Biology 112: Evolution, Form and Function of Organisms
Section 1 | TR 9:25-10:40 AM | RITA 101

Course Syllabus
Instructor: Deb Bidwell | Teaching Extern: Alessandra Metelli | SI Leader: Makayla Cook
bidwelld@cofc.edu | metellia@musc.edu | cookma3@g.cofc.edu
Spring 2021

Due to the ongoing COVID-19 pandemic, please consider the following syllabus as valid on January 11, 2021. If the College issues changes to the calendar and/or in-person contact protocols due to COVID-19, weather related evacuations, or other unforeseen reasons, the Instructor will provide you with a modified version of this syllabus as changes occur. The goal is to ensure the learning outcomes listed below. How and when they are finally achieved may change multiple times over the Spring 2021 semester because of factors beyond our control.

Course Description:

- A foundation course for science majors providing an introduction to evolution with an emphasis on the structure, form and function of plants and animals. Students will be exposed to lectures, activities, readings, discussions, and assessment to ensure a thorough, lasting understanding of the material. Completion of this class and the associated laboratory meets a General Education requirement. For details please see the addendum at the end of this syllabus.

Pre-requisites
- Successful completion of Biology/Honors 111/151, or a high grade in Biology 101. Biology 112 laboratory is normally a co-requisite, unless students already have credit for the laboratory portion of the course.

Student Learning Objectives:

- This general education science sequence provides a background for understanding and evaluating contemporary topics in biology. Students develop a foundational understanding of core concepts to use and on which to expand in upper level courses. They also develop the critical competencies that form the bases for the practice of science and use of scientific knowledge. (See addendum for more information.)

- Students will be able to synthesize knowledge from to or more systems to address a sustainability problem (QEP SLO 4).

Contact/Communication:

Private/Student-To-Instructor Contact
- Students should contact me about issues that are specific to the student by email at
bidwelld@cofc.edu
● My response turnaround time with emails will be within 24 hours on weekdays and within 48 hours on weekends.

Office Hours
● Zoom group drop in office hours Wednesdays 1:30 - 3:30 PM. The group zoom link will be located in our OAKS calendar. Email bidwelld@cofc.edu for private Zoom meeting only if we’ll discuss confidential matters or if my office hours conflict with your schedule.

Course Communication and Community Building
● OAKS will be utilized for posting lectures, readings, quizzes, assignments, news, updates, and recording grades.
● New to Oaks? Get up to speed fast with tutorials here: http://blogs.cofc.edu/oaks/students/getting-started/
● Email will be used to communicate important or sudden changes in course information. Please check your CofC email daily.
● Big class, small feel. We will all work together to build our classroom learning community. I will play a facilitating role in helping you get to know, work with, trust, and collaborate with the other members of our class. Each member of the class belongs and must be willing to participate in a dynamic, and engaging learning group that is inclusive and safe. Your collaboration, participation, willingness to contribute, and your initiative are paramount to having a successful and enjoyable learning experience. We aim to develop a spirit of trust and camaraderie through team learning that will unite us and keep us safe as a diverse and inclusive community of learners.

Expectations
● Students should plan to log into Oaks at least 2 times per week.
● Students should dedicate 6+ hours per week to this course to thrive.
● This class is student-driven. Motivation must come from the student.
● Our class should be interactive and engaging!
● Students are expected to contribute to our learning community.
● There are typically weekly obligations: quizzes, written assignments, or exams.
● A physical notebook with paper and pen are strongly encouraged. Science tells us that taking notes by hand and drawing to learn is the best way to actively engage with our course material. It is not recommended to use a keyboard to take notes unless a need for accommodation is documented.
● You may audio record lectures, but please ask first.
● Please keep phones silenced and away during our class time.

Required Course Materials
● Computer/technology with access to internet, microphone, video camera
● Software/Apps: (web browser, OAKS, Pdf reader, word processing program, Zoom)
Participation

- Students who miss class do not thrive.
- This class meets synchronously.
- If it is safe for you, your peers, and Instructor for you to attend class face to face, please do so (Masked and socially distanced following all sanitary protocols).
- If you are ill, may be ill, are in quarantine due to exposure to someone who has been ill, or are feeling unwell, it is your obligation and responsibility to protect the health and safety of our community by Zooming into class via the links in our OAKS course calendar. When/if Zooming into class, students should do so in a location that allows them to actively focus, take notes, keep video cameras on, and with the ability to actively participate through polls, chat, breakout discussion rooms, and/or by un-muting and speaking if called upon to do so.
- Students too ill to attend class or missing class for official CofC obligations should contact the Instructor by email at bidwelld@cofc.edu for recorded Zoom lecture links.
- If the Instructor is ill or in quarantine, classes will move to a temporary, online Zoom format.
- Unexcused absences require personal responsibility for obtaining notes from a peer.
- Slides will be posted to OAKS for each lecture period by the end of the day. They are not posted ahead of time.

Accommodation

Center for Disability Services (http://disabilityservices.cofc.edu/for-faculty/faqs.php)

- Any student eligible for and needing accommodations because of a disability is requested to speak with the professor during the first two weeks of class or as soon as the student has been approved for services so that reasonable accommodations can be arranged. This College abides by section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act. If you have a documented disability that may have some impact on your work in this class and for which you may require accommodations, please see an administrator at the Center of Disability Services/SNAP, 843.953.1431 so that such accommodation may be arranged.

- Athletes, International, ESL, and all students with life circumstances that may warrant accommodations are encouraged to discuss any concerns with the Instructor in a timely manner. I am fluent in Spanish. I understand that we all have way more important things going on in our lives than this biology class. I aim to be friendly, approachable, and understanding. I will also hold you to high standards.

Assessment

- Formative suggested homework will be provided in our OAKS content area. It is not graded, but strongly encouraged. Answer keys will be posted for self-evaluation.
- Weekly formative quizzes will be multiple-choice, individual, timed, randomized, approximately 10 questions, and conducted through OAKS. They are open-book and open-notes but students must prepare ahead of time, as quizzes are challenging and there will not be time to look up individual answers. Students may take the quizzes as many times as they choose to during the quizzing period. Once students earn 85% or higher on tier 1 level quiz questions, they can move on to tier 2 level
(higher order thinking) questions. Each final quiz grade is the highest score made out of all tier1/tier2 attempts. Quizzes are held each week unless an exam/written assignment is scheduled. Each quiz is open during a five-day window. They open on Thursdays and close on Tuesdays. Students can see which questions they answer incorrectly, but not the correct answers. In the event that a student is unable to take a quiz during the 5-day window due to severe illness/personal disruption, extensions can be made on a case by case basis. Please reach out to the Instructor by email.

- Formal assessment exams (3) consisting of higher order thinking (tier 2 style) multiple choice and short answer questions will be held face to face in Rita 101. They are individual and closed book/notes. If a student is quarantined, receiving urgent medical attention, or is too injured or ill to take a regularly scheduled exam, they must notify the Instructor as soon as possible (prior to the exam) so that a make-up may be arranged. If a student needs to miss an exam due to an official CofC activity, arrangements should be made well ahead of time.
- The final exam is cumulative, multiple choice, held face to face during the scheduled final exam time.
- If classes move to an online only format due to the COVID-19 pandemic, exams will move to a timed online format and a revised syllabus will be issued with specifics.

**Grades calculated as follows:**

<table>
<thead>
<tr>
<th>Component</th>
<th>Value (% of final course grade)</th>
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<tbody>
<tr>
<td>Quizzes (9/10) lowest score dropped, includes syllabus quiz</td>
<td>25</td>
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<tr>
<td>Exams (3)</td>
<td>45</td>
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<tr>
<td>Cumulative Final Exam</td>
<td>20</td>
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<tr>
<td>Sustainable agriculture written assignment</td>
<td>10</td>
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<tr>
<td>Total:</td>
<td>100%</td>
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<table>
<thead>
<tr>
<th>Final course average:</th>
<th>Grade</th>
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<tbody>
<tr>
<td>100-93</td>
<td>A</td>
</tr>
<tr>
<td>90-92</td>
<td>A-</td>
</tr>
<tr>
<td>87-89</td>
<td>B+</td>
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<tr>
<td>83-86</td>
<td>B</td>
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<tr>
<td>80-82</td>
<td>B-</td>
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<td>77-79</td>
<td>C+</td>
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<td>73-76</td>
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<td>70-72</td>
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<td>67-69</td>
<td>D+</td>
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<td>63-66</td>
<td>D</td>
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<tr>
<td>60-62</td>
<td>D-</td>
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<tr>
<td>&lt; 60</td>
<td>F</td>
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Special Agreements  The College abides by Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act. If you have a documented disability that may have some impact on your work in this class and for which you may require accommodations, please see an administrator at the Center of Disability Services/SNAP, (843) 953-1431 or me so that such accommodation may be arranged. Contacting the Instructor as early as possible in the semester is the best strategy.

Supplemental Instruction, MUSC Extern  Our section has Supplemental Instruction. Supplemental Instruction is collaborative learning with a trained underclassman peer biology coach. Our experienced and awesome SI leader is Mikayla Cook. SI is for everyone and is not remedial. Attendance is strongly encouraged! http://csl.cofc.edu/supplemental-instruction/ Our section has a fantastic Teaching Extern post-doc from MUSC, Alessandra Metelli, who will guest lecture and assist with grading.

Center for Student Learning  I encourage you to utilize the Center for Student Learning’s (CSL) academic support services for assistance in study strategies, speaking & writing strategies, and course content. They offer tutoring, Supplemental Instruction, study strategy appointments, and workshops. Students of all abilities have become more successful using these programs throughout their academic career and the services are available to you at no additional cost. For more information regarding these services please visit the CSL website at http://csl.cofc.edu/ or call (843)953-5635.

College of Charleston Honor Code/Academic Integrity:  Lying, cheating, attempted cheating, and plagiarism are violations of our Honor Code that, when identified, are investigated. Each incident will be examined to determine the degree of deception involved.

Incidents where the instructor determines the student’s actions are related more to a misunderstanding will be handled by the instructor. A written intervention designed to help prevent the student from repeating the error will be given to the student. The intervention, submitted by form and signed both by the instructor and the student, will be forwarded to the Dean of Students and placed in the student’s file.

Cases of suspected academic dishonesty will be reported directly by the instructor and/or others having knowledge of the incident to the Dean of Students. A student found responsible by the Honor Board for academic dishonesty will receive a XXF in the course, indicating failure of the course due to academic dishonesty. This grade will appear on the student’s transcript for two years after which the student may petition for the XX to be expunged. The F is permanent. The student may also be placed on disciplinary probation, suspended (temporary removal) or expelled (permanent removal) from the College by the Honor Board.

Students should be aware that unauthorized collaboration--working together without permission-- is a form of cheating. Unless the instructor specifies that students can work together on an assignment, quiz and/or test, no collaboration during the completion of the assignment is permitted. Other forms of cheating include possessing or using an unauthorized study aid (which could include accessing information via a cell phone or computer), copying from others’ exams, fabricating data, and giving unauthorized assistance.

Research conducted and/or papers written for other classes cannot be used in whole or in part for any assignment in this class without obtaining prior permission from the instructor.

Students can find the complete Honor Code and all related processes in the Student Handbook at http://studentaffairs.cofc.edu/honor-system/studenthandbook/index.php
<table>
<thead>
<tr>
<th>Week</th>
<th>Lecture topic</th>
<th>Chapter readings</th>
<th>Other Readings or Videos</th>
<th>Due for grading</th>
<th>Suggested homework</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intro Jan. 12 &amp; 14</td>
<td>Intro, community building, syllabus, Earth's operating conditions, life's principles.</td>
<td>Chp 1, 46.2, 46.3</td>
<td>Course Syllabus Article on OAKS: inspects adaptations</td>
<td>Syllabus quiz 1 (OAKS online) opens 1/12 closes 1/19. Google slides introductions</td>
<td>Carefully read the syllabus (OAKS)</td>
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<tr>
<td>Jan 19 &amp; 21</td>
<td>Intro to evolution, Adaptation, evidence</td>
<td>Chp 18 Intro, 18.1</td>
<td>Article on OAKS: The problem with theory</td>
<td>Quiz 2 (OAKS online) opens 1/21 closes 1/26</td>
<td>Optional selfie assignment (EC, OAKS)</td>
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<tr>
<td>Jan 26 &amp; 28</td>
<td>Evolution by natural selection, phylogeny, intro to speciation</td>
<td>Chp 19 Intro, 19.3, 18.2</td>
<td>Article on OAKS: Genetic manipulation: the first 50,000 years</td>
<td>Quiz 3 (OAKS online) opens 1/28 closes 2/2</td>
<td>Myth-busters: misconceptions about evolution (OAKS)</td>
</tr>
<tr>
<td>Feb 2 &amp; 4</td>
<td>Wrap up evolution unit, Exam 1</td>
<td>Chapter summaries 18.1, 18.2, 19.3</td>
<td>Article on OAKS: Duck sex and the patriarchy</td>
<td>Exam 1 is R 2/4 (EC from readings)</td>
<td>Go outside and play.</td>
</tr>
<tr>
<td>Feb 9 &amp; 11</td>
<td>Plant form and function</td>
<td>30.1-30.4</td>
<td>Darwin Week Events!</td>
<td>Quiz 4 (OAKS online) opens 2/11 closes 2/16</td>
<td>Write a course description for a Plant Behavior class.</td>
</tr>
<tr>
<td>Feb 16 &amp; 18</td>
<td>Plant growth and transport</td>
<td>30.2, 30.5</td>
<td>Article on OAKS: Plants recognize kin</td>
<td>Quiz 5 (OAKS online) opens 2/18 closes 2/23</td>
<td>Water potential practice problems (OAKS)</td>
</tr>
<tr>
<td>Feb 23 &amp; 25</td>
<td>Plant nutrition and response</td>
<td>30.6, 31 (all)</td>
<td>Video: what plants talk about</td>
<td>Sustainable Agriculture Written Essay due 2/25</td>
<td>Reflect on the importance of the soil ecosystem.</td>
</tr>
<tr>
<td>Mar 2 &amp; 4</td>
<td>No classes on</td>
<td>March 2 and 4</td>
<td>Practice quiz, doesn’t count towards grade</td>
<td>Catch up and re-focus, go outside and play.</td>
<td></td>
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<tr>
<td>Mar 9 &amp; 11</td>
<td>Plant reproduction and development, Exam 2</td>
<td>32 (all)</td>
<td>Article on OAKS: Secrets of bees’ buzz</td>
<td>Exam 2 is R 3/11</td>
<td>Draw and label a flower. Draw and label the cycle of alternation of generations.</td>
</tr>
<tr>
<td>Mar 16 &amp; 18</td>
<td>Intro to animals, nutrition, digestion</td>
<td>27.1, 33 (all), 34 (all), 37.3</td>
<td>Article on OAKS: immortal jellyfish</td>
<td>Quiz 7 (OAKS online) opens 3/18 closes 3/23</td>
<td>Draw and label the human digestive system indicating enzyme origins, molecular action, products.</td>
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<tr>
<td>Mar 23 &amp; 25</td>
<td>Gas exchange and circulation</td>
<td>39 (all), 40 (all)</td>
<td>Article on OAKS: how to hold your breath for 20 mins</td>
<td>Quiz 8 (OAKS online) opens 3/25 closes 3/30</td>
<td>Draw and label a mammal heart showing flow. Compare and contrast arteries, veins, capillaries. Diagram fish gills.</td>
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<tr>
<td>Mar 30 &amp; Apr 1</td>
<td>Osmoregulation and excretion</td>
<td>41.1, 41.2, 41.4, 41.5, 37.3</td>
<td>Article on OAKS: Girl who feels no pain</td>
<td>Quiz 9 (OAKS online) opens 4/9 closes 4/14</td>
<td>Draw, label kidney nephron w/role of each segment. Label permeability to water/salts/urea for each segment.</td>
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<tr>
<td>Apr 6 &amp; 8</td>
<td>Nervous system and neuromuscular junction</td>
<td>35 (all), 37.3, 38.4</td>
<td>Article on OAKS: Evolution of the scrotum</td>
<td>Quiz 10 (OAKS online) opens 4/8 closes 4/13</td>
<td>Describe how a toxin blocking the release of acetylcholine would affect you. And a toxin blocking the closing of Na+ channels?</td>
</tr>
<tr>
<td>Apr 13 &amp; 15</td>
<td>Reproduction, Exam 3</td>
<td>43.1-43.4, 37.3</td>
<td>Article on OAKS: Birth control reliability</td>
<td>Exam 3 is 4/15</td>
<td>Understand what regulates menstruation monthly cycle. See birth control study, NY Times (OAKS)</td>
</tr>
<tr>
<td>Apr 20 &amp; 21</td>
<td>Animal immunity, Course reflections Last day of class is Wednesday 4/21 (R schedule)</td>
<td>42</td>
<td>Article on OAKS: journey to science from an anti-vaxxer</td>
<td>Compare and contrast innate and adaptive immunity. New material (immunity) will be on the final exam. Use review sheet for final exam studying.</td>
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</tbody>
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**CUMULATIVE FINAL EXAM TUESDAY APRIL 27 8-10 AM**
**Title IX** The College of Charleston is committed to providing an environment free of all forms of prohibited discrimination, including sexual harassment and violence (i.e. sexual assault, domestic and dating violence, and gender or sex-based bullying and stalking). If you have experienced any form of discrimination or harassment, know that help and support are available.

Please be aware that College of Charleston employees, other than designated confidential resources, are expected to report information they receive about prohibited discrimination, including sexual harassment and sexual violence. This means that if you tell me about a situation involving sexual harassment or violence, or other form of discrimination or harassment, I have to share the information with my supervisor and the College’s Title IX Coordinator.

Students may speak to someone confidentially by contacting the Office of Victim Services at 843-953-2273, Counseling and Substance Abuse Services at 843-953-5640, or Student Health Services at 843-953-5520. Please visit the Office of Equal Opportunity Programs website (http://eop.cofc.edu/title-IX/index.php) for more information.

**Extra Credit** (see OAKS for details):
1. Selfie assignment provides two extra points on exam 1, due date 2/4
2. Attending (or watching Zoom recording of) a Darwin Week and/or Climate Fridays event [https://sustain.cofc.edu/events/climate-fridays.php](https://sustain.cofc.edu/events/climate-fridays.php) and writing up a summary (see directions on OAKS) provides three extra points on exam 2, 3, and Final (up to 6 extra points total). Due date by each exam date, respectively.

**Addendum** General Education information

**Introduction to Cell and Molecular Biology/Evolution, Form, and Function of Organisms**

**BIOL 111 & 111L/BIOL 112 & 112L**

**Department: Biology**

**Learning Goals & Objectives**

This general education science sequence provides a background for understanding and evaluating contemporary topics in biology. Students develop a foundational understanding of core concepts to use and on which to expand in upper level courses. They also develop the critical competencies that form the bases for the practice of science and use of scientific knowledge.

**Core Concepts**

This 2-semester course sequence in general biology addresses fundamental principles in biology to prepare students for sophomore and upper level courses in biology:

- **EQUATION: The diversity of life evolved over time by processes of mutation, selection, and genetic change. The theory of evolution by natural selection allows scientists to understand patterns, processes, and relationships that characterize the diversity of life.**
- **STRUCTURE AND FUNCTION: Basic units of structure define the function of all living things. Structural complexity, together with the information it provides, is built upon combinations of subunits that drive increasingly diverse and dynamic physiological responses in living organisms. Fundamental structural units and molecular and cellular processes are conserved through evolution and yield the extraordinary diversity of biological systems seen today.**
- **INFORMATION FLOW, EXCHANGE, AND STORAGE: The growth and behavior of organisms are activated through the expression of genetic information at different levels of biological organization and depend on specific interactions and information transfer.**
- **PATHWAYS AND TRANSFORMATIONS OF ENERGY AND MATTER: Biological systems grow and change by processes based upon chemical transformation pathways and are governed by the laws of thermodynamic and will be explored to understand how living systems operate, how they maintain orderly structure and**
function, and how physical and chemical processes underlie processes at the cellular level (i.e. metabolic pathways, membrane dynamics), organismal level (i.e. homeostasis) and ecosystem level (i.e. nutrient cycling).

- SYSTEMS: Living systems are interconnected and interacting and biological phenomena are the result of emergent properties at all levels of organization, from molecules to ecosystems to social systems. The course will explore the dynamic interactions of components at one level of biological organization to the functional properties that emerge at higher organizational levels.

The specific topics covered in each course include:

**Biology 111 & Biology 111L**
- Chemical and physical properties of life
- Cell form & function
- Energetics, metabolism, and photosynthesis
- The cell cycle
  - Mitosis and cell reproduction
  - Meiosis and sexual reproduction
- Mendelian genetics / Patterns of inheritance
- Human Inheritance
- The molecular basis of inheritance
- DNA and protein production
- Regulation of gene expression
- Some aspects of biotechnology

**Biology 112 & Biol 112 L**
- The development of evolutionary thinking
- Basic evolutionary processes
- Comparative plant form & function
- Comparative animal form & function

**Core Competencies**

- **Nature of Scientific Knowledge**
  - Understand the intellectual standards used by scientists to establish the validity of knowledge, evidence, and decisions about hypothesis & theory acceptance. These standards include: 1) science relies on external and naturalistic observations, and not internal convictions; 2) scientific knowledge is based on the testing of hypotheses and theories, which are under constant scrutiny and subject to revision based on new observations; 3) the validity of scientifically generated knowledge is established by the community of scientists through peer review and open publication of work.
  - Understand that new ideas in science are limited by the context in which they are conceived; are often rejected by the scientific establishment; sometimes spring from unexpected findings; and usually grow slowly, through contributions from many investigators.
  - Understand that science operates in a world defined by the laws of chemistry and physics.
  - Understand the differences and relationships among scientific theories, hypotheses, facts, laws, & opinions.
  - Understand the differences between science and technology, but also their interrelations.
  - Understand the dynamic (tentative) nature of science.

- **Scientific Methods of Discovery**
  - Understand the methods scientists use to learn about the natural world (observing; questioning; formulating testable deductive hypotheses; controlled experimentation when possible; observing a wide range of natural occurrences and discerning (inducing) patterns).
  - Apply physical/natural principles to analyze and solve problems.

- **Develop a Scientific Attitude**

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1 This learning goal will be measured as part of the general education assessment. The specific learning outcome to be measured is: **Students can apply physical/natural principles to analyze and solve problems.**
Develop habits of mind that foster interdisciplinary and integrative thinking (within biology; between biology and other sciences; between science and other disciplines).

- Develop an appreciation for the scientific attitude - a basic curiosity about nature and how it works.

- Develop scientific analysis and communication skills
  - Develop quantitative reasoning skills (quantitatively expressing the results of scientific investigations, or patterns in nature and using knowledge of biological concepts to explain quantitatively-expressed data or patterns).
  - Understand the probabilistic nature of science and the use/application of inferential statistics to test hypotheses.
  - Develop scientific information literacy (library, internet, databases etc...); find and evaluate the validity of science-related information.
  - Communicate scientific knowledge, arguments, and ideas in a variety of different contexts (scientific, social, cultural), utilizing a variety of different media (scientific articles, policy statements, editorials, oral presentations etc.).
  - Develop cooperative problem-solving skills (working effectively in teams), but also habits of mind and skills that foster autonomous learning.

- Develop an appreciation for the impact of science on society.
  - Develop an appreciation of humans as a part of the biosphere and the impact of biological science on contemporary societal/environmental concerns.
  - Knowledge of the history of the biological sciences and the influences of politics, culture, religion, race, and gender on the scientific endeavor.

**Signature assignments for measuring learning outcomes**

**Learning Outcome 1: Students apply physical/natural principles to analyze and solve problems.**
This learning outcome is assessed using the poster (or scientific article) generated in Biology 112 lab as part of the multi-week student-directed independent research project. In this project students use data they collect (or has been collected in actual research investigations) to test an hypothesis of their choosing. These projects may be themed, with all student groups addressing different aspects of a larger question, emphasizing the interdependence of various research groups needed to address complicated problems. This multi-week project begins the class identifying what questions need to be addresses in the larger problem. Individual student groups then become experts in these areas of the larger problem. The smaller research teams develop a hypothesis, and write a research proposal to test their hypothesis. Students collect (or use already collected data), summarize and statistically analyze the data, and draw conclusions.

**Learning Outcome #2 - Students demonstrate an understanding of the impact that science has on society.**

**Biology 112 lab** Students produce a written document based on one of the case-based labs (examples - policy statement, article, stake-holder professional letter or poster) that requires them to research and apply biological knowledge or evidence to defend or critique a proposed solution to a biology-related societal issue. Although the choice of the specific issue or proposed solution is course-section specific, some examples of potential issues include

- exploring environmental/health impacts of genetically modified organisms
- the use of performance enhancing drugs in sports
- the development of antibiotic resistance in disease organisms

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2 This learning goal will be measured as part of the general education assessment. The specific learning outcome to be measured is: *Students can demonstrate an understanding of the impact that science has on society.*