

Teaching large science classes online

- Sources of Ideas
- Website
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- Socioeconomic Bias
- Lectures
- Exams
- (Labs)



Sources of Ideas

- teaching two simultaneous sections of intro bio with blended in person and online delivery
- ~10 people all teaching intro bio at liberal arts institutions, with varying experience teaching online
- recent PD webinars
- social media & blogs
- SoTL (rather little, unfortunately)

+ Convergence Filter

Website

- Should save you time (in the long run)
- Organization
 - comprehensive & detailed
 - consistent categorization
 - short, succinct lists
 - sensible nomenclature
 - call it “Course Schedule” not “Schedule”!
 - consistent patterns (weekly activities and schedules)
- Example: Biol 112 Moodle Page
- Example: Website Quiz

Incentives

Two parallel motivators:

1. engagement grades (= **active** participation grades)
 - typical in-person grade combines engagement & evaluation, so why not separate engagement online, removing the evaluation online conundrum?
 2. positive rewards get students to do what they ought to
 - engage with course activities
 - engage with course material outside of class
 - engage with being a better student
- Example: online learning systems from textbook publishers
 - Example: Encounters with Diversity
 - Example: Midterm Review

Encounters with Prokaryotes

- In my rez room, I saw a **spider**!
- Was going through my fridge and found some guacamole with **mold** on it
- This weekend I was visiting my grandmother, and we were out for a hike in an area that is known for ticks, which carry the **Domain bacteria** called **Borrelia burgdorferi**. We were walking her dogs, and after our hike we checked them for ticks and took one off them.
- The previous week I was sick with strep throat (**streptococcus**), which is also in the same **family** as meningitis and other bacterial infections that humans can get. Normally these illness are dealt with by antibiotics that fight the bacteria cells.
- While I was at the Student Union building today I bought Kombucha to drink which has a culture of **bacteria** in it. Yummy!
[RCW: also yeast, a fungus!]

Groups

- hugely valuable tool
 - all sorts of improved learning outcomes from peer interaction; reduces marking load
 - easy to implement asynchronously: groups in Moodle
 - easy to implement synchronously: breakout rooms in Collaborate etc.
- massive caveats
 - if students form the groups, groups further marginalize marginalized students
 - best solution: assess students and construct with a mix of abilities/experiences
 - adequate solution: optional group vs solitary assignments
 - adequate solution: serial randomized groups
(students assigned randomly to groups several times)
 - if higher stakes, must include a feedback system to police contributions to group effort
- Example: Parasites
- Example: Sustainability Wiki

Evaluation Weights

Item	Close-to-Traditional	Middle Ground	Revolutionary
Engagement	10%	15%	20%
Evaluated Lecture Activities (Assignments, Group Work)	10%	25%	40%
Evaluated Lab Activities	5%	10%	20%
Lecture Midterm(s)	15%	2x10%	10%
Lab Final Exam	20%	10%	0%
Lecture Final Exam	40%	20%	10%

Socioeconomic Bias Is Unavoidable

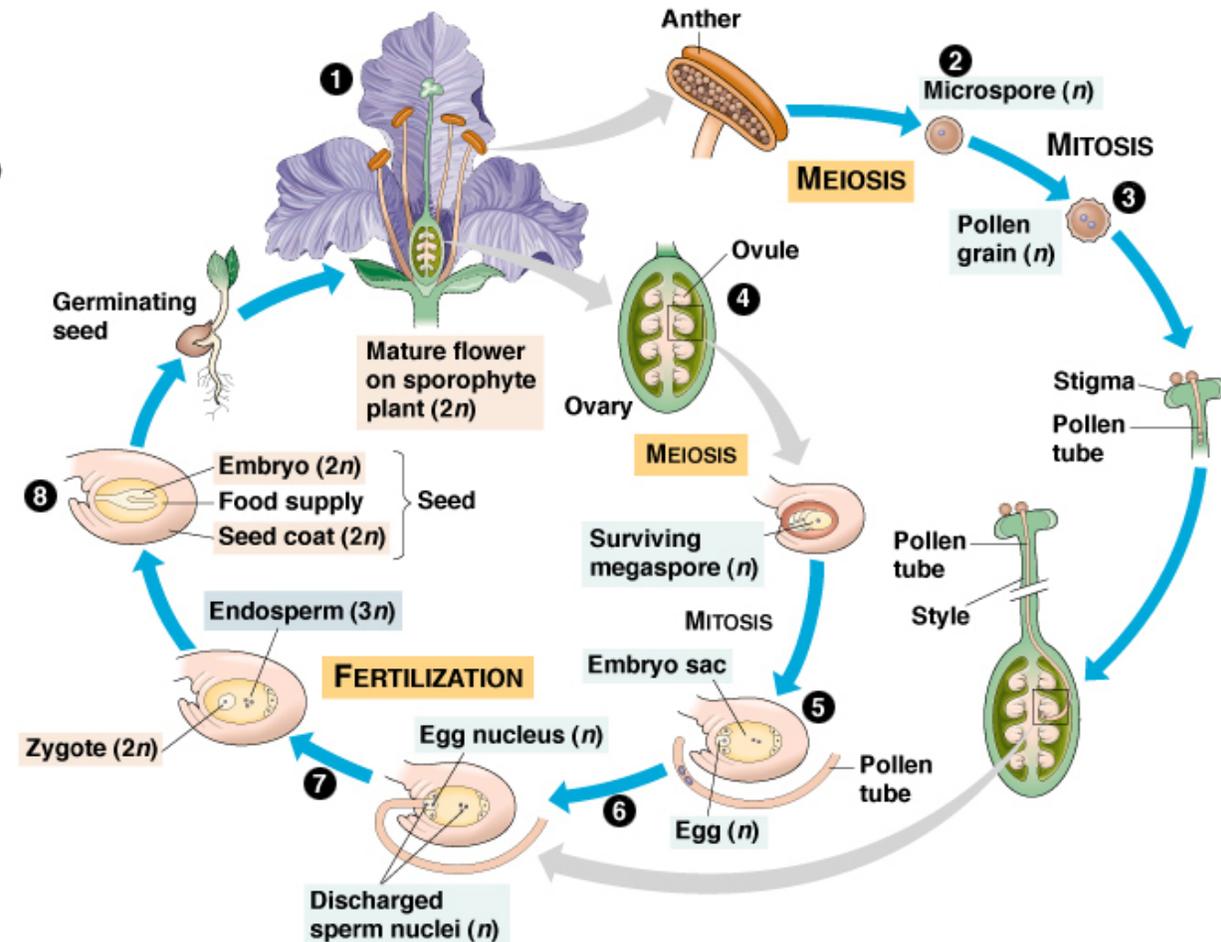
- Dammit

Lectures

- setting precedents and community building early in course
 - student-instructor connections
 - student-student connections
 - patterns of engagement
- divide traditional 50 min lectures into shorter videos: mini-lectures on specific topics
- flipped classroom approach
 - asynchronous (video or reading) delivery of course content
 - synchronous active learning: group discussions, problem sets, excercises, etc.
- Example: Parasites
- Example: Plant Life Cycles

Seed Plant Life Cycle Example

- video mini lecture
- synchronous ordering exercise = puzzle
- poll on structures
- group discussion on “what don’t you understand
- asynchronous quiz for engagement marks



Exam Strategies

- generate perception that cheating is easy to detect
- ensure rules include potentially harsh penalties (zero on the entire exam)
- ensure rules actually afford flexibility
- make cheating more work than not cheating
- diminish probability generic info can be used to answer questions
- deter the use of internet or other devices during the exam
- tweak the exam between different students
- verify the identity of the exam taker
- technicalities mean **MUST** run a mock exam early in term

Course-specific or student-specific questions

Ensure some portion of marks associated with

- specific, non-standard, examples you teach
- incorporate the scientific question into a personalized story

Personalized Question Examples

- You are taking a young cousin to the aquarium and they love sharks and fish. Write them a note to explain the differences between bony fish and sharks. Be sure to explain skeletal, scale, buoyancy, respiration and reproduction differences.
[If they don't write a note to a young cousin using language that a kid can understand they lose points.]
- Why are the reptiles considered to be a Paraphyletic group rather than a monophyletic group? Explain these terms and how the content of this taxon have been revised to make this group monophyletic. Do you like this solution? Explain why or why not.
[They need to say if they like the solution. Usually this keeps them from looking everything up since it's more personal.]
- Mr. Tripsy is very drunk when he is brought to the emergency room after falling down the steps. He is constantly complaining about his "cotton mouth". Knowing that alcohol inhibits ADHs action, you explain to him why his mouth is so dry. What do you tell him and how will you answer his questions?
[They need an answer that makes sense to someone who's drunk. Excellent answers are very fun to read.]

Randomization & Time Constraints

Use LMS quiz/exam question banks to

- randomized answer orders in multiple choice
- random selection of questions from question groups

Use LMS quiz/exam structure to divide exam into different blocks of questions, and impose relative tight time constraints.

Use Identity Verification Questions

- Have students submit personal answers early in term, and then ask them to answer them with very short time constraints in the exam Examples:
 - Favour food?
 - Favourite colour?
 - Student number?
 - Email address?

Two strikes (across the entire course) and they get investigated for potential cheating
- Use a randomized question in the exam and have student take a selfie with the question in the background, and then submit the selfie.
- Include questions that require a video response [available at StFX?]

Commercial Options

- Respondus lockdown browser diminishes opportunity for internet access on same machine. [available at StFX]
- Proctoring services provide monitoring of video feed of students while they write. [availability at StFX?]