON'T TURN SOMETHING IN ON TIME?

GENERALLY, NO LATE WORK WILL BE ACCEPTED. HOWEVER, YOUR LOWEST QUIZ, AND YOUR LOWEST 2 PAKBACK WEEKS ARE DROPPED

THESE DROPS ARE DESIGNED TO TAKE CARE OF UNEXPECTED SITUATIONS/TECH ISSUES, BUT PLEASE REACH OUT TO ME IF YOU HAVE ANY EXTENUATING OR SPECIAL CIRCUMSTANCES

IF HEALTH OR FAMILY EMERGENCIES RESULT IN YOU MISSING A SUBSTANTIAL AMOUNT OF COURSEWORK, YOU MAY BE ELIGIBLE FOR AN "INCOMPLETE". PER UCSD POLICY, YOU MUST BE IN GOOD STANDING BEFORE WORK IS MISSED TO BE ELIGIBLE.

WHAT IF I HAVE QUESTIONS ABOUT GRADES?

FOR QUESTIONS ABOUT WHY POINTS WERE TAKEN OFF, PLEASE CONTACT YOUR OFFICIAL IA.

IF YOU THINK A GRADE MAY HAVE BEEN ASSIGNED IN ERROR OR IF YOU HAVE ANY CONCERNS, PLEASE CONTACT DR. PETRIE WITHIN 7 DAYS OF GETTING YOUR SCORE BACK.

INCLUSIVITY:

EVERYONE WILL COME TO THIS COURSE WITH DIFFERENT BACKGROUNDS, KNOWLEDGE, AND PERSPECTIVES. WE WANT TO CREATE A CLASSROOM CULTURE THAT RESPECTS AND REVELS IN THIS HUMAN DIVERSITY. IF YOU HAVE ANY CONCERNS RELATED TO INCLUSIVITY OR FEEL YOUR IDENTITIES (RACE, GENDER, SEXUALITY, RELIGION, ABILITY, ETC) ARE NOT BEING HONORED, PLEASE LET US KNOW! ACCOMMODATIONS CAN BE MADE FOR STUDENTS WITH A LETTER FROM THE OSD. FOR MORE INFORMATION ON CAMPUS + COMMUNITY RESOURCES, CHECK CANVAS.

ACADEMIC INTEGRITY:

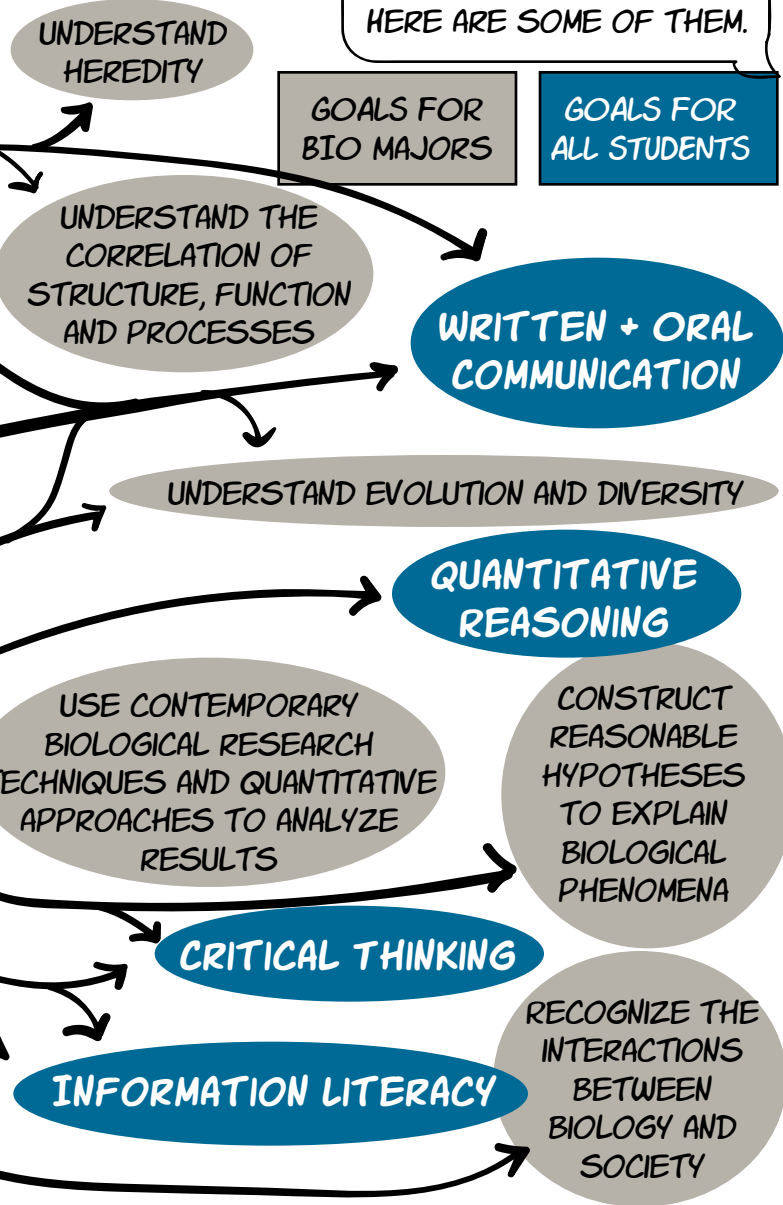
AN INCLUSIVE ENVIRONMENT IS ONE WHERE EVERYONE HAS AN EQUAL OPPORTUNITY TO SUCCEED. ACADEMIC DISHONESTY (INCLUDING, BUT NOT LIMITED TO: CHEATING + PLAGIARIZING) FRACTURES THE PLAYING FIELD BY GIVING SOME STUDENTS AN UNFAIR ADVANTAGE. ASSIGNMENTS WILL BE MONITORED VIA TURN-IT-IN, AND STUDENTS SUSPECTED OF ACADEMIC DISHONESTY WILL BE REPORTED THE ACADEMIC INTEGRITY OFFICE AND MAY RECEIVE A FAILING GRADE

WHAT THIS COURSE WILL ENABLE YOU TO DO:

DID YOU KNOW UCSD HAS CORE SKILLS FOR ALL STUDENTS TO MASTER? HERE ARE SOME OF THEM.

LEARNING OUTCOMES AKA LO'S BY THE END OF THE COURSE YOU'LL BE ABLE TO:

1. EXPLAIN HOW PHENOTYPE = GENOTYPE + ENVIRONMENT + EXPRESSION
2. COMPARE AND CONTRAST EXTANT GENOMES AND CONNECT TO PHENOTYPIC DIFFERENCES
3. SUMMARIZE WAYS GENOMES CHANGE AT THE MOLECULAR LEVEL AND DISCUSS HOW EVOLUTION TAKES ADVANTAGE OF THOSE CHANGES
4. RECOGNIZE DIFFERENT LEVELS OF GENOME DIVERSITY: FROM WITHIN INDIVIDUALS TO WITHIN COMMUNITIES
5. RELATE SCALE OF GENOMES AND GENOMIC DATA TO FAMILIAR SCALES
6. SUMMARIZE OMICS TECHNOLOGIES: HOW THEY WORK AND WHAT QUESTIONS CAN THEY ANSWER
7. INTERPRET OMICS DATA TO DRAW CONCLUSIONS
8. EVALUATE MAINSTREAM MEDIA REPORTS OF OMICS DATA
9. RECOGNIZE UNKNOWNNS IN GENOMICS
10. VALUE THE POWER OF GENOMICS RESEARCH TO ANSWER BROADLY RELEVANT QUESTIONS



WE'RE WORKING TO IMPROVE YOUR EDUCATIONAL EXPERIENCE:

DID YOU KNOW THAT YOU CAN BE PART OF A RESEARCH STUDY IN THIS CLASS?



NO! NOT LIKE THAT! INSTEAD, DURING THIS CLASS, I'LL BE WORKING TO FIGURE OUT THE MOST EFFECTIVE TEACHING METHODS FOR YOUR LEARNING. THIS MEANS YOU MIGHT DO SURVEYS AND PROVIDE FEEDBACK. FOR MORE INFORMATION, PLEASE READ THE INFORMATION AT THE END OF THIS SYLLABUS.

WEEK 1. HOW DO WE SEQUENCE GENOMES?

M - 3/29 INTRODUCTION TO GENOMES AND COURSE
W - 3/31 OLD-SCHOOL GENOME SEQUENCING

INTRODUCTION
+
KEY GENOMIC
METHODS

WEEK 2. HOW DO WE SEQUENCE GENOMES (PART 2)?

M - 4/5 NEXT-GEN GENOME SEQUENCING 1 (ILLUMINA)
W - 4/7 NEXT-GEN GENOME SEQUENCING 2 (ASSEMBLY)

WEEK 3. EXTANT GENOME DIVERSITY (SPECIES)

M - 4/12 MEASURING DIFFERENCES + BUILDING TREES + UCES
W - 4/14 COMPARATIVE GENOMICS + SARS-COV-2

GENOME
DIVERSITY
IN SPACE

WEEK 4. EXTANT GENOME DIVERSITY (POPULATIONS)

M - 4/19 DIVERSITY WITHIN A POPULATION, RESEQUENCING
W - 4/21 EFFECT OF DIFFERENCES WITHIN A POPULATION 1

GENOME DIVERSITY
AMONG THINGS THAT
ARE ALIVE IN THE
BIOSPHERE TODAY.

WEEK 5. EXTANT GENOME DIVERSITY (POPULATIONS)

M - 4/26 EFFECT OF DIFFERENCES WITHIN A POPULATION 2
W - 4/28 POPULATION DIVERSITY AND CONSERVATION

MIDTERM!

**MIDTERM DUE:
TUESDAY
5/4 5PM**

WEEK 6. EXTANT GENOME DIVERSITY (COMMUNITIES)

M - 5/3 METAGENOMES IN THE ENVIRONMENT AND HEALTH
W - 5/5 PLASTIC RESPONSES AND RNA-SEQ 1

GENOME
DIVERSITY
IN TIME

WEEK 7. GENOME DYNAMICS OVER SHORT + MEDIUM TIME SCALES

M - 5/10 PLASTIC RESPONSES AND RNA-SEQ 2
W - 5/12 DEVELOPMENT AND REGULATORY CASCADES

SHORT-TERM DYNAMICS:
CHANGES IN THE
"EXPRESSED"
GENOME

WEEK 8. GENOME DYNAMICS OVER MEDIUM + LONG TIME SCALES

M - 5/17 STEM-CELLS, DIFFERENTIATION
W - 5/19 MECH. OF GENOME EVOLUTION - DE NOVO GENES

LONG-TERM DYNAMICS:
CHANGES IN THE
GENOTYPE ITSELF

WEEK 9. GENOME DYNAMICS OVER LONG TIME SCALES

M - 5/27 EVO-DEVO + ALLELE-SPECIFIC EXPRESSION
W - 5/29 KEY MOMENTS IN GENOME HISTORY

WEEK 10. GENOME DYNAMICS WITHIN A SINGLE LIFETIME

M - 5/31 NO CLASS - UNIVERSITY HOLIDAY!!
W - 6/2 EVOLUTION OF CANCER

FINAL!

**FINAL DUE:
FRIDAY
6/11 10PM**

University of California, San Diego
Consent to Act as a Research Subject

Investigating the Impact of Pedagogical Choices on University Student Learning and
Engagement

Who is conducting the study, why you have been asked to participate, how you were selected, and what is the approximate number of participants in the study?

Gabriele Wienhausen, Director of the Teaching and Learning Commons, together with her education research colleagues is conducting a research study to find out more about how pedagogical choices affect student learning and experience in the classroom. You have been asked to participate in this study because you are a student in a class that is being studied or used as a control. There will be approximately 500,000 participants in this study.

Why is this study being done?

The purpose of this study is to create knowledge that has the potential to improve the learning and educational experience of students at UC San Diego and beyond.

What will happen to you in this study and which procedures are standard of care and which are experimental?

If you agree to be in this study, the following will happen:

- Your data from this class including grades, homework and exam submissions, and survey responses will be included in the analysis to determine the effectiveness of the pedagogical techniques used in this course compared to other similar courses.

How much time will each study procedure take, what is your total time commitment, and how long will the study last?

Your participation involves only agreeing to let us use your data in our analysis. It will require no time on your part above the time you put into this course without agreeing to the study.

What risks are associated with this study?

Participation in this study may involve some added risks or discomforts. These include the following:

1. A potential for the loss of confidentiality. We will not share your personally identifying data with people outside our research team. Data will only be kept in anonymized form for research purposes. Course data will not be used for this research study until after final grades have been posted and will be rendered confidential by removing any identifiers before analysis. Your instructor will not know whether or not you are participating in this study until after final grades have been posted. Data from students who opt out of the study will be removed prior to data analysis. Research records will be kept confidential to the extent allowed by law. Research records may be reviewed by the UCSD Institutional Review Board.

Since this is an investigational study, there may be some unknown risks that are currently unforeseeable. You will be informed of any significant new findings.

What are the alternatives to participating in this study?

The alternatives to participation in this study are not to participate. If you choose to opt-out of participating in this research study, we will exclude your data from analysis. Whether you participate will have no impact on your experience or grade in the associated class as the professor will not know who is or is not participating in the study until after final grades are assigned.

What benefits can be reasonably expected?

There is no direct benefit to you for participating in the study. The investigator, however, may learn more about how to improve student learning, and society may benefit from this knowledge.

Can you choose to not participate or withdraw from the study without penalty or loss of benefits?

Participation in research is entirely voluntary. You may refuse to participate or withdraw or refuse to answer specific questions in an interview or on a questionnaire at any time without penalty or loss of benefits to which you are entitled. If you decide that you no longer wish to continue in this study before the end of the quarter, simply respond to the online opt-out form here: <https://goo.gl/forms/JSBRjEmkES6W6xYc2>. If you decide to opt out after the quarter has ended, you must contact Laurel Nelson (laureln@ucsd.edu) and give the quarter and the course from which you would like your data withdrawn.

You will be told if any important new information is found during the course of this study that may affect your wanting to continue.

Can you be withdrawn from the study without your consent?

The PI may remove you from the study without your consent if the PI feels it is in your best interest or the best interest of the study. You may also be withdrawn from the study if you do not follow the instructions given you by the study personnel.

Will you be compensated for participating in this study?

You will not be compensated for participating in this study.

Are there any costs associated with participating in this study?

There will be no cost to you for participating in this study.

Human Research Protections Program	
UC San Diego	
Approved	
Current Approval:	06/19/2020
Do not use after	07/04/2021
<small>11/19/18</small>	

Who can you call if you have questions?

Gabriele Wienhausen and/or her colleague has explained this study to you and answered your questions. If you have other questions or research-related problems, you may reach Gabriele Wienhausen at gwienhausen@ucsd.edu or (858) 534-3958.

You may call the Human Research Protections Program Office at 858-246-HRPP (858-246-4777) to inquire about your rights as a research subject or to report research-related problems.

Your Consent

If you consent to participate in this study, no action is needed. If you DO NOT consent to participate in this study, or you choose to opt-out at any time during the quarter, please submit this form online at

https://docs.google.com/forms/d/e/1FAIpQLScs0Cznypp4SxQJOsFMgP9nFDjJ0zzYPISBWsiP3_wiWkdjaA/viewform. Your instructor will not have access to the list of students who opted out until after grades are posted. Note that you must separately opt-out of the study for each course involved in this study.

I am not 18 years or older or I do not consent to anonymized research use of my data from the course specified below.

Course name: _____

Course section number: _____

Term: _____

Name: _____

PID: _____

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<small>W170887</small>	