

## Fund for Innovative Teaching (FIT) Grant

Materials for teaching drawing as a scientific skill

Kate O'Toole Ph.D., lecturer, Department of Biology

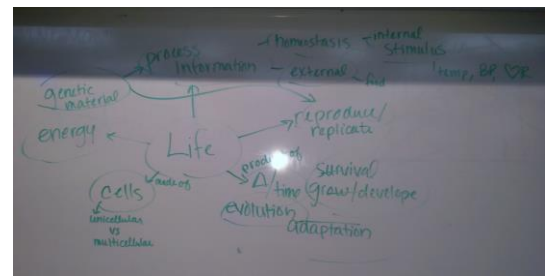
### INNOVATION

Drawing is a very important skill that is often overlooked as a teachable skill, a learning tool, and a creative pedagogical approach. Especially important for science courses, drawing emphasizes the ability to model complex ideas, while practicing abstraction emphasizes how to identify important points and describe connectivity between fundamental concepts. In particular, I teach students how to generate and use concept maps (Box 1) to better understand the topics covered in both my primary courses: BIOL141 Foundations of Modern Biology and BIOL336 Human Physiology.

I propose to use small erasable white boards in order to allow students to practice drawing, abstraction and modeling alone and in groups. These white boards will allow for students to better share their ideas and understanding with each other and the whole classroom. Drawing in the classroom is a low-tech solution to better teach complex ideas and modern skills.

I also propose to use these small white boards to facilitate informal poster-style presentations (Box 2). Clear, concise and effective communication is a fundamental skill in any field. This teaching innovation will increase the opportunities for my students to practice their written, drawn, and oral communication skills throughout the semester.

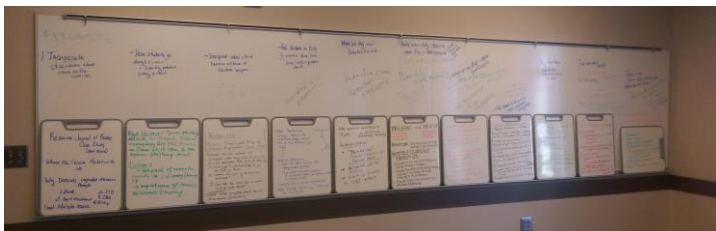
**Box 1.** On day one of BIOL141 students were asked to brainstorm the characteristics of life. They worked in pairs to make their own concept maps, then we generated one together as a class.



The beauty of concept mapping is that each can be different but still correct depending on how you organize the material, as well as, how the question is posed. Sharing individual maps is difficult in a large auditorium style classroom.

### CLASSROOM INTEGRATION

I will be teaching two sections of BIOL141 in the fall (F15 syllabus attached) and I plan to use these whiteboards at least weekly in my course. I already use concept mapping frequently as a review tool and to identify misconceptions. One innovation I plan with the white boards is to play the “telephone” game. In this activity each student will start a concept map and then pass it to the student next to them. Throughout class each student will add a layer to the map, then at the end the group will come together to discuss and give each other feedback. Unlike the childhood game, “telephone”, each time the information is passed more understanding will be added. In this way the students will be able to learn from each other and to generate concept definitions themselves through social constructivism.



**Box 2.** This summer I helped to facilitate a case writing workshop at the Institute for Pedagogy in the Liberal Arts at Oxford College, where personal whiteboards have been integrated into the new teaching spaces. Using personal whiteboards we held a “poster session” where each workshop participant was able to present their ideas and get feedback.

My second innovation will be to incorporate informal poster sessions 2-3 times during the semester. I already use “jigsaw” group activities, where each group is given a different piece of the puzzle. Then the class comes together to share their findings and solve the problem together. An informal poster session would be an ideal way for each group to be able to share their findings with the class and gain a greater understanding with limited classroom time.

## BUDGET

Budget is calculated for 96 students (Biology enrollment cap), however, the student impact will be much greater as I plan to use these whiteboards in all four of my sections during each academic year (384 students possible) while also making them available to all interested Biology instructors (BIOL 141/142, 6 sections, 576 students possible each semester alone!!)

**Total Requested: \$1000**

[Individual Lapboards](#) (9.8 x 13 inches)

\$25 for 12 personal boards

$$96/12 = 8 * \$25 = \$200$$

[Group/Presentation Boards](#) (12.5 x 17.5 inches)

\$27 each

Groups of 4 students

$$96/4 = 24 \text{ groups}$$

$$24 \times \$27 = \$648$$

Total Requested: \$1000 (Rounding up to include tax/shipping costs)

# **Biol141 O'Toole Fall 2015**

## **Foundations of Modern Biology I: Cellular Biology**

**Room 230 1462 Clifton Road Building**

**MWF 12-12:50pm (Section 002)**

**MWF 1-1:50pm (Section 003)**

I welcome you to the study of biology. In this class, we will explore biomolecules, the central dogma, cellular structure and metabolism. This class may be used for biology major and medical school requirements. Throughout the course, I will relate our learning to current applications in medicine and research. *This course is designed to prepare you to think critically about biology whether you enter research, practice medicine, or read the newspaper.*

**Instructor:** Dr. Kate O'Toole

**Office:** Room 2009, Rollins Research Center, 1510 Clifton Rd. (across from classroom building)

**Email:** [kate.k.otoole@emory.edu](mailto:kate.k.otoole@emory.edu) (preferred)

**Telephone:** 404-727-7679 (for emergencies only)

**Office Hours:** 10am-12pm Tuesdays and Thursdays (email for an appointment at an alternate time)

### **BioMentors / Teaching Assistants:**

Shray Ambe, Javier Donestevéz, Bryce Golsen, Milan Patel, and Nilang Shah

These are undergraduates who excelled in Bio141/142 and will help students with learning, application, and practice of the material. They assist in class and hold weekly sessions open to all students where they will use problem sets and review questions from lecture material. Students who attend regularly historically do better in the class.

### **Required Texts:**

1. **Custom bundle** of *Biological Science* by Scott Freeman (Pearson/Prentice-Hall)  
Customized package-includes Volume 1 plus custom booklet of chapters from Volume 2 and MasteringBiology media access card.
2. **A free custom genetics ebook** *Genetic Foundations of Introductory Biology*, accessed with this link: <http://www.nature.com/scitable/group-join/biol141-119049943/7993>
3. **Access to LearningCatalytics.** This in class response software requires that you have an internet enabled device and is linked into the MasteringBiology program.

*Note: Students can buy non-custom, complete hard-copies or e-texts with Mastering Access elsewhere if desired. See Blackboard for more info.*

**Grading:** Grades will be calculated as follows:

Exams (each 100 pts)	300 pts
Cumulative Final	100 pts
Best 10 of 12 Quiz Grades	100 pts
Mastering Biology Homework	counts as a quiz grade

**The Honor Code:** I strictly enforce the Honor Code in this class. If you are cheating *or appear to be cheating*, your name will be submitted to the Honor Council for review. The Honor Code is a matter of fairness for all **and** our faith in that fairness. The few points you might gain by peeking at your neighbor's test (**IF** your neighbor has the same test and **IF** your neighbor has the right answer), plagiarizing, or lying to your professor are not worth ruining your college record, your career plans, and your conscience.

**Emory Honor Code** [http://www.college.emory.edu/current/standards/honor\\_code.html](http://www.college.emory.edu/current/standards/honor_code.html)

Academic misconduct is an offense generally defined as any action or inaction which is offensive to the integrity and honesty of the members of the academic community. This offense includes, but is not limited to, the following:

- (a) Seeking, acquiring, receiving, or giving information about the conduct of an examination, knowing that the release of such information has not been authorized;
- (b) Plagiarizing;
- (c) Seeking, using, giving, or obtaining unauthorized assistance or information in any academic assignment or examination;
- (d) Intentionally giving false information to professors or instructors for the purpose of gaining academic advantage;
- (e) Breach of any duties prescribed by this Code;
- (f) Intentionally giving false evidence in any Honor Council hearing or refusing to give evidence when requested by the Honor Council.

**Class time:** Our class is designed to offer many ways to understand the material, including lectures, in-class group activities, animations, cases, and discussions. *These activities are planned to make your learning an active process to increase retention.* Your active involvement in the class as measured by attendance, in-class assignments and participation will be taken into consideration in the event that your grade is on the borderline of the next higher letter grade.

**Attendance:** *Attendance is expected and rewarded.* Absences due to university-sponsored activity, illness, family emergency, or religious holidays are excused. Attendance will be taken in class after the Drop/Add period. Before then, find your favorite place to sit, as you must sit in your chosen seat for every lecture thereafter. You are responsible for any missed information or inconvenience that results from your absence. Give me a note from your coach/program director **before** a university-sponsored event. If you miss more than three days due to illness, tell the TA at **the next class**. Giving false information to me or a TA is an honor code violation. You are also expected to be generally on time to class. If another professor routinely keeps you over and makes you late, let me know so that I can inform them how inappropriate that is.

**In-class Activities:** *Bring an internet enabled device to every class.* The personal response system LearningCatalytics (LC) will be used in a number of different ways to provide feedback to the student and to the professor about the learning by the class. It is an honor code violation for both when one student uses another's log-in information or another's answer. Missed LC questions will not count against you. We will also have in-class activities where your participation in the discussion and short answer sheets will be rewarded. Correct answers to five appropriate LC questions and in-class activities, randomly chosen at the end of the semester, will be counted toward your total quiz grade, worth a **maximum of three bonus points**.

**Quizzes/Assignments:** There will be regular quizzes during the semester, given **every Friday** in the first 10 minutes every week without an exam. Quizzes cover material from the previous lectures and associated reading. The quizzes serve to identify weaknesses in the student's understanding or studying before the more heavily weighted exams and to assess learning using different mechanisms than those used in the exams. Some quizzes will be replaced with take-home assignments as indicated in class. You will be allowed to drop your 2 lowest quiz grades, therefore there will be no make-up for missed quizzes.

Quizzes or assignments missed due to a university-sponsored event will be excused if you show the professor a note from your coach/program director **beforehand**. You are allowed to miss/drop two quizzes for any other reason (e.g. illness, sleeping late, laziness). However, you do not know when you are going to get sick, so do not waste one of your allowed drops just because you didn't want to go to class. If you haven't studied, it is still better to come to the quiz and earn a 5 than to get a zero.

**Quiz grades will be determined using the top 10 quiz grades** or an adjusted number if there were excused absences (e.g. if one absence was excused, the quiz grade = % of 90 possible points for the 9 best out of 11 quizzes).

**MasteringBiology:** One quiz grade will come from online homework through MasteringBiology. These online activities are due before class **every Monday** (or Wednesday if Monday is a holiday) in order to help you review material before lecture and to practice applying the information afterwards. The due dates for 15 homework assignments are listed on the syllabus. Each *passing* assignment (score  $\geq 70\%$ ) is worth one point, and a maximum of ten points will count as the **Quiz 12 grade**. Some assignments will be paired with AdaptiveLearning question sets. These additional questions will be based on individual knowledge gaps determined by your performance on homework assignments and will provide an opportunity to earn bonus points on that individual assignment. If you get a perfect score on such assignments, the bonus point will be awarded automatically.

**Exams:** The first two exams will be given in class on the dates indicated on the schedule. The third exam will be a two-part exam: Exam 3 on new material + the cumulative Final Exam given at the Biology Group exam time slot: December 10 6:30-9pm (location TBA).

Unexcused missed exams cannot be made-up and will count as zeros. Make-up exams will be granted in the case of a school-sponsored activity **only** with advance written notice from the program director/coach OR in the case of an emergency or illness **only** if :

1. you contact me *before* the exam (email or call 404-727-7679)
2. **AND** you receive an excuse from the College Office of Undergraduate Education (call 404-727-6069)

To ensure fairness, make-exams may contain different questions or be in a completely different format (oral, essay, etc.) than the exam given in class.

**Regrades:** If you believe an error has been made in the grading of your exam or quiz, you must appeal the grading of the question ***in writing within one week of its return***. To ensure fairness, random numbers of the quizzes and exams will be photocopied before being returned to you.

**Disability:** You must inform me in the ***first week*** if you believe you possess a disability that will require accommodation. If ***physical or psychological*** issues arise during the semester, please get help during the semester by contacting me and/or the College Office who can approve an accommodation. If we learn of difficulties only after the semester is over, we have little or no flexibility.

### **Additional Resources:**

**Study Skills Training and free tutors** are available through Learning Programs <http://college.emory.edu/home/academic/learning/> or call 404-727-5300.

**Blackboard** <https://classes.emory.edu> will be the main communication resource for this course. You will be automatically added to your course website after registration.

*A great deal of time and effort has gone into the schedule planning. However, biology is always evolving. Intriguing developments, shocking news reports, or interesting discussions may lead to changes in course management, schedule, and content. I reserve the right to modify the syllabus or class content as deemed necessary any time in the semester but will give notice of such as early as possible.*

**KEY****Bio141-O'Toole Fall 2015**

MB = MasteringBiology Online Assignment

F = Freeman Biological ScienceB = Freeman Biological Science Bioskills AppendixG = Nature Education Genetic Foundations of Introductory Biology

\* = Due Sept 9 after Add/Drop

#	Day	Date	Topic (general outline)	Due:Quiz/ MB	Reading
1	W	Aug 26	Introduction	MBintro*	
2	F	Aug 28	What is life?		B 15-16, F 1
	M	Aug 31	Water and Carbon	MB1*	B 8, F 2.1-3, 2.5
3	W	Sept 2			<b>ADD/DROP ends</b>
4	F	Sept 4	The Genetic Code	<b>QUIZ 1</b>	F 16.1-3, G 3
5	M	<b>Sept 7</b>	<b>LABOR DAY NO CLASS</b>		
6	W	Sept 9		MB2	
7	F	Sept 11	Nucleic Acids	<b>QUIZ 2</b>	F 4, F 8.1-2
8	M	Sept 14		MB3	
9	W	Sept 16	Proteins		B 2, F 3, G 5.4-5
10	F	Sept 18	Enzymes	<b>QUIZ 3</b>	F 8.3-4
11	M	Sept 21		MB4	
12	W	Sept 23	Carbohydrates		F 5
13	F	Sept 25		<b>QUIZ 4</b>	
14	M	Sept 28	Lipids	MB5	F 6.1-2
15	W	Sept 30			
	<b>F</b>	<b>Oct 2</b>	<b>EXAM 1 (Lectures 1-15)</b>		
16	M	Oct 5	Membrane Transport	MB6	F 6.3-4
17	W	Oct 7			
18	F	Oct 9	Cells: Prokaryotes vs. Eukaryotes	<b>QUIZ 5</b>	F 7, G 1.1-2, G 2
	<b>M</b>	<b>Oct 12</b>	<b>FALL BREAK NO CLASS</b>		
19	W	Oct 14	Endomembrane System	MB7	
20	F	Oct 16		<b>QUIZ 6</b>	
21	M	Oct 19	Cell Cycle	MB8	F 12.1-2, G 4.1-2
22	W	Oct 21			
23	F	Oct 23	Replication	<b>QUIZ 7</b>	F 15, G 4.5
24	M	Oct 26		MB9	
25	W	Oct 28	Genes/Mutations		F 16.4
26	F	Oct 30		<b>QUIZ 8</b>	
27	M	Nov 2	Cancer Genetics	MB10	F 12.3-4, G 15
28	W	Nov 4			
	<b>F</b>	<b>Nov 6</b>	<b>EXAM 2 (Lectures 16-28)</b>		
29	M	Nov 9	Transfer of energy	MB11	F 8, G 1.3, 1.5
30	W	Nov 11			
31	F	Nov 13	Respiration	<b>QUIZ 9</b>	F 9, G 1.5 <b>Freshman W deadline</b>
32	M	Nov 16	Glycolysis	MB12	
33	W	Nov 18	Pyruvate Processing and Krebs		
34	F	Nov 20	ETC, Oxidative Phosphorylation	<b>QUIZ 10</b>	
35	M	Nov 23		MB13	
36	<b>W</b>	<b>Nov 25</b>	<b>NO CLASS</b>		
	<b>F</b>	<b>Nov 27</b>	<b>THANKSGIVING BREAK</b>		
37	M	Nov 30	Fermentation	MB14	
38	W	Dec 2			
39	F	Dec 4	Photosynthesis	<b>QUIZ 11</b>	F 10.1-.2, G 1.4
40	M	Dec 7		MB15	
	<b>Thur</b>	<b>Dec 10</b>	<b>EXAM 3 and CUMULATIVE FINAL</b>	<b>6:30-9 pm</b>	<b>Location TBA</b>