Course Outcomes Guide (COG)

Course Title: Bio 201 Spring 2018 **Date: 5/10/18**
Course Team: Lennon

Expected Learning Outcomes
STUDENT LEARNING OUTCOMES:

1. Apply a basic core of scientific and quantitative knowledge to enhance understanding of cell structure and function at the molecular level.
2. Develop and maintain a notebook of laboratory records.
3. Utilize laboratory skills to enhance understanding of cell structure and function while participating in a group environment.

COURSE CONTENT OBJECTIVES:

1. Build on the fundamental concepts of cell structure and function from previous study to include:
    a. the relationship between molecular structure and function.
    b. the dynamic character of cellular organelles.
    c. the use of chemical energy in running cellular activities.
    d. ensuring accurate macromolecular biosynthesis.
    e. unity and diversity at the macromolecular and cellular levels and the relationship to adaptation through time.
    f. homeostatic mechanisms that regulate cellular activity.
2. Relate experimental processes and evidence to the knowledge of cell structure and function that is being learned.
3. Relate the molecular and sub-cellular components of a cell to a framework of heredity and evolution.
4. Integrate classical research findings to current hands-on experiences with the latest biotechnology and information technology.

Assessment (How do or will students demonstrate achievement of each outcome? Please attach a copy of your assessment electronically.)

- Assessment of lecture learning content:
    - 3 multiple choice, true/false, short answer, and essay exams (100 pts each)
    - 1 cumulative final exam (100 pts)
    - Worksheet/quiz for each chapter or topic covered (points vary)
    - Presentation of an original research paper related to course content. (25 pts)
- Assessment of lab learning content:
    - 5 lab reports (varying points value)
    - 2 oral presentation of lab experiment (25)
    - 3 experimental design activities (15 pts each)
    - Other assignments, as needed to bolster understanding (points vary)

- 1 final project involving design of experiment, carrying out of experiment, and poster presentation to class (45 pts)

Grades were determined as follows:

Lecture work was worth 65% of the final grade
Lab was worth 35% of the final grade

Validation (What methods have you used or will you use to validate your assessment?)
A variety of assessment strategies were employed to address student strengths, weaknesses, and assessment preferences. No one type of tool was used, allowing the student to demonstrate proficiency more fully.

Rubrics were created for each assignment/exercise, and students are given access to the rubrics used to assess their work prior to the work being due. In most cases (apart from exams) students were given rubrics to use a guidelines as part of their assignments, and those rubrics were explained in the classroom prior to the due date. In addition, students were assigned an anonymous lab report from another student and asked to grade that lab report with the given rubric. This was to encourage students to use the rubric critically while writing their reports.

Results (What do your assessment data show? If you have not yet assessed student achievement of your learning outcomes, when is assessment planned?)

Avg Exam I (n=11)	Avg Exam II (n=11)	Avg Exam III (n=11)	Avg Final Exam (n=11)	Avg Lab Grade (n=11)
75.5%	**60.2%**	**61%**	**76.3%**	**82.8%**

%A	%B	%C	%D	%F	% Walkaway F
8	**33**	**25**	**25**	**0**	**8**

Follow-up (How have you used or how will you use the data to improve student learning?)
Student performance in BIO 201 is consistently lower than I would expect from upper level majors. As you can see from the statistics above, students tended to perform very well in lab, but not as well in lecture. Higher lab grades appear to have significantly impacted their overall grades in the course as low exam scores still resulted in 100% of students passing the class. While I am happy that they are succeeding in lab, where the focus is on developing the critical thinking skills needed to do laboratory biology (experimental design, carrying out their own experiments, collecting, analyzing, and presenting data), I am concerned with the low level of performance in lecture. From talking with students, my hypothesis as to what may be going on in lecture relates to a continuing problem with inconsistent preparation for the class material. There were several times throughout the semester that I felt like I was trying to teach two classes at once – BIO 113 and BIO 201 - as students seemed to have retained almost nothing from their introductory classes or have not been introduced to material with which I expected them to already be familiar. In the latter case, it's just not feasible for me to teach the introductory material adequately to then allow that student to understand the upper level material. To address this continuing problem in the moment, I stress that students were expected to have mastered their introductory biology material and that if they had not, they needed to review it and/or come

see me for help. This was stated on the very first day of class, and continued to be stressed throughout the semester. Students who expressed concern were given access to my BIO 113 materials to help them review material. Both of the students who took advantage of this offer this semester successfully completed BIO 201 – one with an A, and one with a C.

At least one student was admitted to the class even though she had not completed the pre-requisites. Given that precedent – that this student was allowed to enroll even though she shouldn't have been – I suspect that other students may have had similar experiences.

As mentioned in previous COGs, the Biology faculty are working to solve one of these problems by working together to make sure all students are getting the same material in their introductory biology class (BIO 113). In the meantime, I continued to provide extra resources for students in BIO 201, and tried to indicate what topics from their introductory classes they needed to brush up on in order to succeed in BIO 201. A new approach I took this semester was to email the class before the Winter break to encourage them to review their introductory material over Break, as they would need to have mastered it in order to succeed in BIO 201. A quick survey at the beginning of class indicated that few or none of them did this.

Cell Biology is an ever changing field, with new advances each day that need to be considered and, possibly, incorporated into this class. Often, I learn of a new advance as I'm am going over my notes the day before (or even the day of) class, and incorporate that new information into my lecture on the topic. Because of this, BIO 201 is incredibly challenging to teach and to learn, as things change continuously, but it is also very exciting and engaging because of this.

The goal for this course, including lecture and lab, is to align it with the American Society for Cell Biology *Cell Biology Learning Framework* (http://www.coursesource.org/courses/cell-biology) and with the inquiry- and evidence-based reasoning spirit of the Next Generation Science Standards (http://www.nextgenscience.org/) and the AAAS Vision and Change in Undergraduate Biology Education (http://visionandchange.org/).

Another, equally important goal for the class is also to get students ready for their next steps, as this is a transfer class. BIO 201 transfers to our partner institutions as a 300 level class. As such, when students leave my classroom, they should be ready for their 400 level classes. It is very challenging to take students from a 100 level – often many have had only BIO 113 where we try to get them from high school level biology to college level biology – to be ready for a 400 level class. While I hear a lot of complaints from students as to the rigor during the semester, I often hear back from them a year or so later affirming that what we did in BIO 201 prepared them well for their next steps and that they now appreciate the work that was done!

Budget Justification (What resources are necessary to improve student learning?)
Class will require supplies to support labs, sometimes with only a week's notice. The Instructor often needs to purchase these in the interest of time and for specificity. Request flexibility with reimbursement. Labs focus on increasing students' understanding of the nature of science, including experimental design, carrying out of experiments, data analysis, and presentation of results. Supplies need to be flexible to support student-designed experiments.
Request funds to allow students to print research posters.