
Term Information

Effective Term Spring 2026

General Information

Course Bulletin Listing/Subject Area Biology
Fiscal Unit/Academic Org Introductory Biology - D0326
College/Academic Group Arts and Sciences
Level/Career Undergraduate
Course Number/Catalog 4210
Course Title Undergraduate Research in Biology Education
Transcript Abbreviation Ugd Rsch in Bio Ed
Course Description A course-based undergraduate research experience for students to gain valuable skills as both researchers and lifelong learners. This course focuses on discipline-based research (educational research) and human subjects research to explore the academic environment and answer questions around the topic of biology education.
Semester Credit Hours/Units Fixed: 3

Offering Information

Length Of Course 14 Week, 12 Week
Flexibly Scheduled Course Never
Does any section of this course have a distance education component? No
Grading Basis Letter Grade
Repeatable No
Course Components Lecture
Grade Roster Component Lecture
Credit Available by Exam No
Admission Condition Course No
Off Campus Never
Campus of Offering Columbus, Lima, Mansfield, Marion, Newark, Wooster

Prerequisites and Exclusions

Prerequisites/Corequisites Biology 1113xx, 1114xx, and 3501xx, or permission of instructor.
Exclusions
Electronically Enforced Yes

Cross-Listings

Cross-Listings

Subject/CIP Code

Subject/CIP Code 13.0301
Subsidy Level Baccalaureate Course
Intended Rank Junior, Senior

Requirement/Elective Designation

The course is an elective (for this or other units) or is a service course for other units

Course Details

Course goals or learning objectives/outcomes

- Find and evaluate the credibility of a variety of sources of scientific information.
- Interpret and summarize evidence in primary literature.
- Evaluate claims in scientific papers, popular science articles, and other sources using evidence-based reasoning.
- Recognize gaps in our current understanding of a topic and identify what specific information is missing.
- Develop research questions based on observations.
- Formulate testable hypotheses.
- Compare strengths and limitations of various study designs
- Design controlled experiments
- Execute protocols and accurately record measurements and observations.
- Identify methodological problems and suggest how to troubleshoot them.
- Analyze data, summarize resulting patterns and draw appropriate conclusions.
- Describe sources of error and uncertainty in data.
- Make evidence-based arguments using your own and others' findings.
- Relate conclusions to original hypothesis, consider alternative hypothesis, and suggest future research directions based on findings.
- Record, organize and annotate simple data sets.
- Create and interpret informative graphs and other data visualizations
- Select, carry out, and interpret, statistical analyses.
- Use appropriate language style, and various modes to communicate science effectively to targeted audiences.
- Elicit, listen to, and incorporate ideas from teammates with different perspectives.
- Work effectively with teammates to complete projects.
- Evaluate feedback from others and revise work or behavior appropriately
- Critique others' work and ideas constructively and respectfully.

Content Topic List

- Biology Education Research in the academic environment
- Developing research questions
- Effective use of primary literature
- Developing hypotheses and predictions
- Data collection and protocols
- Statistical analysis
- Reporting of data
- Scientific posters

Sought Concurrence

No

COURSE REQUEST
4210 - Status: PENDING

Last Updated: Vankeerbergen,Bernadette
Chantal
11/21/2025

Attachments

- Biology BS Curriculum Map.docx: Curriculum Map

(Other Supporting Documentation. Owner: Andrews,Adam Lee)

- Biology 4210 Revision Cover Letter.pdf

(Cover Letter. Owner: Andrews,Adam Lee)

- Biology 4210_Syllabus 20251028.pdf

(Syllabus. Owner: Andrews,Adam Lee)

Comments

- Please see feedback email sent to department 10-27-2025. (by Steele,Rachel Lea on 10/27/2025 06:37 PM)
- Please see Subcommittee feedback email sent 9/18/25. (by Neff,Jennifer on 09/18/2025 06:50 PM)
- Please see Subcommittee feedback email sent 04/09/2025. (by Hilty,Michael on 04/09/2025 08:52 AM)
- If this course will be able to count in your major (even as an elective), please upload an updated curriculum map. (by Vankeerbergen,Bernadette Chantal on 03/19/2025 01:32 PM)

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Andrews,Adam Lee	03/07/2025 01:09 PM	Submitted for Approval
Approved	Kulesza,Amy Elizabeth	03/07/2025 01:10 PM	Unit Approval
Revision Requested	Vankeerbergen,Bernadette Chantal	03/19/2025 01:32 PM	College Approval
Submitted	Andrews,Adam Lee	03/20/2025 10:42 AM	Submitted for Approval
Approved	Kulesza,Amy Elizabeth	03/20/2025 10:45 AM	Unit Approval
Approved	Vankeerbergen,Bernadette Chantal	03/20/2025 12:54 PM	College Approval
Revision Requested	Hilty,Michael	04/09/2025 08:52 AM	ASCCAO Approval
Submitted	Andrews,Adam Lee	08/11/2025 12:41 PM	Submitted for Approval
Approved	Kulesza,Amy Elizabeth	08/20/2025 02:54 PM	Unit Approval
Approved	Vankeerbergen,Bernadette Chantal	08/25/2025 09:44 AM	College Approval
Revision Requested	Neff,Jennifer	09/18/2025 06:50 PM	ASCCAO Approval
Submitted	Andrews,Adam Lee	09/29/2025 11:25 AM	Submitted for Approval
Approved	Kulesza,Amy Elizabeth	09/29/2025 12:15 PM	Unit Approval
Approved	Vankeerbergen,Bernadette Chantal	09/29/2025 12:23 PM	College Approval
Revision Requested	Steele,Rachel Lea	10/27/2025 06:37 PM	ASCCAO Approval
Submitted	Andrews,Adam Lee	11/10/2025 03:13 PM	Submitted for Approval
Approved	Kulesza,Amy Elizabeth	11/10/2025 03:24 PM	Unit Approval
Approved	Vankeerbergen,Bernadette Chantal	11/21/2025 04:06 PM	College Approval
Pending Approval	Jenkins,Mary Ellen Bigler Neff,Jennifer Vankeerbergen,Bernadette Chantal Steele,Rachel Lea	11/21/2025 04:06 PM	ASCCAO Approval



10 November 2025

To the Members of the NMS Panel:

While we had hoped for a different decision from the Themes Subcommittee, we respect their decision that, as designed, Biology 4210 – *Undergraduate Research in Biology Education* would not be appropriate as a GE Themes course. Subsequently, we have decided to make some adjustments to the proposal and are resubmitting the course as a non-GE elective for the Biology Major.

To move the course in the new direction, we have made the following changes since the time of the NMS Panel's most recent review:

- All references in the syllabus to the GE Theme: Lived Environments have been removed.
- The course has been reduced from 4 credit hours to 3 hours to be a better fit for the Major's electives. The weekly contact hours have been reduced from 2 x 110 minutes to 2 x 80 minutes and adjustments to the workload have correspondingly been made.
- We have removed Biology 1101 and 1110 as eligible prerequisites as these courses are intended for non-STEM Majors. We have added Biology 3501 – *Integrative Skills in Biology* as a prerequisite instead, with the intention that Biology 4210 would be more aligned with the Biology content and skills expected of an upper-level course for the Major.

We look forward to the Panel's reconsideration of this revised version of the course and thank the Panel for their efforts.

Sincerely,

Adam Andrews

Assistant Director for Curriculum & Instruction



THE OHIO STATE UNIVERSITY

Biology 4210
Undergraduate Research in
Biology Education
Spring 2026 – 3 Credit Hours

Lecturer: Amy Kulesza, Ph.D.

Email: kulesza.5@osu.edu

Office: 240A Jennings Hall

Student Hours: TBD

other times scheduled by appointment

Class Meeting Schedule:

Lecture: Twice Weekly for 80 minutes

Prerequisites:

Biology 1113xx, 1114xx, and 3501.xx, or permission of instructor.

Required Course Materials:

This course has no required text. Students can expect regular reading assignments from the primary and secondary literature, which will be linked on Carmen.

Credit Hours and Work Expectation:

This is a 3-credit hour research course. According to Ohio State policy, students should expect approximately four hours of week of direct instruction and approximately 6 hours of week associated with homework and the research project.

Course Description:

A course-based undergraduate research experience for students to gain valuable skills as both researchers and lifelong learners. This course focuses on discipline-based research (educational research) and human subjects research to explore the academic environment and answer questions around the topic of biology education.

Course Learning Outcomes:

Students will draw on their experiences as learners in a previous biology course to explore and make connections to the broader academic environment, synthesizing new information through active research in the field of biology education. An authentic research project will allow students to experience the complexity and variability that comes naturally with human subjects research while understanding how that research can directly impact the academic environment through analysis of practice and development of improved pedagogical techniques. As part of the research project, students will have the opportunity to measure perceptions of students and / or faculty and how those perceptions manifest in the academic classroom environment. Students in the course will have the opportunity to actively contribute to the authentic analysis and synthesis occurring in the academic environment.

The major goals of this course are adapted from the Vision and Change report (AAAS, 2010), which has outlined core competencies that all life sciences students should develop the following skills: *Process of science skills, Quantitative reasoning skills, and Communication and collaboration skills.*

Biology 4210– Undergraduate Research in Biology Education

V & C Core Competency	Goals	Expected Learning Outcomes
Develop Process of Science Skills	Goal 1: Improve students' information literacy.	Successful students are able to ... 1.1 Find and evaluate the credibility of a variety of sources of scientific information.
		1.2 Interpret and summarize evidence in primary literature.
		1.3 Evaluate claims in scientific papers, popular science articles, and other sources using evidence-based reasoning.
	Goal 2: Develop students' abilities to formulate research questions.	2.1 Recognize gaps in our current understanding of a topic and identify what specific information is missing.
		2.2 Develop research questions based on observations.
		2.3 Formulate testable hypotheses.
	Goal 3: Develop students' abilities to design a scientific study.	3.1 Compare strengths and limitations of various study designs
		3.2 Design controlled experiments
		3.3 Execute protocols and accurately record measurements and observations.
		3.4 Identify methodological problems and suggest how to troubleshoot them.
	Goal 4: Enhance students' abilities to interpret, evaluate, and draw conclusions from data.	4.1 Analyze data, summarize resulting patterns and draw appropriate conclusions.
		4.2 Describe sources of error and uncertainty in data.
		4.3 Make evidence-based arguments using your own and others' findings.
		4.4 Relate conclusions to original hypothesis, consider alternative hypothesis, and suggest future research directions based on findings.
Quantitative reasoning skills	Goal 5: Students will develop quantitative and computational data analytic skills.	5.1 Record, organize and annotate simple data sets.
		5.2 Create and interpret informative graphs and other data visualizations
		5.3 Select, carry out, and interpret, statistical analyses.
Communication and collaboration skills	Goal 6: Practice sharing ideas data and findings with others clearly and accurately.	6.1 Use appropriate language style, and various modes to communicate science effectively to targeted audiences.
	Goal 7: Work productively in teams with people who have diverse backgrounds, skillsets, and perspectives.	7.1 Elicit, listen to, and incorporate ideas from teammates with different perspectives.
		7.2 Work effectively with teammates to complete projects.
	Goal 8: Provide and respond to constructive feedback to improve individual and teamwork.	8.1 Evaluate feedback from others and revise work or behavior appropriately
		8.2 Critique others' work and ideas constructively and respectfully.

Students in Biology 4210 will conduct an authentic undergraduate biology education research project as a whole class. Students will engage in the process of science including developing research questions, collecting data, analysis, and communicating their findings through writing. Students will learn both qualitative and quantitative biology education research methodologies. We will use SPSS for all statistical analyses, but no prior experience is needed. The overarching goal of this course is to deepen students' knowledge of biology education research, strengthen students' abilities to think critically, and to enhance their knowledge of research methodologies. This course will be unique because some of the assignments will depend on how the research progresses.

Grading and Evaluation:

Graded assignments may come in three forms, and students should note the expectations for each in the descriptions of our class assignments below:

- **Independent Work (↑):** Strictly non-collaborative, original-individual work. You may discuss this assignment only with your instructor. Discussions with other individuals, either in person or electronically, are strictly prohibited and constitute academic misconduct.
- **Required Collaboration (↑↑):** An explicit expectation for collaboration among students either in-class or outside (i.e., group work).
- **Optional Collaboration (↑↑↑):** Students are permitted, but not required, to discuss the assignment or ideas with each other. However, all submitted work must be one's original and individual creation.

Assignment	Points	Assignment Type
Practice Honor Lock Quiz	3	↑
Module Quizzes (8 x 20 points each)	160	↑
Human Subjects Training (3 x 10 points each)	30	↑
Course Specific Training	30	↑↑
Literature Review & Annotated Bibliography	50	↑↑↑
Research Proposal	50	↑↑↑
Group Meeting Presentation	30	↑↑
Scientific Poster	50	↑↑
Poster Peer Review	20	↑
Poster Presentation	30	↑↑↑
Minute Papers (2 x 5 points)	10	↑
Final Course Reflection	10	↑
SALG	5	↑
Total Points Possible	478	

Practice HonorLock Quiz

You will complete a practice quiz using HonorLock at the beginning of the term. You will not be graded on the content of the quiz, just whether or not you completed it. The purpose of this practice quiz is to ensure you've downloaded the software properly and for you to familiarize yourself with the HonorLock process before taking our first lecture quiz.

Module Quizzes

There will be eight quizzes throughout the semester (see schedule). Quiz questions will be based on lecture material, assigned readings, and videos. The quizzes will mainly focus on the previous weeks' material, but because most of the concepts in this course build on one another, relevant material will be included from previous topics as well. Question formats may include multiple choice, short answer, matching, fill-in-the-blank, labeling, etc. There will not be traditional, large exams in the class, nor a final exam. Quizzes will be administered remotely using HonorLock. You will have from 12:00 AM on

Friday until 12:00 PM on Mondays to complete each quiz as indicated on the course schedule. Quiz extensions will only be given for extreme circumstances. You are strongly encouraged not to wait until the last minute to complete the quiz as technological issues (i.e. internet or power failures, etc.) will not be grounds to extend the quiz window. *If a technological issue arises, please contact Dr. Kulesza. It may be possible to reset a quiz attempt during the quiz window, but deadlines will not be extended if the attempt is not reset or technical problems are not solved before the deadline.*

HONORLOCK:

- HonorLock, an online proctoring tool, will be used during this course for the scheduled quizzes.
- HonorLock offers you flexibility to take your quizzes at the time and in the location of your choosing. Students are required to have a webcam (USB or internal) with a microphone and a strong and stable internet connection. During the course of a quiz, HonorLock will record the testing environment, therefore students should select private spaces for the quiz session where disruptions are unlikely and where recording devices can be enabled. Instructions for HonorLock use will be provided. The tool has **limitations in its accessibility for students reliant upon screen readers and keyboard navigation. If you have concerns about using an online proctoring tool for the reasons listed above or in general, please work with your instructor to find an equivalent alternative. Additional information on academic integrity at Ohio State and [recommended proctoring options](#) are available.**
- HonorLock offers free [student support](#) through web chat or email.

Human Subjects Training

Students will complete human subjects (CITI) training, Institutional Data Policy training, Responsible Conduct of Research training, and a Conflict-of-Interest form. Your certificates of completion will be uploaded to Carmen.

Course Specific Training

Depending on each cohort's specific projects, students may need additional training in interviewing participants, running focus groups, or using survey tools such as Qualtrics. See Carmen for details about your cohort's training.

Literature Review & Annotated Bibliography

Students will conduct a literature review on their research topic using appropriate databases, and write an annotated bibliography. See Carmen for assignment details.

Research Proposal

Students will write a brief research proposal in the style of an Institutional Review Board (IRB) proposal. This will be as a whole class, or in smaller groups as needed. See Carmen for assignment guidelines.

Group Meeting Presentation:

Oral presentations are a hallmark of life in the scientific community. Each student will present a small portion (~5-7 minutes) of the research comprising their ongoing research to the class.

Scientific Poster:

In pairs, students will present a summary of their research in the form of a Scientific Poster, which will be presented during the CLSE poster session (Date TBD), a traditional scientific poster session style event.

Poster Peer Review:

Students will be expected to visit multiple posters and provide written feedback in the form of a peer review.

Minute Papers

At the end of a class session, students will be asked to write (in one minute) either a quick summary of the day's activities related to their research project, or the muddiest point—something they are still confused about or struggling with. The minute paper can promote metacognitive skill development in students (Angelo and Cross, 1993). See course schedule for due dates.

Final Course Reflection

Students will submit a final reflection paper discussing at least three course learning outcomes in which they made gains over the course of the research project.

SALG (5 points):

At the end of the course, 5 points will be assigned based on participation in a survey, the Student Assessment of Learning Gains (SALG). Grades on the SALG will be based solely on completion. The SALG will allow students to reflect on the gains they made in the course, including on the Learning Outcomes, Skills, and in other areas pertaining to the research goals.

Your Final Grade:

Your final grade will be based on the percentage of the 478 points that you earn during the course of the semester as described above. Please note that we do not grade the course on a curve and Carmen does not round averages up to the next nearest percentage point, so 92.11% and 92.97% both earn the grade of A-. Final letter grades will be determined by the university-approved grade scale below:

Grade Scale:

A	A-	B+	B	B-	C+	C	C-	D+	D	E
100 – 93.0%	92.9 – 90.0%	89.9 – 87.0%	86.9 – 83.0%	82.9 – 80.0%	79.9 – 77.0%	76.9 – 73.0%	72.9 – 70.0%	69.9 – 67.0%	66.9 – 60.0%	59.9 – 0%

Posting of Grades:

All grades will be posted on Carmen. After grades are posted you have 10 working days to challenge any grade or inquire regarding an unposted or missing grade. **After that time, grades are final.** To challenge or inquire about a missing grade, contact your instructor.

****IMPORTANT****

Make sure that all of your grades are properly posted on Carmen as you receive them. Challenges about grades, particularly after the end of the semester, will not be entertained after the 10-day grace period.

Late Assignments:

All assignments are due on the date and time prescribed in the course schedule. Late work will not be accepted, except in rare (and documentable) circumstances.

Absences:

If you miss a class, you must contact your instructor within 48 hours of their missed class in order to be eligible to complete a make-up assignment. All make-up work requires a valid written excuse from a doctor, therapist, athletic coach, or other person involved with the absence (preferably before the event occurs, if it's a planned absence). We will consider one absence for every student to be excused without documentation, however students must contact their instructor within **48 hours** of their missed class to receive the make-up exercise. Therefore, it is essential that you contact your instructor immediately if you miss a class, or if you know in advance that you cannot attend class on a specific date.

Make-up work must be completed and received within one week of the original assignment date (unless very unusual circumstances apply), or else you forfeit all points for that workshop.

Excused absences include, but are not limited to:

1. Illness and injury
2. Mental health
3. Disability-related concerns
4. Military service
5. Death in the immediate family
6. Religious observance
7. Academic field trips
8. Participation in university sanctioned concert or athletic event
9. Participation in university disciplinary hearings

If you have a reason to miss class that is not listed above, please reach out to the instructor to discuss your options. It is the intention of the Center for Life Sciences Education to remain supportive of the needs of each of our students. Students who do not contact their instructor within 48 hours of the missed class will not be eligible for make-up work.

Disability Services:

The university strives to maintain a healthy and accessible environment to support student learning in and out of the classroom. If you anticipate or experience academic barriers based on your disability (including mental health, chronic, or temporary medical conditions), please let the instructor know immediately so that we can privately discuss options. To establish reasonable accommodations, we may request that you register with Student Life Disability Services. After registration, make arrangements with the instructor as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. This will help us ensure that your individual needs will be met appropriately and fairly.

If you are ill and need to miss class, including if you are staying home and away from others while experiencing symptoms of a viral infection or fever, please let your instructor know immediately. In cases where illness interacts with an underlying medical condition, please consult with Student Life Disability Services to request reasonable accommodations. You can connect with them at slds@osu.edu; 614-292-3307; or slds.osu.edu.

Religious Accommodations:

Ohio State has had a longstanding practice of making reasonable academic accommodations for students' religious beliefs and practices in accordance with applicable law. In 2023, Ohio State updated its practice to align with new state legislation. Under this new provision, students must be in early communication with their instructors regarding any known accommodation requests for religious beliefs and practices, providing notice of specific dates for which they request alternative accommodations within 14 days after the first instructional day of the course. Instructors in turn shall not question the sincerity of a student's religious or spiritual belief system in reviewing such requests and shall keep requests for accommodations confidential.

With sufficient notice, instructors will provide students with reasonable alternative accommodations with regard to examinations and other academic requirements with respect to students' sincerely held religious

beliefs and practices by allowing up to three absences each semester for the student to attend or participate in religious activities. Examples of religious accommodations can include, but are not limited to, rescheduling an exam, altering the time of a student's presentation, allowing make-up assignments to substitute for missed class work, or flexibility in due dates or research responsibilities. If concerns arise about a requested accommodation, instructors are to consult their tenure initiating unit head for assistance.

A student's request for time off shall be provided if the student's sincerely held religious belief or practice severely affects the student's ability to take an exam or meet an academic requirement **and** the student has notified their instructor, in writing during the first 14 days after the course begins, of the date of each absence. Although students are required to provide notice within the first 14 days after a course begins, instructors are strongly encouraged to work with the student to provide a reasonable accommodation if a request is made outside the notice period. A student may not be penalized for an absence approved under this policy.

If students have questions or disputes related to academic accommodations, they should contact their course instructor, and then their department or college office. For questions or to report discrimination or harassment based on religion, individuals should contact the [Civil Rights Compliance Office](#).

Policy: [Religious Holidays, Holy Days and Observances](#)

Intellectual Diversity:

Ohio State is committed to fostering a culture of open inquiry and intellectual diversity within the classroom. This course will cover a range of information and may include discussions or debates about controversial issues, beliefs, or policies. Any such discussions and debates are intended to support understanding of the approved curriculum and relevant course objectives rather than promote any specific point of view. Students will be assessed on principles applicable to the field of study and the content covered in the course. Preparing students for citizenship includes helping them develop critical thinking skills that will allow them to reach their own conclusions regarding complex or controversial matters.

Weather or Other Short-Term Closing:

Should in-person classes be canceled, students will be notified as to which alternative methods of teaching will be offered to ensure continuity of instruction for this class. Communication will be via Carmen announcements and course-wide email.

Instructor Feedback and Response Expectations:

- **Email response:** The CLSE's expectation of instructors is that emails will be responded to within one business day. If your email is sent during the evening or over the weekend, you may not receive a response until the next business day.
- **Class announcements:** I will send important class-wide messages through the Announcements tool in Carmen. Please check [your notification preferences](#) (go.osu.edu/canvas-notifications) to ensure you receive these messages.
- **Graded assignments:** Assignments will be graded and returned to you within one week after they were due. All scores are posted on Carmen no later than the day the graded assignment is returned.

Course Technology:

For help with your password, university e-mail, Carmen, or any other technology issues, questions, or requests, contact the OSU IT Service Desk. Standard support hours are available at <https://ocio.osu.edu/help/hours>, and support for urgent issues is available 24x7.

- **Self-Service and Chat support:** <http://ocio.osu.edu/selfservice>
- **Phone:** 614-688-HELP (4357)
- **Email:** 8help@osu.edu
- **TDD:** 614-688-8743

Carmen

- Carmen, Ohio State's Learning Management System, will be used to host materials and activities throughout this course. To access Carmen, visit [Carmen.osu.edu](https://carmen.osu.edu). Log in to Carmen using your name.# and password. If you have not setup a name.# and password, visit my.osu.edu.
- Help guides on the use of Carmen can be found at <https://resourcecenter.odee.osu.edu/carmen>
- **This online course requires use of Carmen (Ohio State's learning management system) and other online communication and multimedia tools. If you need additional services to use these technologies, please request accommodations with your instructor.**
- [Carmen accessibility](#)

CarmenZoom

- Office hours will be held through Ohio State's conferencing platform, CarmenZoom. A separate guide to accessing CarmenZoom and our office hours is posted on the course Carmen page under Files.
- Students may use the audio and video functions if a webcam and microphone are available. If not, there is still a chat function within CarmenZoom for the student to live chat with the professor or TA in the virtual office hours room.
- [Carmen Zoom](#) help guide

TurnItIn

- Students at The Ohio State University are accountable for the integrity of the work they submit. Therefore, you should be familiar with the guidelines provided by the [Committee on Academic Misconduct \(COAM\)](#) and [Section A of OSU's Code of Student Conduct](#) in order to meet the academic expectations concerning appropriate documentation of sources. In addition, OSU has made TurnItIn, a learning tool and plagiarism prevention system, available to instructors. For this class, you will submit your papers to TurnItIn from Carmen. When grading your work, I will interpret the originality report, following [Section A of OSU's Code of Student Conduct](#) as appropriate. For more information about TurnItIn, please see [the vendor's guide for students](#). Note that submitted final papers become part of the OSU database.
- Please know that I view TurnItIn first and foremost as a teaching tool to make you a better writer. You will see in your individual originality reports exactly what the instructors see. We WANT you to look at this report as soon as you submit your assignments. If you see an issue, please correct it right away, before we start grading the assignment. You can resubmit without penalty as many times as you want prior to the established due date for any assignment. After the due date, the late policy is in effect.

Discussion and Communication Guidelines:

The following are expectations for how we should communicate as a class. Above all, please remember to be respectful and thoughtful.

- **Tone and civility:** Let's maintain a supportive learning community where everyone feels safe and where people can disagree amicably. Remember that sarcasm doesn't always come across online and is not always appreciated in-person. The instructional team work very hard to provide a positive learning experience. Please keep this in mind and remain civilized and respectful in your class communications.
- **Citing your sources:** When we have academic discussions, please cite your sources to back up what you say.

Issue Resolution:

The CLSE believes that student concerns are usually most effectively addressed by the staff closest to the situation. Therefore, students are ordinarily expected to address issues or concerns first with their instructors. If the issue cannot be resolved by your instructor, or for some reason you feel that you

absolutely cannot address your concern with your instructor, please feel free to contact Assistant Director Adam Andrews (andrews.171@osu.edu).

Building Emergency Action Plan:

Each building on campus has a Building Emergency Action Plan (BEAP) outlining that specific building's specific procedures to be followed in the event of a range of emergency situations, including fire, weather, terrorism, chemical spills, etc. It is the role of every Buckeye to help keep each other safe and to be aware of these procedures. You can find all of the campus BEAPs at <https://dps.osu.edu/beap>.

Lyft Ride Smart:

Lyft Ride Smart at Ohio State offers eligible students discounted rides, inside the university-designated [service area](#), from 7 p.m. to 7 a.m. Prices may be impacted by distance, traffic, time of day, special events and prime time surcharges. To qualify for program discounts, users must select "shared ride" when booking in the Lyft app. For more information, visit: <https://ttm.osu.edu/ride-smart>.

Mental Health:

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting ccs.osu.edu or calling 614-292-5766. CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on call counselor when CCS is closed at 614-292-5766 and 24 hour emergency help is also available 24/7 by dialing 988 to reach the Suicide and Crisis Lifeline.

Creating an Environment Free from Harassment, Discrimination, and Sexual Misconduct:

The Ohio State University is committed to building and maintaining a community to reflect diversity and to improve opportunities for all. All Buckeyes have the right to be free from harassment, discrimination, and sexual misconduct. Ohio State does not discriminate on the basis of age, ancestry, color, disability, ethnicity, gender, gender identity or expression, genetic information, HIV/AIDS status, military status, national origin, pregnancy (childbirth, false pregnancy, termination of pregnancy, or recovery therefrom), race, religion, sex, sexual orientation, or protected veteran status, or any other bases under the law, in its activities, academic programs, admission, and employment. Members of the university community also have the right to be free from all forms of sexual misconduct: sexual harassment, sexual assault, relationship violence, stalking, and sexual exploitation.

To report harassment, discrimination, sexual misconduct, or retaliation and/or seek confidential and non-confidential resources and supportive measures, contact the Civil Rights Compliance Office:

- Online reporting form at <http://civilrights.osu.edu/>,
- Call 614-247-5838 or TTY 614-688-8605,
- Or Email equity@osu.edu

The university is committed to stopping sexual misconduct, preventing its recurrence, eliminating any hostile environment, and remedying its discriminatory effects. All university employees have reporting responsibilities to the Civil Rights Compliance Office to ensure the university can take appropriate action:

- All university employees, except those exempted by legal privilege of confidentiality or expressly identified as a confidential reporter, have an obligation to report incidents of sexual assault immediately.
 - The following employees have an obligation to report all other forms of sexual misconduct as soon as practicable but at most within five workdays of becoming aware of such information: 1. Any human resource professional (HRP); 2. Anyone who supervises faculty, staff, students, or volunteers; 3. Chair/director; and 4. Faculty member.

Academic Misconduct:

Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. Thus, The Ohio State University and the [Committee on Academic Misconduct](#) (COAM) expect that all students have read and understand the University's [Code of Student Conduct](#), and that all students will complete all academic and scholarly assignments with fairness and honesty. Students must recognize that failure to follow the rules and guidelines established in the University's Code of Student Conduct and this syllabus may constitute Academic Misconduct.

The Ohio State University's Code of Student Conduct (Section 3335-23-04) defines academic misconduct as: Any activity that tends to compromise the academic integrity of the University or subvert the educational process. Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Ignorance of the University's Code of Student Conduct is never considered an excuse for academic misconduct, so please review the Code of Student Conduct and, specifically, the sections dealing with academic misconduct.

If an instructor suspects that a student has committed academic misconduct in this course, the instructor is obligated by University Rules to report those suspicions to the Committee on Academic Misconduct. If COAM determines that a student violated the University's Code of Student Conduct (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in the course and suspension or dismissal from the University.

If students have questions about the above policy or what constitutes academic misconduct in this course, they should contact the instructor.

- Unless otherwise specified for a particular assignment, all submitted work should be a student's own unique effort. Collaborative efforts are not permitted unless expressly sanctioned for a particular assignment.
- Unless otherwise specified for a particular assignment, use of AI-generated materials for course submissions is not permitted.
- Reusing past work: In general, you are prohibited in university courses from turning in work from a past class to your current class, even if you modify it. If you want to build on past research or revisit a topic you've explored in previous courses, please discuss the situation with me.
- Using others' verbatim words without the use of quotation marks and citation is plagiarism. Paraphrased work requires citation to denote the use of others' ideas. Copying other's words without quotation while using citations is still considered plagiarism.
- Use of any technology during a quiz or exam (including but not limited to cell phones, smart watches, headphones, electronic dictionaries, etc.) is strictly prohibited.

Artificial Intelligence and Academic Integrity:

There has been a significant increase in the popularity and availability of a variety of generative artificial intelligence (AI) tools, including ChatGPT, Sudowrite, and others. These tools will help shape the future of work, research and technology, but when used in the wrong way, they can stand in conflict with academic integrity at Ohio State.

All students have important obligations under the Code of Student Conduct to complete all academic and scholarly activities with fairness and honesty. Our professional students also have the responsibility to uphold the professional and ethical standards found in their respective academic honor codes. Specifically, students are not to use unauthorized assistance in the laboratory, on field work, in scholarship, or on a course assignment unless such assistance has been authorized specifically by the course instructor. In addition, students are not to submit their work without acknowledging any word-for-word use and/or paraphrasing of writing, ideas or other work that is not your own. These requirements apply to all students undergraduate, graduate, and professional.

To maintain a culture of integrity and respect, these generative AI tools should not be used in the completion of course assignments unless an instructor for a given course specifically authorizes their use. Some instructors may approve of using generative AI tools in the academic setting for specific goals. However, these tools should be used only with the explicit and clear permission of each individual instructor, and then only in the ways allowed by the instructor.

Copyrighted Class Materials:

© The Instructor's lectures and all course materials, including power point presentations, tests, outlines, assignments, and similar materials, are protected by copyright. You may take notes and make copies of course materials for your own use. You may not and may not allow others to reproduce or distribute lecture notes and course materials publicly whether or not a fee is charged without the express written consent of the course instructor.

Course Schedule: Spring 2026

Schedule and assignments subject to change with as much advance notice as possible

Week	Lecture Topic	Learning Outcomes*	Assignments Due	At Home Readings/Videos/Activities
1	Overview of biology education research Research ethics, institutional review board, how to read a scientific paper	Define biology education research. Define human subjects research. Recognize the ways that who researchers are can affect their results. Explain how to approach reading of a scientific paper.		
2	Idea generation Literature review	Recognize gaps in our current understanding of a topic and identify what specific information is missing. Develop research questions based on observations. Find and evaluate the credibility of a variety of sources of scientific information. Elicit, listen to, and incorporate ideas from teammates with different perspectives. Work effectively with teammates to complete projects. Explain the purpose of the IRB, and what our ethical obligations are as researchers of human subjects. Define theoretical research frameworks.	Module 1 Quiz Human Subjects Training	Complete: IRB CITI training ~3 hours; upload certificate to Carmen Complete: IRB Responsible Code of Conduct training ~4 hours; upload certificate to Carmen Complete: COI form ~ 10 minutes Read- Literature Reviews, Theoretical Frameworks, and Conceptual Frameworks: An Introduction for New Biology Education Researchers (Luft, Jeong, Idsardi, and Gardner, 2022) https://www.lifescied.org/doi/10.1187/cbe.21-05-0134
3	Literature review Research question development	Find and evaluate the credibility of a variety of sources of scientific information. Identify appropriate search engines and databases. Interpret and summarize evidence in primary literature.	Literature Review & Annotated Bibliography	Read- Brady, A. C., Hensley, L. C., Sovic, D., Kulesza, A., Wolters, C. A., & Breitenberger, C. (2022). What makes a study strategy intervention impactful? An interview-based study. <i>College Student Affairs Journal</i> , 40(1), 17-31 Read- Knowledge of Learning Makes a Difference: A Comparison of Metacognition in Introductory and Senior-Level Biology Students . Julie Dangremond Stanton, Kathryn Morris Dye, and Me'Shae Johnson CBE—Life Sciences Education 2019 18:2

		Evaluate claims in scientific papers, popular science articles, and other sources using evidence-based reasoning. Develop research questions based on observations. Elicit, listen to, and incorporate ideas from teammates with different perspectives. Work effectively with teammates to complete projects. Situate the research questions within an appropriate theoretical framework.		Read- a 3 rd article the student finds related to metacognitive skill development
4	Research question development Experimental design	Develop research questions based on observations. Formulate testable hypotheses.	Module 2 Quiz Minute Paper 1	Read: Design-Based Research: A Methodology to Extend and Enrich Biology Education Research Emily E. Scott, Mary Pat Wenderoth, and Jennifer H. Doherty CBE—Life Sciences Education 2020 19:3 Read: Jensen JL, Bailey EG, Kummer TA, Weber KS. 2017. Using Backward Design in Education Research: A Research Methods Essay. J Microbiol Biol Educ. 18:10.1128/jmbe.v18i3.1367. https://doi.org/10.1128/jmbe.v18i3.1367
5	Experimental design Tests and measurement development	Formulate testable hypotheses. Compare strengths and limitations of various study designs. Design controlled experiments. Choose appropriate methods for the research question. Define reliability and validity in measurement. Differentiate between the different types of data that can be collected and identify the benefits of each type.	Research Proposal	Read: Mixed-Methods Design in Biology Education Research: Approach and Uses Abdi-Rizak M. Warfa CBE—Life Sciences Education 2016 15:4 Read: Venturing into Qualitative Research: A Practical Guide to Getting Started; Mariel A. Pfeifer and Erin L. Dolan; SPUR (2023) 7 (1): https://doi.org/10.18833/spur/7/1/2
6	Tests and measurement development	Choose appropriate methods for the research question.	Course Specific Training	Complete IDP training (~1 hour)

		Compare and contrast quantitative and qualitative tools. Define reliability and validity in measurement. Identify methodological problems and suggest how to troubleshoot them.	Module 3 Quiz	Read: Contemporary Test Validity in Theory and Practice: A Primer for Discipline-Based Education Researchers Todd D. Reeves and Gili Marbach-Ad CBE—Life Sciences Education 2016 15:1
7	Tests and measurement development Data collection	Choose appropriate methods for the research question. Execute protocols and accurately record measurements and observations.	Module 4 Quiz	Read: The Other Half of the Story: Effect Size Analysis in Quantitative Research Jessica Middlemis Maher, Jonathan C. Markey, and Diane Ebert-May CBE—Life Sciences Education 2013 12:3, 345-351
8	Data collection Quantitative and qualitative analysis practice	Execute protocols and accurately record measurements and observations. Practice secure data management strategies.	Module 5 Quiz	Read: One Size Doesn't Fit All: Using Factor Analysis to Gather Validity Evidence When Using Surveys in Your Research Eva Knekta, Christopher Runyon, and Sarah Eddy CBE—Life Sciences Education 2019 18:1
9	Data cleaning Quantitative and qualitative analysis practice	Record, organize and annotate simple data sets. Practice secure data management strategies. Describe sources of error and uncertainty in data. Select, carry out, and interpret, statistical analyses.	Module 6 Quiz	Read: Developing and Using a Codebook for the Analysis of Interview Data: An Example from a Professional Development Research Project; Jessica T. DeCuir-Gunby, Patricia L. Marshall, and Allison W. McCulloch; Volume 23, Issue 2 https://doi.org/10.1177/1525822X10388 <u>Complete: Practice analysis</u>
10	Quantitative and qualitative data analysis	Select, carry out, and interpret, statistical analyses. Use statistical software.	Module 7 Quiz Minute Paper 2	Read: Module 2 from Shultz, Kenneth S., et al. <i>Measurement Theory in Action: Case Studies and Exercises, Second Edition</i>, Taylor & Francis Group, 2013. Available online through OSU libraries <u>Begin: Class data analysis</u>
11	Quantitative and qualitative data analysis	Select, carry out, and interpret, statistical analyses. Use statistical software.	Module 8 Quiz	Watch: Responsible Conduct of Research-Authorship; https://www.youtube.com/watch?v=VTrDW_HMwV8 <u>Complete: Video Reflection</u> <u>Continue: Class data analysis</u>
12	Quantitative and qualitative data analysis Initial findings presentations	Select, carry out, and interpret, statistical analyses. Use statistical software.	Group Meeting Presentations	Continue: Class data analysis

		Use appropriate language style, and various modes to communicate science effectively to targeted audiences. Critique others' work and ideas constructively and respectfully. Make evidence-based arguments using your own and others' findings. Relate conclusions to original hypothesis, consider alternative hypothesis, and suggest future research directions based on findings. Elicit, listen to, and incorporate ideas from teammates with different perspectives. Work effectively with teammates to complete projects.		
13	Summarizing findings and manuscript outline/poster creation Initial findings presentations	Create and interpret informative graphs and other data visualizations. Analyze data, summarize resulting patterns and draw appropriate conclusions. Use appropriate language style, and various modes to communicate science effectively to targeted audiences. Critique others' work and ideas constructively and respectfully. Make evidence-based arguments using your own and others' findings. Relate conclusions to original hypothesis, consider alternative hypothesis, and suggest future research directions based on findings. Elicit, listen to, and incorporate ideas from teammates with different perspectives. Work effectively with teammates to complete projects.	Group Meeting Presentations	Complete: Class data analysis

14	Final manuscript/posters	Use appropriate language style, and various modes to communicate science effectively to targeted audiences. Critique others' work and ideas constructively and respectfully. Elicit, listen to, and incorporate ideas from teammates with different perspectives. Work effectively with teammates to complete projects. Evaluate feedback from others and revise work or behavior appropriately	Poster Due Peer Reviews	Prepare: final products
15	Poster Presentations	Use appropriate language style, and various modes to communicate science effectively to targeted audiences. Make evidence-based arguments using your own and others' findings. Work effectively with teammates to complete projects.	Final Posters	Prepare: final products

*Course Learning Outcomes in **bold**

Biology BS Curriculum Map

B = beginning, I = intermediate, A = advanced

[illegible]

	Phys 1250	Mechanics, Work and Energy, Thermal Physics (5 Hrs.)																		
PHYS Req. #2	Phys 1201	E&M, Optics, Modern Physics	5	B	B									B	B	B	B			
	or																			
	Phys 1251	E&M, Waves, Optics, Modern Physics																		
Total Hrs.			48-61																	
Core Electives for the Major									Biology BS Learning Outcomes											
Sem. Course Number	Course Title		Sem. hrs.	1.1	1.2	1.3	1.4	1.5	1.6	1.7	2.1	2.2	2.3	3.1	3.2	3.3	3.4	3.5	4	
MICRBIOL 4000 or 4100	General Microbiology		4/5	A	I	I	I	I	I	I				A	A	I	A	I	I	
BIOCHEM 4511 or 5613 AND 5614	Biochemistry		4/6	A	I	A		I								I		I	I	
MOLGEN 3300	General Plant Biology		4	A	I	I	I	I	I	I				A	A	I	A	I	I	
MOLGEN 4500 or 4606	General Genetics		3 / 4	A	I	A	A	I	I							I		I	I	
EEOB 2510 or 2511	Human Anatomy		3 / 4	I														I	B	
EEOB 2520	Human Physiology		3	I														I	B	
EEOB 3510 or MOLGEN 4700	Cell Biology		3	A	A	I	I	I						I					I	
EEOB 3310	Evolution		4	A	I		I	A	I	I						I		I	I	
EEOB 3410	Ecology		4	I	I			I		A				A	I	I	I	I	I	
EEOB 3520	Microscopic Anatomy		3	I	I	I												I	I	
EEOB 4510	Comparative vertebrate anatomy		3	I	I														I	
ANTHRO 2200	Physical Anthropology (Additional Prereq)		4				B	B	B	B				B	B		B	B	B	
BIO 3401 or 3501	Integrated Biology or Integrative Skills in Biology		4/3	I	I	I	I	I	I	I				I	B	I	I	I	I	
BIO 4901	Biological Capstone		2	A	A	A	A	A	A	A	A	A	A	A	B	A	I	I	A	
Additional Biology Electives									Biology BS Learning Outcomes											
Sem. Course Number	Course Title		Sem. hrs.	1.1	1.2	1.3	1.4	1.5	1.6	1.7	2.1	2.2	2.3	3.1	3.2	3.3	3.4	3.5	4	
BIO 2200	Genome Biology		1		I		I							I	I	I	I	I	B	
BIO 2750	Scientific Thought in an Anecdotal World		3													B		I	I	
BIO 4210	Undergraduate Research in Biology Education		4											A	A	A	A	A	A	
BIO 4798	Scientific Roots in England		3	I					I										I	
BIO 5001	Topics in Biology Teaching		1															A	A	

*** Full text of program learning goals:**

Describe the hierarchical relationship between structure and function at all levels:

1.1 molecular, cellular, and organismic.

Diagram, explain, and contrast the major cellular processes in Archaea, bacteria,

1.2 and eukaryotes.

Differentiate types of biological macromolecules and compare their contributions

1.3 to cellular structure and function.

1.4 Apply the principles of genetics and describe the flow of genetic information.

Explain changes in organisms through time by applying the principles of

1.5 evolutionary biology.

- Demonstrate how relationships among living things are understood through
- 1.6** taxonomy and phylogenetic analysis.
 - 1.7** Describe ecological relationships between organisms and their environment.
Apply the scientific process, including designing and conducting experiments and
 - 2.1** testing hypotheses.
Use laboratory equipment, employ safe laboratory practices, and adapt tools such as laboratory notebooks and spreadsheets to organize and analyze data
 - 2.2** associated with scientific processes.
Retrieve information from the life sciences literature; read, understand, and
 - 2.3** critically review scientific papers.
 - 2.4** Prepare oral and written reports following a recognized scientific format.
Develop an awareness of the careers and professions that rely on knowledge of
 - 2.5** biological sciences.
 - 3.1** Integrate biological knowledge in discussions of society and everyday life