

Biology I: Big Questions (BIOS 10170) Fall 2020

Department of Biological Sciences

Course Overview

Big Questions is the fall introductory biology course for first year and sophomore students. This course uses a conceptual and integrated approach to learning fundamental concepts in biology, with an emphasis on scientific practice, and use of teaching methodologies consistent with how students learn. *Big Questions* is being implemented by eight faculty, each teaching one section in the context of an interesting and topical “big question” in their area of expertise. Thus, biological concepts and content will be introduced in the context of current scientific ideas or research topics that promote an active, engaged learning environment.

Course Outcomes

The contextual learning used by *Big Questions* will allow students to see how understanding different levels of organization and approaches in biology are needed to find solutions to contemporary problems such as climate change, infectious diseases, and the origin of life. In addition to foundational knowledge, students will learn process skills, such as critical analysis, while developing a framework on which to scaffold other biological information. This framework will help students retain knowledge and make connections amongst topics in other courses, but especially during the second, spring introductory biology course, *Molecules to Ecosystems*.

Course Requirements

Core goals of *Big Questions* include not only acquisition of fundamental biological knowledge and understanding, but also integration of intellectual virtues - academically, the right way to think and act - to emphasize that the approach used in science is critical for effective biological study. Such intellectual virtues are important for the development of both good (pursues knowledge, truth, and understanding) and successful (fulfills one's potential and accomplishes aims) students. Consequently, *Big Questions* will require students to develop and apply many intellectual virtues. For example, students will need to be inquisitive, asking deep and meaningful questions, while searching for understanding. Students will also need to be self-directed and independent in their thinking, going beyond what is learnt in the classroom in order gain deeper understanding. Furthermore, students will need to take intellectual risks, continuing to think and ask questions despite uncertainty about the outcomes. Finally, students will need to be receptive to new ideas and perspectives, especially those contrary to conventional wisdom or their existing knowledge.

Core Concepts & Learning Goals

Each module in *Big Questions* will integrate a set of core biological concepts:

1. **Evolution:** populations evolve through genetic change as a result of mutation, selection, drift and migration
2. **Biological Information and Flow:** Expression of genetic information controls the growth and behavior of organisms
3. **Structure-Function:** Basic units of structure define the function of all living things
4. **Transformations of Energy and Matter:** Biological systems grow and change using chemical transformation pathways governed by the laws of thermodynamics
5. **Systems:** Living systems are interconnected and interacting

By the end of the course, students will be able to:

1. Apply/analyze core concepts as they relate to two Big Questions in Biology
2. Articulate integration between core concepts
3. Draw inferences from qualitative and quantitative data
4. Apply an equation, model or quantitative technique to solve a biological problem
5. Develop proficiency in reading a scientific paper
6. Identify limitations in published material
7. Distinguish between valid versus opinion science
8. Speak proficiently about a science issue
9. Articulate how biology solves societal problems
10. Identify ethical implications of research
11. Approach a problem from a biological perspective

Course Details

- 3-credit course, MWF 1:00 -1:50 PM
- Pre-requisites: None
- Text: Course packets by each instructor
- Course Assessment: Your final grade will be the combination of your two module grades and module-independent activities

The fall semester is divided into two half-semester modules. Students will indicate their preferences for the modules in the first week of the semester after hearing about the themes of the different modules from the professors and will begin Module I on Friday, 8/14.

Four modules will be delivered via dual delivery, and four modules will be delivered online only. Each student will be assigned to one dual delivery module and one online-only module. "Dual delivery" means that the instructor plans to deliver the course in-person in a classroom. Most students will attend in-person, but some will attend remotely. "Online only" means that the instructor and all students will meet at the appointed time via Zoom.

Textbook

The format of this course, and the diverse content in each module, is supported by assigned readings taken from a variety of sources. There is no required textbook for *Big Questions*. Readings will be provided by the instructor in each module. We urge you to read all assigned material to reinforce the topics and examples we cover in lectures.

Course Web Site

General information on the *Big Questions* course can be found on the ND Biology Department

website (<https://biology.nd.edu/undergraduate/introductory-biology/>). Each module will maintain a website in the *Sakai* system. These sites contain the syllabus and the daily program for each module. *Lecture material and assigned readings are found in the Resources tab.* In addition, *Sakai* sites will allow you to access your assignment, quiz and exam scores.

Assessments

Your grade in this course will be determined by the combination of points from the two modules (equally weighted) and an additional small set of module-independent activities focused on integration across all of biology and intellectual virtues.

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|-------------------------------|----------|
| TOTAL POINTS FOR EACH MODULE: | 100 |
| MODULE-INDEPENDENT POINTS: | <u>5</u> |
| TOTAL POINTS FOR COURSE: | 205 |

In each module, points will be determined through a variety of assignments, quizzes and an exam. The breakdown of points is given below. All modules will follow this general format for the number of assignments and the points for each. If needed, final grades will be standardized across modules at the end of the semester. The content and details for these assignments will be unique to the material presented in each module.

- 1) **Quizzes/Problem Sets (32 pts)** - 4 total. Some assignments may be completed in class and others out of class.
- 2) **Concept Checks (10 pts)** - Short assignments designed to assess knowledge and engagement. Graded on a credit / no credit basis.
- 3) **Paper analysis (8 pts)** - This assignment is designed to improve your skills in critical evaluation of peer-reviewed articles.
- 4) **Writing/Presentation assignment (20 pts)** - The details for this assignment will be presented in each module.
- 5) **Exam (30 pts)** - At the end of each module there will be an exam covering the content of the module. These will be a mixed format, including multiple choice, short answer, etc. The final exam will include 2-3 synthesis questions that evaluate your ability to integrate concepts across modules and areas of Biology and a question that asks you to reflect on your personal development of intellectual virtues.

Module-independent points will be earned through participation in and completion of assignments associated with an initial class session covering intellectual virtues and a mid-semester day focused on synthesis across modules. Final exam questions focused on synthesis and intellectual virtues will also be included in these module-independent points.

Anticipated Course Grading Scale

| <u>Points</u> | <u>Grade</u> |
|----------------|--------------|
| 190.7 - 205 | A |
| 184.5 - 190.69 | A- |
| 178.4 - 184.49 | B+ |

| | |
|----------------|----|
| 170.2 - 178.39 | B |
| 164.0 - 170.19 | B- |
| 157.9 - 163.99 | C+ |
| 149.7 - 157.89 | C |
| 143.5 - 149.69 | C- |
| 123.0 - 143.49 | D |
| 0.0 - 122.99 | F |

Schedule

Below is an outline of the main dates for the course. The first two days are an introduction to the course structure and modules and an exercise in Intellectual Virtues. The process for module selection will be described the first day.

Date

| | |
|--------------------------|---|
| August 10 | Content delivered online. Students will watch videos introducing the course and describing each of the modules. |
| August 12 | Content delivered online at the scheduled class time. Intellectual Virtues. |
| August 14 - September 23 | 18 sessions for Module I |
| September 25 | Review Session |
| September 28 | In class Exam for Module I |
| September 30 | Synthesis Day with in class exercises |
| October 2 - November 11 | 18 sessions for Module II |
| TBD | Final Exam |

How to be a good and successful Big Questions student

1. Attend class regularly. Be courageous and participate in classroom discussions and activities in order to master the material. In-class exercises and active learning activities are essential tools to reinforce key concepts.
2. Use the resources available to you. Instructors, teaching assistants, and Learning Resource Center tutors are here to help you build knowledge and think like a biologist. The more you talk about the material with other students and your instructors, the more comfortable you will be with the concepts.
3. Be an autonomous and responsible student. Finish assigned readings before lectures as described and complete all assignments on time and to the best of your abilities.
4. Be open minded and engage with your fellow students. Contribute to meaningful group discussions in class and strive to go over the day's lecture each day with a study partner. Cramming to learn the material for exams will not be successful!
5. Embrace your inner wonder. This course is designed to spark your biological curiosity and hone your ability to ask and answer biological questions. Go beyond memorizing facts, and endeavor to understand and apply concepts.

Zoom Etiquette

- Ensure you have the Zoom app downloaded on your computer well in advance; you can download the app ([zoom download link](#)).
- Test the Zoom link provided by your instructor or meeting facilitator and check for connectivity issues. If possible, test in the same space and network you will be using during the meeting or class.
- In the Zoom app settings, make sure the option to *Turn off my video when joining meeting* is **NOT CHECKED**. *Note:* If you have connection problems, turn video off to decrease your need for network bandwidth.
- Likewise, set your microphone to mute when you join a session: **Audio section > Always mute microphone when joining meeting** checkbox.
- Join each session 10-15 minutes early.
- Use a wired internet connection instead of WiFi whenever possible.
- **Please use your preferred full name when you join the Zoom session.** Do not use any usernames or “nicknames” that don’t represent your real name. Instructors or facilitators may need to take attendance and call on you. You can change your displayed name in the *Participants* side pane by selecting yourself and clicking **Rename**.
- Join from a quiet, private location
- Use headphones or earbuds
- Keep your microphone muted unless you are speaking
- Turn your video on unless your instructor or facilitator says otherwise; if you run into connection issues, turn your video off to try to help
- If using video, location considerations:
 - Camera position
 - Background distractions
 - Adequate room lighting
- If using video, act as if you are in a normal classroom or meeting:
 - Wear appropriate clothing
 - Do not eat during the session
 - Be *present* and don’t multitask
 - Sit on a chair and use a table for your laptop
 - Make the necessary preparations in advance of your online Zoom session (For example, when possible, use the restroom before the session starts)
 - Raise your hand in the *Participants* side pane or private chat your instructor or facilitator if you have any technical problems.

Honor Code

The Notre Dame Academic Code of Honor Pledge is observed in this course. “As a member of the Notre Dame community, I acknowledge that it is my responsibility to learn and abide by principles of intellectual honesty and academic integrity, and therefore I will not participate in or tolerate academic dishonesty.” Thus, you are bound by the Honor Code in recording answers to quizzes and exams.

Accommodations for Students with Disabilities

If you require any special accommodations for the Big Questions course, please let us know as soon as possible. It is the policy and practice of the University of Notre Dame to provide reasonable accommodations for students with properly documented disabilities. Students who have questions about Sara Bea Disability Services or who have, or think they may have, a disability are invited to contact Sara Bea Disability Services for a confidential discussion in the Sara Bea Center for Students with Disabilities or by phone at [574-631-7157](tel:574-631-7157). Because the University’s Academic Accommodations Processes generally require students to request accommodations well in advance of the dates when they are needed, students who believe they may need an accommodation for this course are encouraged to contact Sara Bea Disability Services at their earliest

opportunity. Additional information about Sara Bea Disability Services and the process for requesting accommodations can be found at sarabeadisabilityservices.nd.edu

Health and Safety Protocols

In this class, as elsewhere on campus, students must comply with all University health and safety protocols, including:

- Face masks that completely cover the nose and mouth will be worn by all students and instructors;
- Physical distancing will be maintained in all instructional spaces;
- Students will sit in assigned seats throughout the semester, which will be documented by faculty for purposes of any needed contact tracing; and
- Protocols for staged entry to and exit from classrooms and instructional spaces will be followed.

We are part of a community of learning in which compassionate care for one another is part of our spiritual and social charter. Consequently, compliance with these protocols is an expectation for everyone enrolled in this course. If a student refuses to comply with the University's health and safety protocols, the student must leave the classroom and will earn an unexcused absence for the class period and any associated assignments/assessments for the day. Persistent deviation from expected health and safety guidelines may be considered a violation of the University's "Standards of Conduct," as articulated in *du Lac: A Guide for Student Life*, and will be referred accordingly.

Attendance

Attendance in lecture is mandatory. You will be held responsible for lecture material on quizzes, assignments, and exams. Not all of this material will be posted on the class website. For example, video clips, figures, and information may be provided during class and you are responsible for that information. Active learning exercises in class are an essential component of this course and cannot be made-up outside of class.

In dual-delivery modules, the following protocol governs whether attendance should be in-person or online: every morning, members of the Notre Dame Community will be asked to complete a daily health check and submit their information via the Return to Campus Advisor application. The health check application will indicate one of the following:

- a) Student is cleared for class and should attend class in person; or
- b) Student is advised to stay home to monitor symptoms and should participate in class virtually and complete all assignments and assessments; or
- c) Student must consult a healthcare provider and should contact University Health Services (UHS) for an assessment. In the meantime, the student should participate in class virtually and complete all assignments and assessments. Depending on the medical assessment, UHS will follow the University's standard protocol for obtaining an excused absence for medical reasons.

In online-only modules, attendance will be online-only.

Late Assignments and Make-up Exams

Assignments turned in late without a University-approved excuse will be penalized on a sliding scale:

- up to 24 hours late will lose 25% of points earned
- 24 to 48 hours late will lose 50% of points earned

-48 to 72 hours late will lose 75% of points earned

-over 72 hours late will receive no credit

If you can't make it to class - submit the assignment early.

Make-up exams will be given only for students who notify their Professor prior to the exam and who provide an official university-approved excuse from your Dean's office. We will require appropriate documentation for the legitimate absence (such as a letter from a treatment provider within 2 days following the absence). Thus, a makeup exam would be scheduled only for *extraordinary* reasons. Again, for emergencies and medical problems, we must be informed of this *in advance of the exam*. This means an e-mail or phone call stating that you will miss the exam. Subsequent confirmation will be required from your Dean's office.

Questions and concerns on graded assignments or exams must be addressed within one week of the return of the assignment or exam.

Biology I: Big Questions Modules for Fall 2020

Blindness: Can We See Potential Gene and Stem Cell Therapies? (dual delivery)

David Hyde

Have Humans Changed the Rules? Biology in the Anthropocene (online)

Stuart Jones

Who's in Control? The Role of Microbiomes in Our World (online)

Shaun Lee

Hero or Villain: How Might Earth's Ecosystem Resolve the Climate Question? (online)

David Medvigy

Humans: How Did We Get Here, and Why Are We Like This? (dual delivery)

Mike Pfrender

What Powers Life on Earth? (online)

Jeanne Romero-Severson

Natural Selection: The Reason Why We Haven't Cured Cancer? (dual delivery)

Zach Schafer

Harnessing Our Immune System to Fight Disease: To Be or Not to Be? (dual delivery)

Jeff Schorey

(On next page)

INTRODUCTORY BIOLOGY

CONCEPTUAL FRAMEWORK

**BUILD FOUNDATIONAL
KNOWLEDGE**

**THINK LIKE
A BIOLOGIST**

**DEVELOP ENTHUSIASM
FOR BIOLOGY**

