

Term Information

Effective Term Spring 2025

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 2750
Course Title Scientific Thought in an Anecdotal World
Transcript Abbreviation Scientific Thought
Course Description Examination of the intersection of modern biological methodologies with the cultural environment, focusing on the sharing of information, identification of validated biological discovery, and comparison with misinformation encountered in our lived environment.
Semester Credit Hours/Units Fixed: 3

Offering Information

Length Of Course 14 Week, 12 Week, 8 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, Workshop
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 Completion of GE Foundations: Natural Sciences requirement
Exclusions
Electronically Enforced Yes

Cross-Listings

Cross-Listings

Subject/CIP Code

Subject/CIP Code 26.0101
Subsidy Level General Studies Course
Intended Rank Sophomore, Junior, Senior

Requirement/Elective Designation

Lived Environments

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

- Students will evaluate both controversies in biology as well as biological topics viewed as controversial by parts of society.
- Students will use critical thinking skills to evaluate the validity of biological claims presented as scientific in social media and the popular press.
- Students will synthesize evidence-based arguments to diverse audiences using knowledge and skills from other coursework explaining how biology and technology address problems of the contemporary world.
- Students will differentiate biological science from pseudoscience and non-science.
- Students will identify examples of logical fallacies used in biological misinformation.
- Students will use logical fallacies to evaluate examples of biological research as well as biological misinformation.
- Students will compare anecdotal thought and experiences to biological data and reasoning.
- Students will differentiate between hypotheses, predictions, theories, laws, and facts.
- Students will synthesize the contributions of various scientific philosophers in the age of scientific reasoning from both eastern and western culture.
- Students will recognize that interpretation of data is a regular part of methodology in the natural sciences.
- Students will analyze the inherent risk of bias as a product of biological research being a human endeavor.
- Students will synthesize sound scientific explanations grounded in the scientific process.
- Students will summarize the process of peer review and publication commonly used in the natural sciences.
- Students will explain the self-correcting nature of science using examples from the history of biological research.
- Students will compare and differentiate between theoretical biology and applied biology.
- Students will compare knowledge in the biological sciences to other forms of knowledge.
- Students will contrast the questions applicable to the scientific process and those that cannot be answered by science.
- Students will assess uncertainty and its role in biological literacy and agenda-driven interpretation in the media.
- Students will construct and deliver sound arguments appealing to different ways of thinking in specified environments.
- Students will apply critical thinking skills to assess human willingness or susceptibility to accept claims without evidence.
- Students will reflect on the ways their personal experiences have influenced their own thought or perceptions.
- Students will analyze scientific misconduct in the biological sciences and the conditions that encourage intentional and unintentional malfeasance.
- Students will analyze the misrepresentation of biological data by individuals and groups within the biological sciences.

Content Topic List

- Introduction to Science and Malarkey
- The Philosophy of Science and the Community of Scientists
- Biological Methodologies
- Correlation and Causality in Biology
- Statistical Traps
- Common Data Visualization practices in biology
- Publication Bias
- Predatory Publishers
- Critical Thinking
- Misconduct in biology

Sought Concurrence

Yes

Attachments

- Statistics Concurrence.pdf: Concurrence from Statistics
(Concurrence. Owner: Andrews, Adam Lee)
- Psychology Concurrence for Biology 2750.pdf: Concurrence from Psychology
(Concurrence. Owner: Andrews, Adam Lee)
- CS Concurrence Request - Biology 2750.pdf: Concurrence from Comparative Studies
(Concurrence. Owner: Andrews, Adam Lee)
- Communications Concurrence Request.pdf: Concurrence request Comm. - No response received
(Concurrence. Owner: Andrews, Adam Lee)
- EEOB Concurrence.pdf: Concurrence from EEOB
(Concurrence. Owner: Andrews, Adam Lee)
- Biology 2750 Syllabus 20240402.pdf
(Syllabus. Owner: Andrews, Adam Lee)
- Proposal for Biology 2750 20240402.docx: Full proposal
(Other Supporting Documentation. Owner: Andrews, Adam Lee)
- submission-lived-environments.docx: Lived Env. Cover Sheet
(Other Supporting Documentation. Owner: Andrews, Adam Lee)

Comments

- See Feedback email sent to department 12-11-2023 *(by Steele, Rachel Lea on 12/11/2023 09:29 AM)*
- Please see Subcommittee feedback email sent 11/17/23. *(by Neff, Jennifer on 11/17/2023 12:03 PM)*

COURSE REQUEST
2750 - Status: PENDING

Last Updated: Vankeerbergen, Bernadette
Chantal
04/10/2024

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Andrews, Adam Lee	10/04/2023 01:23 PM	Submitted for Approval
Approved	Kulesza, Amy Elizabeth	10/05/2023 08:19 AM	Unit Approval
Approved	Vankeerbergen, Bernadette Chantal	10/19/2023 04:55 PM	College Approval
Revision Requested	Neff, Jennifer	11/17/2023 12:03 PM	ASCCAO Approval
Submitted	Andrews, Adam Lee	11/17/2023 01:52 PM	Submitted for Approval
Approved	Kulesza, Amy Elizabeth	11/17/2023 03:04 PM	Unit Approval
Approved	Vankeerbergen, Bernadette Chantal	11/17/2023 03:18 PM	College Approval
Revision Requested	Steele, Rachel Lea	12/11/2023 09:29 AM	ASCCAO Approval
Submitted	Andrews, Adam Lee	04/04/2024 02:56 PM	Submitted for Approval
Approved	Kulesza, Amy Elizabeth	04/05/2024 07:16 AM	Unit Approval
Approved	Vankeerbergen, Bernadette Chantal	04/10/2024 12:28 PM	College Approval
Pending Approval	Jenkins, Mary Ellen Bigler Hanlin, Deborah Kay Hilty, Michael Neff, Jennifer Vankeerbergen, Bernadette Chantal Steele, Rachel Lea	04/10/2024 12:28 PM	ASCCAO Approval

Proposal for Biology 2750 – Scientific Thought in an Anecdotal World

3 Credit Hours

Course Description: *Examination of the intersection of modern biological methodologies with the cultural environment, focusing on the sharing of information, identification of validated biological discovery, and comparison with misinformation encountered in our lived environment.*

Prerequisite: Completion of course requirements in GE Foundations: Natural Sciences

Course Introduction and Logistics

Our cultural environment has changed dramatically over the past few decades with the rise of the internet and social media. In this new modern world, Biology tends to be the center of many misinformation (unintentionally spreading wrong information) and disinformation (intentionally spreading wrong information) campaigns making it difficult to discern fact from fiction. Accordingly, as instructors within the Biological Sciences, we are particularly qualified to provide a course of this nature as many social, ethical, and cultural issues of our modern society – climate change ecology, genetic engineering and genetic testing, food and agriculture, drug testing, environmental conservation, medical treatments, disease outbreaks, invasive species, and others – are inherently biological issues. Therefore, we are proposing a new course that would fulfill the General Education *Lived Environments* theme and serve as an elective to the Biology Major curriculum.

The course will be set up with two hours of weekly lecture (2x55 minutes) with an additional 80-minute weekly active workshop meeting. The lecture will be taught by a faculty member, while the smaller workshop sections will be led by either a faculty member or TA. The proposed setup will allow for scalability, as we intend to use the workshop as an active learning discussion or seminar component and not just a 'review session', benefiting from the smaller class size than what will be anticipated in the lecture. The workshop section will therefore justify its own credit hour. Future offerings of the course may have Distance Learning sections, but currently we are not submitting for approval to offer the course as an online GE.

Below, we break down how the General Theme Goals and the Lived Environment Theme Goals will be fulfilled by our course.

GE Themes Goals

Goal 1: Successful students will analyze an important topic or idea at a more advanced and in-depth level than the foundations. In this context, "advanced" refers to courses

that are e.g., synthetic, rely on research or cutting-edge findings, or deeply engage with the subject matter, among other possibilities.

Over the past several decades, the rise of the internet has considerably changed our cultural environment in the way we interact with knowledge. In our modern society, scientific misinformation can spread at an alarming rate, often attacking topics with overwhelming scientific consensus and the scientific processes themselves. In the past, scientific information was curated by experts in their field and passed along to scientific journalists and trustworthy media outlets who then disseminated this information to the public. Certainly, there are credible sources of scientific information to be found online but there are also several sources pushing misinformation that is often cloaked in jargon with complex scientific language, frequently using cherry-picked data to intentionally mislead and confuse.

Owing to a lack of general understanding of core principles of biological methodology and sensationalism in the media and across the internet, it becomes easier to improperly question the validity of biological research and dangerously spread misinformation. Suggestions that vaccines cause autism, GMO's will change your DNA, and climate change isn't real are all quite easy to find online. This type of rhetoric is dangerous to our society and recent research suggests young people are unable to traverse this new environment they're born into. These misconceptions and the confusion brought about by these practices can easily be found in the public but are often readily observed in the students taking our courses as well. We often find our students confused about what is credible; they very often lack the skills necessary to navigate this new environment and are unable to evaluate sources of scientific information. Because of this new media environment, our students often learn about these issues through YouTube, Tik Tok, podcasts, or conversations with friends and family; all sources where they are more likely to encounter misinformation and disinformation. This course seeks to provide students with opportunities to engage in more in-depth breakdown and analysis of these ideas.

Goal 2: *Successful students will integrate approaches to the theme by making connections to out-of-classroom experiences with academic knowledge or across disciplines and/or to work they have done in previous classes and that they anticipate doing in future.*

While many Foundational GE science courses will devote a small amount of time to the nature of science, this is often limited to a brief description of the scientific process focused exclusively on the inductive reasoning approach before moving on to more focused topics and course material. This course aims to build on that foundational material. We take a deep dive into the approaches that researchers often use by exploring the methods of biological research in our modern cultural environment. Specifically, as detailed in the attached syllabus, using Jeffrey Lee's *The Scientific*

Endeavor as a textbook for the course, we will take a stepwise progression through the history and methodology of scientific processes utilizing both historical and contemporary events as a framework for the effect science has on the student's cultural and lived environment. We then explore how our cultural environment has changed in recent decades and engage students in discussions and analysis of this modern environment (internet-based) and its interactions with the scientific community. Students will be asked to consider how they interact with their environment (for example, through use of social media) and how these interactions may lead to the spread of misinformation. We use a variety of readings (see attached syllabus) to facilitate these goals.

Lived Environment Goals

Goal 3: *Successful students will explore a range of perspectives on the interactions and impacts between humans and one or more types of environment (e.g. agricultural, built, cultural, economic, intellectual, natural) in which humans live.*

We will guide students in developing skills to effectively evaluate biological-based claims found in the media and primary literature so they can better navigate their modern cultural environment. From here, we build critical thinking skills to help spot misinformation and provide a framework to discuss uncertainty and variability in data using statistical techniques.

Furthermore, the public outcry against some 'useless' research will provide us the backdrop to compare theoretical and applied research in biology. An understanding that technology, an applied science, is the product of theoretical research is key to this comparison. Debates that arise from where public research money should be focused will lead us to the discussion of the value of biology research and its contribution to society.

The frequent writing assignments in the course, as outlined in the attached syllabus, will require students to analyze the impacts of scientific methodologies on society, through the development of technology, the effects of misconduct in science, and the perceptions of reality that exist – including those driving the rise in misinformation. All the writing assignments will have students researching examples and synthesizing their findings with the principles discussed in lecture and in the assigned reading from *The Scientific Endeavor* as well as chosen articles from the primary and secondary literature and popular press.

Goal 4: *Successful students will analyze a variety of perceptions, representations and/or discourses about environments and humans within them.*

This course will discuss the formation of misinformation in biology stemming from changes in the way research results make their way into the public sector through the rise of preprint servers that gain media attention, publication biases, predatory publishers, and malfeasance (example: Andrew Wakefield's misconduct fabricating the link between vaccines and autism). Overall, this course will provide students a framework to recognize misleading biological-based claims making them more informed citizens and better able to traverse the modern environment they find themselves in after completing their undergraduate degree.

Index of Included Materials

Appendix A: Biology 2750 Course Learning Objectives and Alignment
(*See Attached*)

Appendix B: Sample Course Syllabus
(*See Attached*)

Appendix C: Sample Writing Assignment
(*See Attached*)

Appendix D: Sample Workshop Activity
(*See Attached*)

Appendix A: Biology 2750 Course Learning Objectives and Alignment

Goals	Expected Learning Outcomes	GE ELO Alignment (GT = General Themes, LE = Lived Environments)
Goal 1: Students will develop science literacy skills and the ability to construct a scientifically literate argument.	<ul style="list-style-type: none"> 1.1 Students will evaluate both controversies in biology as well as biological topics viewed as controversial by parts of society. 	<ul style="list-style-type: none"> GT 1.1 Engage in critical and logical thinking about the topic or idea of the theme. GT 1.2 Engage in an advanced, in-depth, scholarly exploration of the topic or idea of the theme. LE 2.1 Analyze how humans' interactions with their environments shape or have shaped attitudes, beliefs, values and behaviors. LE 2.2 Describe how humans perceive and represent the environments with which they interact. LE 2.3 Analyze and critique conventions, theories, and ideologies that influence discourses around environments.
	<ul style="list-style-type: none"> 1.2 Students will use critical thinking skills to evaluate the validity of biological claims presented as scientific in social media and the popular press. 	<ul style="list-style-type: none"> GT 1.1 Engage in critical and logical thinking about the topic or idea of the theme. GT 1.2 Engage in an advanced, in-depth, scholarly exploration of the topic or idea of the theme.
	<ul style="list-style-type: none"> 1.3 Students will synthesize evidence-based arguments to diverse audiences using knowledge and skills from other coursework explaining how biology and technology address problems of the contemporary world. 	<ul style="list-style-type: none"> GT 2.1 Identify, describe, and synthesize approaches or experiences as they apply to the theme. GT 2.2 Demonstrate a developing sense of self as a learner through reflection, self-assessment, and creative work, building on prior experiences to respond to new and challenging contexts.
Goal 2: Students will develop critical thinking skills through and exploration of logical fallacies and their use in arguments.	<ul style="list-style-type: none"> 2.1 Students will differentiate biological science from pseudoscience and non-science. 	<ul style="list-style-type: none"> GT 1.1 Engage in critical and logical thinking about the topic or idea of the theme. GT 1.2 Engage in an advanced, in-depth, scholarly exploration of the topic or idea of the theme.

	<ul style="list-style-type: none"> • 2.2 Students will identify examples of logical fallacies used in biological misinformation. 	<p>GT 1.2 Engage in an advanced, -depth, scholarly exploration of the pic or idea of the theme.</p> <ul style="list-style-type: none"> • LE 2.3 Analyze and critique conventions, theories, and ideologies that influence discourses around environments.
	<ul style="list-style-type: none"> • 2.3 Students will use logical fallacies to evaluate examples of biological research as well as biological misinformation. 	<p>GT 1.1 Engage in critical and gical thinking about the topic or idea of the theme.</p> <p>GT 1.2 Engage in an advanced, -depth, scholarly exploration of the pic or idea of the theme.</p> <ul style="list-style-type: none"> • LE 2.2 Describe how humans perceive and represent the environments with which they interact. • LE 2.3 Analyze and critique conventions, theories, and ideologies that influence discourses around environments.
	<ul style="list-style-type: none"> • 2.4 Students will compare anecdotal thought and experiences to biological data and reasoning. 	<p>GT 1.1 Engage in critical and gical thinking about the topic or idea of the theme.</p> <ul style="list-style-type: none"> • LE 2.2 Describe how humans perceive and represent the environments with which they interact.
<p>Goal 3: Students understand the scientific process in both modern and historical contexts.</p>	<ul style="list-style-type: none"> • 3.1 Students will differentiate between hypotheses, predictions, theories, laws, and facts. 	<ul style="list-style-type: none"> • LE 1.2 Describe examples of human interaction with and impact on environmental change and transformation over time and across space. • LE 2.2 Describe how humans perceive and represent the environments with which they interact.
	<ul style="list-style-type: none"> • 3.2 Students will synthesize the contributions of various scientific philosophers in the age of scientific reasoning from both eastern and western culture. 	<ul style="list-style-type: none"> • GT 2.1 Identify, describe, and synthesize approaches or experiences as they apply to the theme. • LE 1.2 Describe examples of human interaction with and impact on environmental change and transformation over time and across space. • LE 2.1 Analyze how humans' interactions with their environments

		<p>shape or have shaped attitudes, beliefs, values and behaviors.</p> <ul style="list-style-type: none"> • LE 2.2 Describe how humans perceive and represent the environments with which they interact.
	<ul style="list-style-type: none"> • 3.3 Students will recognize that interpretation of data is a regular part of methodology in the natural sciences. 	<ul style="list-style-type: none"> • GT 1.1 Engage in critical and logical thinking about the topic or idea of the theme. • GT 1.2 Engage in an advanced, in-depth, scholarly exploration of the topic or idea of the theme. • LE 1.1 Engage with the complexity and uncertainty of human-environment interactions. • LE 2.2 Describe how humans perceive and represent the environments with which they interact. • LE 2.3 Analyze and critique conventions, theories, and ideologies that influence discourses around environments.
	<ul style="list-style-type: none"> • 3.4 Students will analyze the inherent risk of bias as a product of biological research being a human endeavor. 	<ul style="list-style-type: none"> • GT 1.1 Engage in critical and logical thinking about the topic or idea of the theme. • GT 1.2 Engage in an advanced, in-depth, scholarly exploration of the topic or idea of the theme. • LE 1.1 Engage with the complexity and uncertainty of human-environment interactions. • LE 2.2 Describe how humans perceive and represent the environments with which they interact. • LE 2.3 Analyze and critique conventions, theories, and ideologies that influence discourses around environments.
	<ul style="list-style-type: none"> • 3.5 Students will synthesize sound scientific explanations grounded in the scientific process. 	<ul style="list-style-type: none"> • GT 1.2 Engage in an advanced, in-depth, scholarly exploration of the topic or idea of the theme. • GT 2.1 Identify, describe, and synthesize approaches or experiences as they apply to the theme.

	<ul style="list-style-type: none"> • 3.6 Students will summarize the process of peer review and publication commonly used in the natural sciences. 	<ul style="list-style-type: none"> • GT 1.2 Engage in an advanced, in-depth, scholarly exploration of the topic or idea of the theme. • LE 2.3 Analyze and critique conventions, theories, and ideologies that influence discourses around environments.
	<ul style="list-style-type: none"> • 3.7 Students will explain the self-correcting nature of science using examples from the history of biological research. 	<ul style="list-style-type: none"> • GT 1.2 Engage in an advanced, in-depth, scholarly exploration of the topic or idea of the theme. • LE 2.3 Analyze and critique conventions, theories, and ideologies that influence discourses around environments.
<p>Goal 4: Students will describe the interdependence of scientific and technological developments.</p>	<ul style="list-style-type: none"> • 4.1 Students will compare and differentiate between theoretical biology and applied biology. 	<ul style="list-style-type: none"> • GT 1.1 Engage in critical and logical thinking about the topic or idea of the theme. • GT 1.2 Engage in an advanced, in-depth, scholarly exploration of the topic or idea of the theme. • GT 2.1 Identify, describe, and synthesize approaches or experiences as they apply to the theme. • LE 1.2 Describe examples of human interaction with and impact on environmental change and transformation over time and across space.
<p>Goal 5: Students will analyze and interpret major forms of human thought, culture, and expression.</p>	<ul style="list-style-type: none"> • 5.1 Students will compare knowledge in the biological sciences to other forms of knowledge. 	<ul style="list-style-type: none"> • GT 2.1 Identify, describe, and synthesize approaches or experiences as they apply to the theme. • LE 1.1 Engage with the complexity and uncertainty of human-environment interactions. • LE 1.2 Describe examples of human interaction with and impact on environmental change and transformation over time and across space. • LE 2.1 Analyze how humans' interactions with their environments shape or have shaped attitudes, beliefs, values and behaviors. • LE 2.2 Describe how humans perceive and represent the

		environments with which they interact.
	<ul style="list-style-type: none"> • 5.2 Students will contrast the questions applicable to the scientific process and those that cannot be answered by science. 	<ul style="list-style-type: none"> • GT 1.1 Engage in critical and logical thinking about the topic or idea of the theme. • GT 1.2 Engage in an advanced, in-depth, scholarly exploration of the topic or idea of the theme. • GT 2.1 Identify, describe, and synthesize approaches or experiences as they apply to the theme.
<p>Goal 6: Students evaluate how ideas influence the character of human beliefs, the perception of reality, and the norms which guide human behavior.</p>	<ul style="list-style-type: none"> • 6.1 Students will assess uncertainty and its role in biological literacy and agenda-driven interpretation in the media. 	<ul style="list-style-type: none"> • GT 1.1 Engage in critical and logical thinking about the topic or idea of the theme. • GT 1.2 Engage in an advanced, in-depth, scholarly exploration of the topic or idea of the theme. • GT 2.1 Identify, describe, and synthesize approaches or experiences as they apply to the theme. • LE 1.1 Engage with the complexity and uncertainty of human-environment interactions. • LE 1.2 Describe examples of human interaction with and impact on environmental change and transformation over time and across space. • LE 2.1 Analyze how humans' interactions with their environments shape or have shaped attitudes, beliefs, values and behaviors. • 2.2 Describe how humans perceive and represent the environments with which they interact. • 2.3 Analyze and critique conventions, theories, and ideologies that influence discourses around environments.
	<ul style="list-style-type: none"> • 6.2 Students will construct and deliver sound arguments appealing to different ways of thinking in specified environments. 	<ul style="list-style-type: none"> • GT 1.1 Engage in critical and logical thinking about the topic or idea of the theme.

		<ul style="list-style-type: none"> • GT 1.2 Engage in an advanced, in-depth, scholarly exploration of the topic or idea of the theme. • GT 2.1 Identify, describe, and synthesize approaches or experiences as they apply to the theme. • GT 2.2 Demonstrate a developing sense of self as a learner through reflection, self-assessment, and creative work, building on prior experiences to respond to new and challenging contexts. • LE 1.1 Engage with the complexity and uncertainty of human-environment interactions.
	<ul style="list-style-type: none"> • 6.3 Students will apply critical thinking skills to assess human willingness or susceptibility to accept claims without evidence. 	<ul style="list-style-type: none"> • GT 1.1 Engage in critical and logical thinking about the topic or idea of the theme. • GT 2.1 Identify, describe, and synthesize approaches or experiences as they apply to the theme. • GT 2.2 Demonstrate a developing sense of self as a learner through reflection, self-assessment, and creative work, building on prior experiences to respond to new and challenging contexts. • LE 1.1 Engage with the complexity and uncertainty of human-environment interactions. • LE 2.1 Analyze how humans' interactions with their environments shape or have shaped attitudes, beliefs, values and behaviors. • LE 2.2 Describe how humans perceive and represent the environments with which they interact. • LE 2.3 Analyze and critique conventions, theories, and ideologies that influence discourses around environments.
	<ul style="list-style-type: none"> • 6.4 Students will reflect on the ways their personal experiences have influenced 	<ul style="list-style-type: none"> • GT 2.2 Demonstrate a developing sense of self as a learner through reflection, self-assessment, and creative work, building on prior

	<p>their own thought or perceptions.</p>	<p>experiences to respond to new and challenging contexts.</p> <ul style="list-style-type: none"> • LE 2.1 Analyze how humans' interactions with their environments shape or have shaped attitudes, beliefs, values and behaviors.
	<ul style="list-style-type: none"> • 6.5 Students will analyze scientific misconduct in the biological sciences and the conditions that encourage intentional and unintentional malfeasance. 	<ul style="list-style-type: none"> • GT 1.1 Engage in critical and logical thinking about the topic or idea of the theme. • GT 1.2 Engage in an advanced, in-depth, scholarly exploration of the topic or idea of the theme. • GT 2.1 Identify, describe, and synthesize approaches or experiences as they apply to the theme. • LE 1.2 Describe examples of human interaction with and impact on environmental change and transformation over time and across space. • LE 2.1 Analyze how humans' interactions with their environments shape or have shaped attitudes, beliefs, values and behaviors. • LE 2.3 Analyze and critique conventions, theories, and ideologies that influence discourses around environments.
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		<ul style="list-style-type: none">• LE 2.3 Analyze and critique conventions, theories, and ideologies that influence discourses around environments.
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Appendix B: Sample Course Syllabus



THE OHIO STATE UNIVERSITY

Biology 2750

Scientific Thought in an Anecdotal World

Spring 2025

If you are too ill to take an exam or must miss for another legitimate unscheduled reason, you must contact the Course Coordinator within 24 hours of the exam. Make up exams will be given only to students who produce, at the make up or before, documentation of a legitimate reason (at the time of the absence) for missing the exam. Valid excuses are limited to problems that are beyond the student's control, such as military duty, intercollegiate athletic or academic activities, funerals, etc. Medical excuses will be considered only if you have been treated by a medical professional on the day of the exam (excuses from the student health center website will not be accepted). Lack of transportation, loss of electricity, travel plans, etc. are not considered valid excuses. If you anticipate having to miss an exam due to attendance at a university sanctioned event or other qualifying conflict, you must contact the Course Coordinator at least one week in advance of the exam.

If you have no documentation to support your absence, or your absence from the exam is not for an excused reason, you will still be offered the opportunity for a makeup exam, with a 25% overall deduction on your exam score if arrangements are made within 24 hours of the original exam.

The format of makeup exams is at the discretion of the instructors. All makeup exams must be made up within one week of when the original exam was given.

Note: Check the date and time of the final examination now and make sure that this time does not conflict with your future plans. No early final exams will be given. The only makeup exam will be held on Wednesday, December xx at 9:00 a.m. and is available only in emergency situations and with prior approval of the Course Coordinator.

Make-Up Workshops and Lecture Activities: Both the lecture and workshop are integral parts of this course. If you miss a class, you must contact your instructor (lecture or workshop, as appropriate) 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 workshop to receive the make-up exercise. Therefore, it is essential that you contact your instructor immediately if you miss a workshop, 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.

If you are isolating while waiting for a COVID-19 test result, please let me know immediately. Those testing positive for COVID-19 should refer to the [Safe and Healthy Buckeyes site](#) for resources. Beyond five days of the required COVID-19 isolation period, I may rely on Student Life Disability Services to establish further reasonable accommodations. You can connect with them at slds@osu.edu; 614-292-3307; or slds.osu.edu.

- **Accommodation of Special Needs:**

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 us 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 Course Coordinator as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. Only the course coordinator is authorized to complete SLDS accommodations. This will help us ensure that your individual needs will be met appropriately and fairly. SLDS contact information: slds@osu.edu; 614-292-3307; slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue.

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 [Office of Institutional Equity](#).

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

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.

Section Changes:

All section changes and adds are completed by the course coordinator. Due to the need to keep up-to-minute availability of seats in each workshop, the lecturer and workshop instructors are unable to sign any permission forms.

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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. 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.

TopHat

- TopHat is a web-based response system that allows students to use their own devices provide responses in the classroom. This course uses Top Hat to promote active engagement, allow for synchronous feedback, and monitor attendance.
- [TopHat](#) help guide

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 the Course Coordinator or 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 Younkun 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.

Title IX:

Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the appropriate resources at <http://titleix.osu.edu> or by contacting the Ohio State Title IX Coordinator at titleix@osu.edu.

Diversity:

The Ohio State University affirms the importance and value of diversity in the student body. Our programs and curricula reflect our multicultural society and global economy and seek to provide opportunities for students to learn more about persons who are different from them. We are committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters sensitivity, understanding, and mutual respect among each member of our community; and encourages each individual to strive to reach his or her own potential. Discrimination against any individual based upon protected status, which is defined as age, color, disability, gender identity or expression, national origin, race, religion, sex, sexual orientation, or veteran status, is prohibited.

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Academic Misconduct:

- It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term “academic misconduct” includes all forms of student academic misconduct wherever committed, illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct <http://studentlife.osu.edu/csc/>. We will adhere to this policy.
- 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.

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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 or course coordinator.

3 Credit Hours

**Lecturers: James Chiucchi, Ph.D.
 Samantha Herrmann, Ph.D.**
 Center for Life Sciences Education
 Jennings Hall

Course Coordinator:

Teaching Associates:

Class Meeting Schedule

Lecture: TU/TH (55-minute lectures)
 Workshop: 80 minutes, once weekly

Course Materials

Required: *The Scientific Endeavor: A Primer on Scientific Principles and Practice Edition 2.0* by Jeffrey A. Lee; ISBN: 9781536893830.

Assigned Readings Provided to Students:

Carroll, S. B. (2019). *The Story of Life: Great Discoveries in Biology (First Edition)*.

Chapter 2. W. W. Norton & Company, Inc.

Cook, J., Ecker, U. K. H., Trecek-King, M., Schade, G., Jeffers-Tracy, K., Fessmann, J., Kim, S. C., Kinkead, D., Orr, M., Vraga, E., Roberts, K., & McDowell, J. (2022).

The cranky uncle game—combining humor and gamification to build student resilience against climate misinformation. *Environmental Education Research*, 4, 1–17. <https://doi.org/10.1080/13504622.2022.2085671>

Idso, C. D., Carter, R. M., S Fred Singer, Nongovernmental International Panel On Climate Change, & Heartland Institute (Chicago, Ill. (2016). *Why scientists disagree about global warming: the NIPCC report on scientific consensus*. NIPCC

By The Heartland Institute.

Loss, S. R., Will, T., Longcore, T., & Marra, P. P. (2018). Responding to misinformation and criticisms regarding United States cat predation estimates. *Biological Invasions*, 20(12), 3385–3396. <https://doi.org/10.1007/s10530-018-1796-y>

Mammola, S., Malumbres-Olarte, J., Arabesky, V., Barrales-Alcalá, D. A., Barrion-Dupo, A. L., Benamú, M. A., Bird, T. L., Bogomolova, M., Cardoso, P., Chatzaki, M., Cheng, R.-C., Chu, T.-A., Classen-Rodríguez, L. M., Čupić, I., Dhiya'ulhaq, N. U., Drapeau Picard, A.-P., El-Hennawy, H. K., Elverici, M., Fukushima, C. S., & Ganem, Z. (2022). The global spread of misinformation on spiders. *Current Biology*, 32(16), R871–R873. <https://doi.org/10.1016/j.cub.2022.07.026>

National Academies of Sciences, E. (2019). Reproducibility and Replicability in Science. In *nap.nationalacademies.org*. <https://nap.nationalacademies.org/catalog/25303/reproducibility-and-replicability-in-science>

Osborne, J., Pimentel, D., Alberts, B., Allchin, D., Barzilai, S., Bergstrom, C., Coffey, J., Donovan, B., Kivinen, K., Kozyreva, A., & Wineburg, S. (2022). *Science Education in an Age of Misinformation*. Stanford University, Stanford, CA.

West, J. D., & Bergstrom, C. T. (2021). Misinformation in and about science. *Proceedings of the National Academy of Sciences*, 118(15), e1912444117. <https://doi.org/10.1073/pnas.1912444117>

Internet Access: Your access to Carmen is an integral and necessary part of this course. You must activate your OSU email account to have access to Carmen. The Carmen URL is <http://carmen.osu.edu> and Biology 2750 should be listed under My Courses on your Carmen homepage. The username to log on is your OSU name.# and the password is the one you use with all OSU email and registration systems. If you have a problem logging in or using Carmen, contact 688-HELP or carmen@osu.edu. IMPORTANT: The CLSE and its course staff will send email ONLY to your official OSU email account.

Prerequisites: GE Foundational coursework in Natural Sciences.

Course Description: *Examination of the intersection of modern biological methodologies with the cultural environment, focusing on the sharing of information, identification of validated biological discovery, and comparison with misinformation encountered in our lived environment.*

General Education Natural Science Goals & Objectives

Students who successfully complete this course will fulfill the following General Education goals and objectives:

Themes: General	
Goals	Expected Learning Outcomes
GOAL 1: Successful students will analyze an important topic or idea at a more advanced and in-depth level than the foundations.	<p>Successful students are able to ...</p> <p>1.1 Engage in critical and logical thinking about the topic or idea of the theme.</p>

	1.2 Engage in an advanced, in-depth, scholarly exploration of the topic or idea of the theme.
GOAL 2: Successful students will integrate approaches to the theme by making connections to out-of-classroom experiences with academic knowledge or across disciplines and/or to work they have done in previous classes and that they anticipate doing in future.	2.1 Identify, describe, and synthesize approaches or experiences as they apply to the theme.
	2.2 Demonstrate a developing sense of self as a learner through reflection, self-assessment, and creative work, building on prior experiences to respond to new and challenging contexts.
Theme: Lived Environments	
GOAL 1: Successful students will explore a range of perspectives on the interactions and impacts between humans and one or more types of environments (e.g., agricultural, built, cultural, economic, intellectual, natural) in which humans live.	Successful students are able to ...
	1.1 Engage with the complexity and uncertainty of human-environment interactions.
	1.2 Describe examples of human interaction with and impact on environmental change and transformation over time and across space.
GOAL 2: Successful students will analyze a variety of perceptions, representations and/or discourses about environments and humans within them.	2.1 Analyze how humans' interactions with their environments shape or have shaped attitudes, beliefs, values and behaviors.
	2.2 Describe how humans perceive and represent the environments with which they interact.
	2.3 Analyze and critique conventions, theories, and ideologies that influence discourses around environments.

Our cultural environment has changed dramatically over the past few decades with the rise of the internet and social media. In this new modern world, Biology tends to be the center of many misinformation (unintentionally spreading wrong information) and disinformation (intentionally spreading wrong information) campaigns making it difficult to discern fact from fiction. In our modern society, scientific misinformation can spread at an alarming rate, often attacking topics with overwhelming scientific consensus and the scientific processes themselves. In the past, scientific information was curated by experts in their field and passed along to scientific journalists and trustworthy media outlets who then disseminated this information to the public. Certainly, there are credible sources of scientific information to be found online but there are also several sources pushing misinformation that is often cloaked in jargon with complex scientific language, frequently using cherry-picked data to intentionally mislead and confuse.

As a student in Biology 2750, you will analyze the processes central to scientific endeavors specifically within the biological sciences, and examine the effect of these

processes in the context of historical and contemporary social responses (Lived Environments (LE) Learning Outcome (LO) 1.1, 1.2). You will develop skills to effectively evaluate the validity of biological claims, and practice those skills studying modern biological issues you will encounter in your everyday lived environment (LE LO 2.1).

This course will discuss the formation of misinformation in biology stemming from changes in the way research results make their way into the public sector through social media, the rise of preprint servers that gain media attention, publication biases, predatory publishers, and malfeasance (example: Andrew Wakefield’s misconduct fabricating the link between vaccines and autism) (LE LO 2.1, 2.2, 2.3). Overall, this course will provide you a framework to recognize misleading biological-based claims making you more informed citizens and better able to traverse the modern environment you find yourself in currently and after completing your undergraduate degree.

Biology 2750 Goals and Learning Outcomes

Upon successful completion of Biology 2750, students will demonstrate the ability to:

Goals	Expected Learning Outcomes
Goal 1: Students will develop science literacy skills and the ability to construct a scientifically literate argument.	<ul style="list-style-type: none"> • 1.1 Students will evaluate both controversies in biology as well as biological topics viewed as controversial by parts of society.
	<ul style="list-style-type: none"> • 1.2 Students will use critical thinking skills to evaluate the validity of biological claims presented as scientific in social media and the popular press.
	<ul style="list-style-type: none"> • 1.3 Students will synthesize evidence-based arguments to diverse audiences using knowledge and skills from other coursework explaining how biology and technology address problems of the contemporary world.
Goal 2: Students will develop critical thinking skills through and exploration of logical fallacies and their use in arguments.	<ul style="list-style-type: none"> • 2.1 Students will differentiate biological science from pseudoscience and non-science.
	<ul style="list-style-type: none"> • 2.2 Students will identify examples of logical fallacies used in biological misinformation.
	<ul style="list-style-type: none"> • 2.3 Students will use logical fallacies to evaluate examples of biological research as well as biological misinformation.
	<ul style="list-style-type: none"> • 2.4 Students will compare anecdotal thought and experiences to biological data and reasoning.
Goal 3: Students understand the scientific process in both modern and historical contexts.	<ul style="list-style-type: none"> • 3.1 Students will differentiate between hypotheses, predictions, theories, laws, and facts.
	<ul style="list-style-type: none"> • 3.2 Students will synthesize the contributions of various scientific philosophers in the age of scientific reasoning from both eastern and western culture.

	<ul style="list-style-type: none"> • 3.3 Students will recognize that interpretation of data is a regular part of methodology in the natural sciences.
	<ul style="list-style-type: none"> • 3.4 Students will analyze the inherent risk of bias as a product of biological research being a human endeavor.
	<ul style="list-style-type: none"> • 3.5 Students will synthesize sound scientific explanations grounded in the scientific process.
	<ul style="list-style-type: none"> • 3.6 Students will summarize the process of peer review and publication commonly used in the natural sciences.
	<ul style="list-style-type: none"> • 3.7 Students will explain the self-correcting nature of science using examples from the history of biological research.
Goal 4: Students will describe the interdependence of scientific and technological developments.	<ul style="list-style-type: none"> • 4.1 Students will compare and differentiate between theoretical biology and applied biology.
Goal 5: Students will analyze and interpret major forms of human thought, culture, and expression.	<ul style="list-style-type: none"> • 5.1 Students will compare knowledge in the biological sciences to other forms of knowledge.
	<ul style="list-style-type: none"> • 5.2 Students will contrast the questions applicable to the scientific process and those that cannot be answered by science.
Goal 6: Students evaluate how ideas influence the character of human beliefs, the perception of reality, and the norms which guide human behavior.	<ul style="list-style-type: none"> • 6.1 Students will assess uncertainty and its role in biological literacy and agenda-driven interpretation in the media.
	<ul style="list-style-type: none"> • 6.2 Students will construct and deliver sound arguments appealing to different ways of thinking in specified environments.
	<ul style="list-style-type: none"> • 6.3 Students will apply critical thinking skills to assess human willingness or susceptibility to accept claims without evidence.
	<ul style="list-style-type: none"> • 6.4 Students will reflect on the ways their personal experiences have influenced their own thought or perceptions.
	<ul style="list-style-type: none"> • 6.5 Students will analyze scientific misconduct in the biological sciences and the conditions that encourage intentional and unintentional malfeasance.
	<ul style="list-style-type: none"> • 6.6 Students will analyze the misrepresentation of biological data by individuals and groups within the biological sciences.

Credit hour and work expectation: This is a 3-credit-hour course. According to Ohio State policy, students should expect around 3 hours per week of time spent on direct

instruction (instructor content, labs, and Carmen activities, for example) in addition to 6 hours of homework (reading and assignment preparation, for example) to receive a grade of (C) average. [ASC Honors](#) provides an excellent guide to scheduling and study expectations.

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.
- **Collaboration Required (👥)**: 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
Workshop Assignments (10 x 20 pts each)	200 pts.	👥
Writing Assignments (4 x 20 pts each)	80 pts.	👥👉
Lecture Quizzes (5 x 50 pts each)	250 pts	👤
Final Project	50 pts.	👤
Misinformation Inventory	30 pts	👤
In-class Activities (including TopHat)	50 pts.	👥👉
SALG	5 pts.	👤
TOTAL COURSE POINTS	665	

Workshop Assignments 👥: During workshop, cooperative groups will apply knowledge gained in lecture to analyze relevant case studies. These case studies will vary each week but will primarily consist of short answer responses, graph and figure analysis, and some multiple-choice questions. Groups will submit their work at the beginning of workshop the following week. Examples of topics discussed will include Climate change research and climate change denial, COVID -19 and vaccine misinformation, GMO's, misinformation on invasive species, nutrition misinformation, alternative medicine, Conservation Biology, Evolution misinformation, and genetic engineering techniques. Examples of these assignments are designed to help students 1) better understands credible biology sources, 2) use lateral reading to determine source credibility, 3) discuss the role of expertise in biological fields, and 4) parse conflicting credible information within the field of biology itself.

Writing Assignments 👥👉: These assignments will be a mix of writing assignments asking students to synthesize content from lecture, reading assignments, and individual research of articles in the popular and primary literature (we have

included an example assignment at the end of this document – *Appendix C: Sample Writing Assignment Debunk the Bunk*).

Lecture Quizzes 📌 : These brief quizzes will serve as checkpoints for students to keep up with objective components of lecture. They will be held at the beginning of lecture and consist of multiple choice and short answer questions reflective of lecture material. There will be 5 progressive quizzes throughout the semester.

Final Project 📌 : This final paper will ask students to research an example of pseudoscience and provide a scientific counterargument aimed at winning a “Thanksgiving debate with your uncle.”

Misinformation Inventory: You will keep track of all misinformation you encounter for a week as well as the misinformation you create and/or try to debunk for an entire week. This data will then be turned into a visual representation of your choice. Be creative here and think of ways you might want to display this data. Examples will be shown during class to help give you some ideas.

In-Class Activities 🗨️: Active learning opportunities in lecture will include group case studies as well as TopHat questions.

SALG 📌 : The Student Assessment of Learning Gains is a survey taken during the final week of the course and will be worth 5 points for completion.

Final Grades:

Your final grade will be based on the percentage of the 665 points that you earn during the semester, as indicated below. Please note that we do not grade the course on a curve and *Carmen* does not round scores up to the next nearest percentage point, so 92.11% and 92.97% both earn the grade of A-.

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 as posted or zero if missing.** To challenge or inquire about a grade, contact your TA. 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, cannot be entertained after the 10-day grace period.

Late Assignments Policy:

All written assignments are due by 11:59 pm on the assigned dates. A late assignment (except exams) will be subject to a 25% deduction for each day late. This corresponds to 100% point deduction if assignments are turned in after 4 days of the due date.

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:** We will send all important class-wide messages through the Announcements tool in CarmenCanvas. Please check [your notification preferences](https://go.osu.edu/canvas-notifications) (go.osu.edu/canvas-notifications) to ensure you receive these messages.
- **Graded Assignments** will be graded and returned to you within one week after they were turned in. All scores are posted on Carmen no later than the day the graded assignment is returned.

Absences:

If you are too ill to take an exam or must miss for another legitimate unscheduled reason, you must contact the Course Coordinator within 24 hours of the exam. Make up exams will be given only to students who produce, at the make up or before, documentation of a legitimate reason (at the time of the absence) for missing the exam. Valid excuses are limited to problems that are beyond the student's control, such as military duty, intercollegiate athletic or academic activities, funerals, etc. Medical excuses will be considered only if you have been treated by a medical professional on the day of the exam (excuses from the student health center website will not be accepted). Lack of transportation, loss of electricity, travel plans, etc. are not considered valid excuses. If you anticipate having to miss an exam due to attendance at a university sanctioned event or other qualifying conflict, you must contact the Course Coordinator at least one week in advance of the exam.

If you have no documentation to support your absence, or your absence from the exam is not for an excused reason, you will still be offered the opportunity for a makeup exam, with a 25% overall deduction on your exam score if arrangements are made within 24 hours of the original exam.

The format of makeup exams is at the discretion of the instructors. All makeup exams must be made up within one week of when the original exam was given.

Note: Check the date and time of the final examination now and make sure that this time does not conflict with your future plans. No early final exams will be given. The only makeup exam will be held on Wednesday, December xx at 9:00 a.m. and is available only in emergency situations and with prior approval of the Course Coordinator.

Make-Up Workshops and Lecture Activities: Both the lecture and workshop are integral parts of this course. If you miss a class, you must contact your instructor (lecture or workshop, as appropriate) 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 workshop to receive the make-up exercise. Therefore, it is essential that you contact your instructor immediately if you miss a workshop, 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:

2. Illness and injury
3. Mental health
4. Disability-related concerns
5. Military service
6. Death in the immediate family
7. Religious observance
8. Academic field trips
9. Participation in university sanctioned concert or athletic event
10. 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.

If you are isolating while waiting for a COVID-19 test result, please let me know immediately. Those testing positive for COVID-19 should refer to the **Safe and Healthy Buckeyes site** for resources. Beyond five days of the required COVID-19 isolation period, I may rely on Student Life Disability Services to establish further reasonable accommodations. You can connect with them at slds@osu.edu; 614-292-3307; or slds.osu.edu.

Accommodation of Special Needs:

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 us 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 Course Coordinator as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. Only the course coordinator is authorized to complete SLDS accommodations. This will help us ensure that your individual needs will be met appropriately and fairly. SLDS contact information: slds@osu.edu; 614-292-3307; slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue.

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 [Office of Institutional Equity](#).

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

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.

Section Changes:

All section changes and adds are completed by the course coordinator. Due to the need to keep up-to-minute availability of seats in each workshop, the lecturer and workshop instructors are unable to sign any permission forms.

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. 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.

TopHat

- TopHat is a web-based response system that allows students to use their own devices provide responses in the classroom. This course uses Top Hat to promote active engagement, allow for synchronous feedback, and monitor attendance.
- [TopHat](#) help guide

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 the Course Coordinator or 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://tm.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 Younklin 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.

Title IX:

Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the appropriate resources at <http://titleix.osu.edu> or by contacting the Ohio State Title IX Coordinator at titleix@osu.edu.

Diversity:

The Ohio State University affirms the importance and value of diversity in the student body. Our programs and curricula reflect our multicultural society and global economy and seek to provide opportunities for students to learn more about persons who are different from them. We are committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters sensitivity, understanding, and mutual respect among each member of our community; and encourages each individual to strive to reach his or her own potential. Discrimination against any individual based upon protected status, which is defined as age, color, disability, gender identity or expression, national origin, race, religion, sex, sexual orientation, or veteran status, is prohibited.

Academic Misconduct:

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed, illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct <http://studentlife.osu.edu/csc/>. We will adhere to this policy.

- 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.

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 or course coordinator.

Spring 2025 TENTATIVE SCHEDULE

Week	Lecture Topics	Chapters and Readings	Assignments Due
1	Introduction to Science and Malarkey	1	Workshop Assignment 1: Understanding Sources
2	The Philosophy of Science and the Community of Scientists <ul style="list-style-type: none"> Focus on the unifying theories of modern biology (Cell Theory, Evolution, Central Dogma/Hereditiy) The colloquial "It's just a theory." 	2	Workshop Assignment 2: How to read a scientific paper
3	Biological Methodologies: <ul style="list-style-type: none"> Types of research studies in biology Qualitative vs Quantitative biology Observational studies and clinical trials in Biology Pilot Studies 	3, 4	Writing Assignment 1 due; Lecture Quiz 1
4	Biological Research in Our Modern Lived Environment <ul style="list-style-type: none"> In the lab/field – what happens? Publishing – What are journals? How does the public find out about research? Peer Review The politics of public funding for studies 	3, 4	Workshop Assignment 3: Visit a journal website: How do you submit a paper?
5	Correlation and Causality in Biology <ul style="list-style-type: none"> Storks deliver babies? Interpreting correlations Common Causes in correlation Determining Causality 	6	Writing Assignment 2 due; Workshop Assignment 4: Storks Deliver Babies (p = 0.008)
6	Statistical Traps in Biological research <ul style="list-style-type: none"> Interpreting p-values in biological research Multiple tests and the p-value False positives and negatives 	6	Lecture Quiz 2
7	Common Data Visualization practices in biology <ul style="list-style-type: none"> Bar Charts Line Graphs Y-axis values Misleading figures in the media and how to spot them 	7	Workshop Assignment 5: Data Analysis Skills and reading figures
8	Publication Bias within the natural sciences <ul style="list-style-type: none"> What studies get published? Negative results are just as interesting? How to spin a publication? 	National Academies of Sciences, E. (2019); West and Bergstrom (2021)	Writing Assignment 3 due Workshop Assignment 6: Conflicting Information – Vitamin E
9	Predatory Publishers <ul style="list-style-type: none"> What are they? How do we spot them? How do we fight back? 	West and Bergstrom (2021)	Lecture Quiz 3
10	Evaluating Biological Claims <ul style="list-style-type: none"> Wakefield et al. controversy surrounding vaccines and autism Why are most biological claims you come across false? 	(Idso et al., 2016)	Workshop Assignment 7: Lateral Reading – Determining the credibility of biological claims
11	How to spot biological misinformation <ul style="list-style-type: none"> Where do we find this? What do we look for? 	3; (Idso et al., 2016); Cook (2022)	Writing Assignment 4 due Workshop Assignment 8: Why scientists disagree about global warming

12	<p>Critical Thinking in Biology</p> <ul style="list-style-type: none"> • Find the source • Think about the big picture – linking multiple biological ideas together 	6; Osborne et al. (2022)	Lecture Quiz 4
13	<p>Strategies to correct biological misinformation</p> <ul style="list-style-type: none"> • Finding correct information • Methods to correct • Strategies to engage with misinformation 	Loss et al. (2018); Mammola et al. (2022)	Workshop Assignment 9: Bluff the listener
14	<p>Misconduct in biology</p> <ul style="list-style-type: none"> • The Legacy of Wakefield • Spider Misconduct • Misconduct at OSU 	Chapter 5; (Carroll, 2019)	Final Project Due Friday at 11:59 p.m. Workshop 10: Who can be trusted as a credible scientist?
15	Final Exam Week	No readings	Lecture Quiz 5 on assigned final exam day

Information in this syllabus is subject to change with as much notice to students as possible.

Appendix C: Sample Writing Assignment Debunk the Bunk

Learning Outcomes

Successful students will:

- Identify and evaluate misleading or inaccurate biological claims in the media (ELO 1.2, 2.1, 6.3)
- Formulate an argument using logic and tools discussed in lecture that rebukes the misleading claim (ELO 1.1)
- Synthesize an explanation of the same topic that is accurate, logical, and evidence-based (ELO 1.3, 6.2)

As you're learning, misleading headlines and misinformation are all around us. For this assignment, you will find an article or news segment where biological information is either misconstrued or incorrect and formulate an explanation as to why the information is misleading and then correctly explain the topic.

When you do this assignment, you will need to properly cite your work. This includes the article or segment that you are debunking, any information from class or your text, and any other sources you may need in order to synthesize a fact-based explanation in your write-up.

Part A: Find the Bunk (5 points)

You'll need to keep your eyes open for articles or news segments where the information is intentionally or unintentionally misleading or wrong. You will need to be able to submit a copy of this article or a video of the segment along with this assignment. If you cannot obtain a copy to upload into Carmen, then you'll need to find another source. This article or segment should come from main-stream media. This can mean several things, but a good rule of thumb is that it is written for a large audience. Blog articles, for example, are not an appropriate choice for this assignment but an article from The Atlantic or a segment from CBS News would be good choices. If you are unsure if your article is appropriate, just ask your instructor or TA.

Part B: Debunk the Bunk (9 points)

Using the tools and knowledge you have gained in lecture up until this point, you will explain why the information presented in this segment or article is misleading or incorrect. Your description should include key concepts discussed in lecture in order to logically and rationally debunk the argument. For example, if the news segment includes a logical fallacy in its explanation, you will explain what the fallacy is and how the segment is relying on it. This explanation should be comprehensive and concise. You should also include an explanation of why this misleading or incorrect information is problematic.

Part C: Clean up the Bunk (6 points)

Now that you have explained why the article is incorrect, what should the author or presenter have said? In this section, you will briefly explain the facts that were not presented correctly in the article. This section does not need to be argumentative, but rather a simple and complete explanation of the correct information. Please note you do not have to be an expert on the subject to do this. This explanation should simply focus on the basic facts that were not properly represented. You can use external sources in this explanation and should properly cite them.

Your write-up (Parts B and C and your references) should be no longer than one page, single-spaced and should use Times New Roman font size 12 with one-inch margins. You will submit your write-up and article you are debunking to Carmen. These can be uploaded in two separate files, but they both must be uploaded by the due date to receive full credit.

Rubric

Criterion	Excellent	Good	Satisfactory	Unsatisfactory
Part A: Article or segment choice	(Article or segment chosen is viewable and appropriate 5 points	Article or segment chosen is viewable but not the best choice (inaccuracies are missing or it is not a particularly misleading claim and/or has little to do with biology 1-4 Points		Article or segment chosen is either not inaccurate or misleading and/or is not related to a biological topic OR Article or segment is not uploaded or viewable by the instructor 0 Points
Part B: Description of inaccuracies using tools from lecture	Student thoroughly and succinctly describes inaccuracies of article/segment Description utilizes concepts and tools discussed in lecture and 7-9 Points	Student thoroughly and succinctly describes inaccuracies of article/segment Description utilizes concepts and tools discussed in lecture Description may be somewhat incomplete or unclear 5-7 Points	Student description of inaccuracies is missing key points Concepts and tools discussed in lecture are not appropriately used or correctly explained Description is incomplete or unclear 1-4 Points	Article or segment is not uploaded or viewable by instructor OR Write-up fails to debunk article using concepts and tools discussed in lecture 0 Points
Part C: Correct explanation of concept	Student accurately and concisely provides correct explanation Explanation is clear and demonstrates the student is grasping the information from lecture External sources properly cited where appropriate 5-6 Points	Explanation is accurate but description is somewhat incomplete or unclear Student seems to be grasping the information from lecture External sources properly cited where appropriate 4-5 Points	Explanation is inaccurate or unclear Explanation does not demonstrate the student fully understands information from lecture External sources properly cited where appropriate 1-4 Points	Article or segment is not uploaded or viewable by instructor OR Student explanation of correct information is incorrect or missing OR Student fails to properly cite external sources used 0 Points

Appendix D: Sample Workshop Activity

Names: _____

Vitamins and Health – Why Experts Disagree¹

Instructions: You are to complete this activity in your Workshop groups. You can fill in your responses in this document and upload to Carmen. Be sure each of your names is on the document you turn in.

Learning Outcomes

- Evaluate different sources of information on a particular topic
- Infer the health benefits or harmful effects of Vitamin E supplements using seemingly contradicting studies
- Differentiate types of studies and their benefits and limitations
- Analyze figures and results to draw conclusions

Nutritional advice from different sources is often contradictory. Even sources that seem reliable can give opposite advice. In this activity, we will analyze the evidence behind the contradictory advice in one specific case – whether to take vitamin E supplements.

- "Recommended Supplement: Vitamin E, about 200 IU"* a day
 - "Three very large studies found 40% heart disease risk reduction with supplements."
 - "Antioxidant; protects blood fats ... Prevents blood sticking, clots and artery damage." (<http://www.health-heart.org/vitamins.htm>)

vs.

- "Vitamin E: Just say no"
 - "... vitamin E supplements haven't been found to offer any conclusive protection against disease in large clinical trials, and they might even be risky."
 - "Two analyses have linked doses of vitamin E as low as 400 IU a day – and possibly even lower – to a small but statistically significant increase in mortality." (<http://www.consumerreports.org/cro/2012/04/top-selling-vitamin-supplements/index.htm>)

*IU = International Unit = 0.67 mg of the natural form of vitamin E or 0.45 mg of the synthetic form

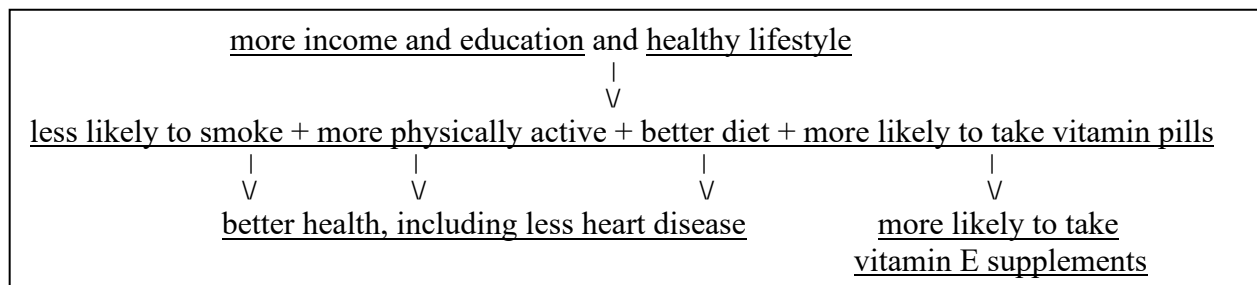
Both websites give accurate descriptions of research evidence, but they argue for opposite advice about whether to take vitamin E supplements. How can the evidence support two opposite conclusions?

To answer this question, we will begin by looking at the evidence behind the opposing claims of "40% heart disease risk reduction" *versus* a "small but statistically significant increase in mortality". Since heart disease is responsible for one-quarter of deaths in

¹ This Workshop is modified from activity by Dr. Ingrid Waldron, Department of Biology, University of Pennsylvania, copyright 2012.

the US, a 40% reduction in heart disease should result in a 10% reduction in mortality, *not* an increase. To understand these seemingly contradictory research results, we need to look at the different types of research studies that produced these results.

The evidence for a lower risk of heart disease comes from observational studies. In an observational study, researchers observe people or nature as they are without any intervention by the researcher. For example, in one type of observational study, researchers ask people whether they take vitamin E supplements, check which of these people develop heart disease during a follow-up period, and then evaluate whether the risk of developing heart disease differs between people who take vitamin E supplements and those who do not. Results from this type of observational study have shown a correlation or association between taking vitamin E supplements and lower risk of heart disease. However, these results do *not* establish that vitamin E *causes* better health, because observational studies cannot eliminate the effects of confounding factors. For example, people who take vitamin supplements tend to have more education and income and a generally healthy lifestyle and these characteristics could be the cause of their better health (see flowchart). Because of confounding factors, vitamin E supplements may be *correlated* with better health, even if they do *not cause* better health.



To evaluate causal effects, researchers use experimental studies. In an experiment, researchers control the conditions for two or more groups of subjects. Ideally, all variables are the same for these groups except for one experimental variable which differs between the groups. In this way, the experimenter can test the causal effect of the experimental variable.

In animal experiments, researchers can test the effect of a vitamin supplement by having two groups of genetically identical animals that live under identical conditions, except that one group receives the vitamin supplement, and one does not. Obviously, researchers cannot do this with people. Instead, they use a kind of experiment called a clinical trial.

Clinical trials are a type of experiment in which participants are randomly assigned to two groups, one of which receives the treatment (e.g., a vitamin supplement), while the other group receives a placebo (a pill that does not contain the vitamin, but tastes, smells and looks like the vitamin supplement, so the participants in both groups have an equal expectation of benefit). Since the participants are assigned at random to either

the treatment group or the placebo group, none of the characteristics of the participants can influence who gets the vitamin supplement and who gets the placebo; therefore, all the participants' characteristics are the same for the vitamin and placebo groups. Thus, the design of a clinical trial eliminates the effects of confounding factors, so any differences in health outcome can be interpreted as a causal effect of the vitamin supplement.

Part 1:

1. To provide persuasive evidence that a vitamin supplement has a causal effect on health, a study should meet the following criterion:

There should be two groups which have identical characteristics except that one group consumes the vitamin supplement and the other does not.

This criterion is *not* fulfilled by an observational study that compares people who choose to take vitamin supplements with people who do not. Explain why not. **(2 points)**

2a. Suppose that a kind-hearted researcher who believes in the benefits of vitamin E decides to help the low-income participants in his clinical trial by putting all of them in the vitamin E group. He plans to put all the high-income participants in the placebo group. Explain why this clinical trial would not be a true experiment that could accurately evaluate the causal effects of vitamin E on health. **(2 points)**

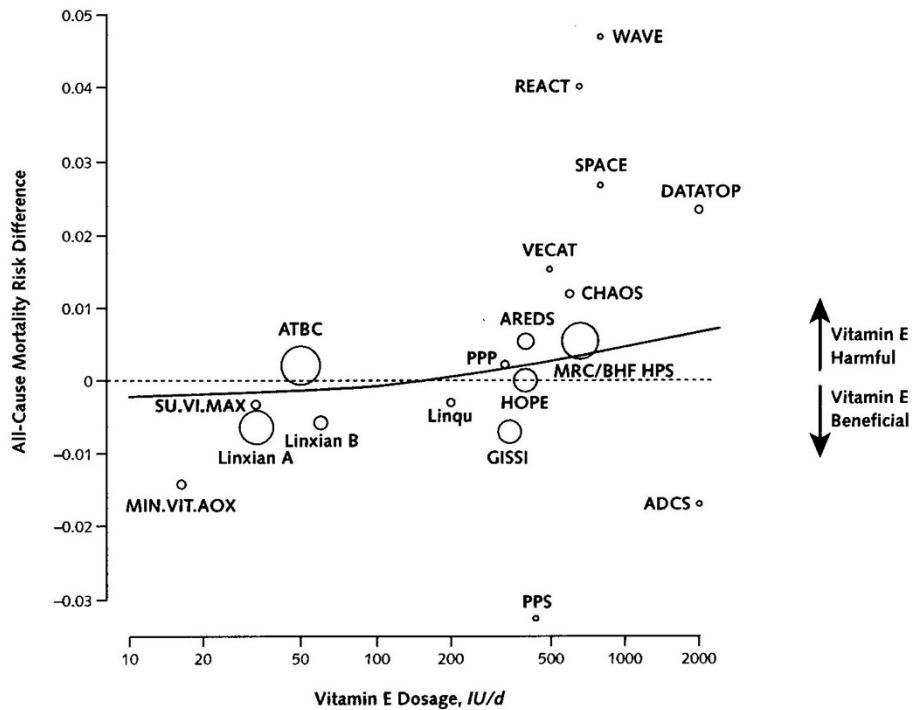
b. Why is it crucial for participants to be randomly assigned to the vitamin E and placebo groups in a clinical trial? **(2 points)**

3. Observational studies have found that people who take vitamin E supplements have a substantially lower risk of heart disease than those who do not. In contrast, clinical trials have not found consistent benefits of vitamin E supplements. What is a likely

explanation for this difference between the findings from observational studies and clinical trials? **(2 points)**

Part 2:

Conflicting results are observed even when different studies of the same type are compared. The figure below shows the findings from different randomized, placebo-controlled clinical trials that have evaluated the effects of vitamin E supplements on mortality. Each circle represents one clinical trial, and larger clinical trials with more participants are represented by larger circles. The Y axis represents the difference in the risk of dying for participants who received vitamin E versus participants who received placebo; the dashed line indicates no difference in mortality risk between the vitamin E and placebo groups.



(From Miller et al., Annals of Internal Medicine 2005; 142:37)

4. The results of the smaller clinical trials show a great deal of random variation, as illustrated by the extreme opposite results of the PPS and WAVE clinical trials (see figure). Fill in the blanks to describe the opposite results of these two clinical trials. In the ___ clinical trial, the vitamin E group had lower mortality than the placebo group, as expected. In contrast, the ___ clinical trial found the opposite result, with higher mortality for the vitamin E group. **(.5 point)**

The only large clinical trial to show a significant beneficial effect of vitamin E (Linxian A) was carried out in an area of China where blood levels of vitamin E tend to be lower

than in more economically developed countries (e.g., the US and European countries where most of the clinical trials were carried out). This result is compatible with the general finding that vitamin supplements are more likely to be beneficial for people with low vitamin intake in their diets.

5. Suppose that an expert argues that people in the US should take vitamin E supplements because two clinical trials (PPS and Linxian A) have found that vitamin E supplements significantly reduced mortality. Would you find this argument persuasive? ___ Yes ___ No **(1 point)**

Explain why or why not. **(2 points)**

When different clinical trials yield different results, researchers can use a statistical technique called meta-analysis to combine the results from the different clinical trials and calculate a best estimate of the true effect based on all the available data. A recent meta-analysis of clinical trial results estimated that the participants who took vitamin E supplements had 3% higher mortality risk than the participants who took a placebo. This result provides the best estimate we have of the effect of vitamin E supplements on mortality in economically developed countries like the US. If vitamin E supplements do cause a 3% increase in mortality risk, this could be considered a relatively small increase in risk for any individual, but it could add up to a lot of deaths if lots of people are taking vitamin E supplements.

In summary, the results from the clinical trials suggest that vitamin E supplements may increase mortality in countries like the US but may decrease mortality in regions with less adequate diets. To understand how vitamin E could have opposite effects in different circumstances, we need to look at the results from laboratory experiments where researchers tested the effects of vitamin E on molecules or cells in a test tube or petri dish. Laboratory experiments have shown a wide variety of beneficial and harmful effects of vitamin E, including the following.

- Laboratory experiments have shown that vitamin E can have antioxidant effects which protect molecules and cells from damage. However, under other experimental conditions, vitamin E can have pro-oxidant effects which can harm molecules and cells.
- Laboratory experiments have also shown that vitamin E can decrease blood clotting. Decreased blood clotting can reduce the risk of some diseases (e.g., heart disease and an Ischemic stroke caused by blood clots which block needed blood flow), but increase the risk of other diseases (e.g., Hemorrhagic stroke caused by bleeding in the brain).

Thus, vitamin E has multiple effects on the molecules and cells in our bodies, and the balance between beneficial and harmful effects of vitamin E supplements may vary depending on factors such as how much vitamin E people are getting from their diet. Because vitamin E has both beneficial and harmful effects, the results of laboratory

studies cannot tell us whether the overall health effect of vitamin E supplements will be beneficial or harmful.

6. An advertisement urges you to take an antioxidant supplement that contains several types of antioxidant molecules that laboratory experiments have shown can prevent damage to other molecules and cells. Before you decide whether to take the antioxidant supplement, what else would you want to know? **(2 points)**

7. Both websites quoted in the box on page 1 give accurate statements concerning the research evidence, but these two websites argue for opposite conclusions. Explain how these two opposite conclusions can both be supported by factually accurate evidence. **(2 points)**

8. Based on all the evidence presented in this activity, which of the following statements best summarizes your conclusion about the health effects of vitamin E supplements for a typical person in the US? **(.5 point)**

- a) Vitamin E is an antioxidant and has other beneficial health effects, so everyone should be encouraged to take vitamin E supplements.
- b) The best evidence suggests that vitamin E supplements may have a small harmful effect on health for people in countries like the US. Therefore, experts should discourage people from taking vitamin E supplements, unless a doctor identifies a specific medical reason for taking these supplements.
- c) The research results are so contradictory and confusing that scientists don't know whether vitamin E has beneficial or harmful effects on health, so people should just ignore the scientific findings and decide for themselves whether to take vitamin E supplements.

Explain your reasoning and the evidence that supports your choice above. **(2 points)**

9. Suppose that you read a newspaper headline, "New Study Shows that Vitamin D Improves Health". State two reasons why you should be skeptical about this headline and find out more before you start taking vitamin D supplements. **(2 points)**

Appendix B: Sample Course Syllabus



THE OHIO STATE UNIVERSITY

Biology 2750
***Scientific Thought in
an Anecdotal World***
Spring 2025
3 Credit Hours

Lecturers: James Chiucchi, Ph.D.
Samantha Herrmann, Ph.D.
Center for Life Sciences Education
Jennings Hall

Course Coordinator:

Teaching Associates:

Class Meeting Schedule

Lecture: TU/TH (55-minute lectures)

Workshop: 80 minutes, once weekly

Course Materials

Required: *The Scientific Endeavor: A Primer on Scientific Principles and Practice Edition 2.0* by Jeffrey A. Lee; ISBN: 9781536893830.

Assigned Readings Provided to Students:

Carroll, S. B. (2019). *The Story of Life: Great Discoveries in Biology (First Edition)*. Chapter 2. W. W. Norton & Company, Inc.

Cook, J., Ecker, U. K. H., Trecek-King, M., Schade, G., Jeffers-Tracy, K., Fessmann, J., Kim, S. C., Kinkead, D., Orr, M., Vraga, E., Roberts, K., & McDowell, J. (2022). The cranky uncle game—combining humor and gamification to build student resilience against climate misinformation. *Environmental Education Research, 4*, 1–17. <https://doi.org/10.1080/13504622.2022.2085671>

Idso, C. D., Carter, R. M., S Fred Singer, Nongovernmental International Panel On Climate Change, & Heartland Institute (Chicago, Ill. (2016). *Why scientists disagree about global warming: the NIPCC report on scientific consensus*. NIPCC By The Heartland Institute.

Loss, S. R., Will, T., Longcore, T., & Marra, P. P. (2018). Responding to misinformation and criticisms regarding United States cat predation estimates. *Biological Invasions, 20*(12), 3385–3396. <https://doi.org/10.1007/s10530-018-1796-y>

Mammola, S., Malumbres-Olarte, J., Arabesky, V., Barrales-Alcalá, D. A., Barrion-Dupo, A. L., Benamú, M. A., Bird, T. L., Bogomolova, M., Cardoso, P., Chatzaki, M., Cheng, R.-C., Chu, T.-A., Classen-Rodríguez, L. M., Čupić, I., Dhiya'ulhaq, N. U.,

Drapeau Picard, A.-P., El-Hennawy, H. K., Elverici, M., Fukushima, C. S., & Ganem, Z. (2022). The global spread of misinformation on spiders. *Current Biology*, 32(16), R871–R873. <https://doi.org/10.1016/j.cub.2022.07.026>

National Academies of Sciences, E. (2019). Reproducibility and Replicability in Science. In *nap.nationalacademies.org*.
<https://nap.nationalacademies.org/catalog/25303/reproducibility-and-replicability-in-science>

Osborne, J., Pimentel, D., Alberts, B., Allchin, D., Barzilai, S., Bergstrom, C., Coffey, J., Donovan, B., Kivinen, K., Kozyreva, A., & Wineburg, S. (2022). *Science Education in an Age of Misinformation*. Stanford University, Stanford, CA.

West, J. D., & Bergstrom, C. T. (2021). Misinformation in and about science. *Proceedings of the National Academy of Sciences*, 118(15), e1912444117. <https://doi.org/10.1073/pnas.1912444117>

Internet Access: Your access to Carmen is an integral and necessary part of this course. You must activate your OSU email account to have access to Carmen. The Carmen URL is <http://carmen.osu.edu> and Biology 2750 should be listed under My Courses on your Carmen homepage. The username to log on is your OSU name.# and the password is the one you use with all OSU email and registration systems. If you have a problem logging in or using Carmen, contact 688-HELP or carmen@osu.edu. IMPORTANT: The CLSE and its course staff will send email ONLY to your official OSU email account.

Prerequisites: GE Foundational coursework in Natural Sciences.

Course Description: *Examination of the intersection of modern biological methodologies with the cultural environment, focusing on the sharing of information, identification of validated biological discovery, and comparison with misinformation encountered in our lived environment.*

General Education Natural Science Goals & Objectives

Students who successfully complete this course will fulfill the following General Education goals and objectives:

Themes: General	
Goals	Expected Learning Outcomes
GOAL 1: Successful students will analyze an important topic or idea at a more advanced and in-depth level than the foundations.	Successful students are able to ... 1.1 Engage in critical and logical thinking about the topic or idea of the theme.
	1.2 Engage in an advanced, in-depth, scholarly exploration of the topic or idea of the theme.
GOAL 2: Successful students will integrate approaches to the theme	2.1 Identify, describe, and synthesize approaches or experiences as they apply to the theme.

<p>by making connections to out-of-classroom experiences with academic knowledge or across disciplines and/or to work they have done in previous classes and that they anticipate doing in future.</p>	<p>2.2 Demonstrate a developing sense of self as a learner through reflection, self-assessment, and creative work, building on prior experiences to respond to new and challenging contexts.</p>
<p>Theme: Lived Environments</p>	
<p>GOAL 1: Successful students will explore a range of perspectives on the interactions and impacts between humans and one or more types of environments (e.g., agricultural, built, cultural, economic, intellectual, natural) in which humans live.</p>	<p>Successful students are able to ...</p> <p>1.1 Engage with the complexity and uncertainty of human-environment interactions.</p> <p>1.2 Describe examples of human interaction with and impact on environmental change and transformation over time and across space.</p>
<p>GOAL 2: Successful students will analyze a variety of perceptions, representations and/or discourses about environments and humans within them.</p>	<p>2.1 Analyze how humans' interactions with their environments shape or have shaped attitudes, beliefs, values and behaviors.</p> <p>2.2 Describe how humans perceive and represent the environments with which they interact.</p> <p>2.3 Analyze and critique conventions, theories, and ideologies that influence discourses around environments.</p>

Our cultural environment has changed dramatically over the past few decades with the rise of the internet and social media. In this new modern world, Biology tends to be the center of many misinformation (unintentionally spreading wrong information) and disinformation (intentionally spreading wrong information) campaigns making it difficult to discern fact from fiction. In our modern society, scientific misinformation can spread at an alarming rate, often attacking topics with overwhelming scientific consensus and the scientific processes themselves. In the past, scientific information was curated by experts in their field and passed along to scientific journalists and trustworthy media outlets who then disseminated this information to the public. Certainly, there are credible sources of scientific information to be found online but there are also several sources pushing misinformation that is often cloaked in jargon with complex scientific language, frequently using cherry-picked data to intentionally mislead and confuse.

As a student in Biology 2750, you will analyze the processes central to scientific endeavors specifically within the biological sciences, and examine the effect of these processes in the context of historical and contemporary social responses (Lived Environments (LE) Learning Outcome (LO) 1.1, 1.2). You will develop skills to effectively evaluate the validity of biological claims, and practice those skills studying

modern biological issues you will encounter in your everyday lived environment (LE LO 2.1).

This course will discuss the formation of misinformation in biology stemming from changes in the way research results make their way into the public sector through social media, the rise of preprint servers that gain media attention, publication biases, predatory publishers, and malfeasance (example: Andrew Wakefield’s misconduct fabricating the link between vaccines and autism) (LE LO 2.1, 2.2, 2.3). Overall, this course will provide you a framework to recognize misleading biological-based claims making you more informed citizens and better able to traverse the modern environment you find yourself in currently and after completing your undergraduate degree.

Biology 2750 Goals and Learning Outcomes

Upon successful completion of Biology 2750, students will demonstrate the ability to:

Goals	Expected Learning Outcomes
Goal 1: Students will develop science literacy skills and the ability to construct a scientifically literate argument.	<ul style="list-style-type: none"> • 1.1 Students will evaluate both controversies in biology as well as biological topics viewed as controversial by parts of society.
	<ul style="list-style-type: none"> • 1.2 Students will use critical thinking skills to evaluate the validity of biological claims presented as scientific in social media and the popular press.
	<ul style="list-style-type: none"> • 1.3 Students will synthesize evidence-based arguments to diverse audiences using knowledge and skills from other coursework explaining how biology and technology address problems of the contemporary world.
Goal 2: Students will develop critical thinking skills through and exploration of logical fallacies and their use in arguments.	<ul style="list-style-type: none"> • 2.1 Students will differentiate biological science from pseudoscience and non-science.
	<ul style="list-style-type: none"> • 2.2 Students will identify examples of logical fallacies used in biological misinformation.
	<ul style="list-style-type: none"> • 2.3 Students will use logical fallacies to evaluate examples of biological research as well as biological misinformation.
	<ul style="list-style-type: none"> • 2.4 Students will compare anecdotal thought and experiences to biological data and reasoning.
Goal 3: Students understand the scientific process in both modern and historical contexts.	<ul style="list-style-type: none"> • 3.1 Students will differentiate between hypotheses, predictions, theories, laws, and facts.
	<ul style="list-style-type: none"> • 3.2 Students will synthesize the contributions of various scientific philosophers in the age of scientific reasoning from both eastern and western culture.
	<ul style="list-style-type: none"> • 3.3 Students will recognize that interpretation of data is a regular part of methodology in the natural sciences.

	<ul style="list-style-type: none"> • 3.4 Students will analyze the inherent risk of bias as a product of biological research being a human endeavor.
	<ul style="list-style-type: none"> • 3.5 Students will synthesize sound scientific explanations grounded in the scientific process.
	<ul style="list-style-type: none"> • 3.6 Students will summarize the process of peer review and publication commonly used in the natural sciences.
	<ul style="list-style-type: none"> • 3.7 Students will explain the self-correcting nature of science using examples from the history of biological research.
Goal 4: Students will describe the interdependence of scientific and technological developments.	<ul style="list-style-type: none"> • 4.1 Students will compare and differentiate between theoretical biology and applied biology.
Goal 5: Students will analyze and interpret major forms of human thought, culture, and expression.	<ul style="list-style-type: none"> • 5.1 Students will compare knowledge in the biological sciences to other forms of knowledge.
	<ul style="list-style-type: none"> • 5.2 Students will contrast the questions applicable to the scientific process and those that cannot be answered by science.
Goal 6: Students evaluate how ideas influence the character of human beliefs, the perception of reality, and the norms which guide human behavior.	<ul style="list-style-type: none"> • 6.1 Students will assess uncertainty and its role in biological literacy and agenda-driven interpretation in the media.
	<ul style="list-style-type: none"> • 6.2 Students will construct and deliver sound arguments appealing to different ways of thinking in specified environments.
	<ul style="list-style-type: none"> • 6.3 Students will apply critical thinking skills to assess human willingness or susceptibility to accept claims without evidence.
	<ul style="list-style-type: none"> • 6.4 Students will reflect on the ways their personal experiences have influenced their own thought or perceptions.
	<ul style="list-style-type: none"> • 6.5 Students will analyze scientific misconduct in the biological sciences and the conditions that encourage intentional and unintentional malfeasance.
	<ul style="list-style-type: none"> • 6.6 Students will analyze the misrepresentation of biological data by individuals and groups within the biological sciences.

Credit hour and work expectation: This is a 3-credit-hour course. According to Ohio State policy, students should expect around 3 hours per week of time spent on direct instruction (instructor content, labs, and Carmen activities, for example) in addition to 6 hours of homework (reading and assignment preparation, for example) to receive a

grade of (C) average. [ASC Honors](#) provides an excellent guide to scheduling and study expectations.

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.
- **Collaboration Required (↑↑)**: 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
Workshop Assignments (10 x 20 pts each)	200 pts.	↑↑↑
Writing Assignments (4 x 20 pts each)	80 pts.	↑↑
Lecture Quizzes (5 x 50 pts each)	250 pts	↑
Final Project	50 pts.	↑
Misinformation Inventory	30 pts	↑
In-class Activities (including TopHat)	50 pts.	↑↑
SALG	5 pts.	↑
TOTAL COURSE POINTS	665	

Workshop Assignments ↑↑↑: During workshop, cooperative groups will apply knowledge gained in lecture to analyze relevant case studies. These case studies will vary each week but will primarily consist of short answer responses, graph and figure analysis, and some multiple-choice questions. Groups will submit their work at the beginning of workshop the following week. Examples of topics discussed will include Climate change research and climate change denial, COVID -19 and vaccine misinformation, GMO's, misinformation on invasive species, nutrition misinformation, alternative medicine, Conservation Biology, Evolution misinformation, and genetic engineering techniques. Examples of these assignments are designed to help students 1) better understands credible biology sources, 2) use lateral reading to determine source credibility, 3) discuss the role of expertise in biological fields, and 4) parse conflicting credible information within the field of biology itself.

Writing Assignments ↑↑: These assignments will be a mix of writing assignments asking students to synthesize content from lecture, reading assignments, and individual research of articles in the popular and primary literature (we have included an example assignment at the end of this document – *Appendix C: Sample Writing Assignment Debunk the Bunk*).

Lecture Quizzes † : These brief quizzes will serve as checkpoints for students to keep up with objective components of lecture. They will be held at the beginning of lecture and consist of multiple choice and short answer questions reflective of lecture material. There will be 5 progressive quizzes throughout the semester.

Final Project † : This final paper will ask students to research an example of pseudoscience and provide a scientific counterargument aimed at winning a “Thanksgiving debate with your uncle.”

Misinformation Inventory: You will keep track of all misinformation you encounter for a week as well as the misinformation you create and/or try to debunk for an entire week. This data will then be turned into a visual representation of your choice. Be creative here and think of ways you might want to display this data. Examples will be shown during class to help give you some ideas.

In-Class Activities 🗨️: Active learning opportunities in lecture will include group case studies as well as TopHat questions.

SALG † : The Student Assessment of Learning Gains is a survey taken during the final week of the course and will be worth 5 points for completion.

Final Grades:

Your final grade will be based on the percentage of the 665 points that you earn during the semester, as indicated below. Please note that we do not grade the course on a curve and *Carmen* does not round scores up to the next nearest percentage point, so 92.11% and 92.97% both earn the grade of A-.

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 as posted or zero if missing.** To challenge or inquire about a grade, contact your TA. 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, cannot be entertained after the 10-day grace period.

Late Assignments Policy:

All written assignments are due by 11:59 pm on the assigned dates. A late assignment (except exams) will be subject to a 25% deduction for each day late. This corresponds to 100% point deduction if assignments are turned in after 4 days of the due date.

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:** We will send all important class-wide messages through the Announcements tool in CarmenCanvas. Please check [your notification preferences](https://go.osu.edu/canvas-notifications) (go.osu.edu/canvas-notifications) to ensure you receive these messages.
- **Graded Assignments** will be graded and returned to you within one week after they were turned in. All scores are posted on Carmen no later than the day the graded assignment is returned.

Absences:

If you are too ill to take an exam or must miss for another legitimate unscheduled reason, you must contact the Course Coordinator within 24 hours of the exam. Make up exams will be given only to students who produce, at the make up or before, documentation of a legitimate reason (at the time of the absence) for missing the exam. Valid excuses are limited to problems that are beyond the student's control, such as military duty, intercollegiate athletic or academic activities, funerals, etc. Medical excuses will be considered only if you have been treated by a medical professional on the day of the exam (excuses from the student health center website will not be accepted). Lack of transportation, loss of electricity, travel plans, etc. are not considered valid excuses. If you anticipate having to miss an exam due to attendance at a university sanctioned event or other qualifying conflict, you must contact the Course Coordinator at least one week in advance of the exam.

If you have no documentation to support your absence, or your absence from the exam is not for an excused reason, you will still be offered the opportunity for a makeup exam, with a 25% overall deduction on your exam score if arrangements are made within 24 hours of the original exam.

The format of makeup exams is at the discretion of the instructors. All makeup exams must be made up within one week of when the original exam was given.

Note: Check the date and time of the final examination now and make sure that this time does not conflict with your future plans. No early final exams will be given. The only makeup exam will be held on Wednesday, December xx at 9:00 a.m. and is available only in emergency situations and with prior approval of the Course Coordinator.

Make-Up Workshops and Lecture Activities: Both the lecture and workshop are integral parts of this course. If you miss a class, you must contact your instructor (lecture or workshop, as appropriate) 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 workshop to receive the make-up exercise. Therefore, it is essential that you contact your instructor immediately if you miss a workshop, 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.

If you are isolating while waiting for a COVID-19 test result, please let me know immediately. Those testing positive for COVID-19 should refer to the **Safe and Healthy Buckeyes site** for resources. Beyond five days of the required COVID-19 isolation period, I may rely on Student Life Disability Services to establish further reasonable accommodations. You can connect with them at slds@osu.edu; 614-292-3307; or slds.osu.edu.

Accommodation of Special Needs:

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 us 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 Course Coordinator as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. Only the course coordinator is authorized to complete SLDS accommodations. This will help us ensure that your individual needs will be met appropriately and fairly. SLDS contact information: slds@osu.edu; 614-292-3307; slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue.

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 [Office of Institutional Equity](#).

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

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.

Section Changes:

All section changes and adds are completed by the course coordinator. Due to the need to keep up-to-minute availability of seats in each workshop, the lecturer and workshop instructors are unable to sign any permission forms.

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. 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.odde.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.

TopHat

- TopHat is a web-based response system that allows students to use their own devices provide responses in the classroom. This course uses Top Hat to promote active engagement, allow for synchronous feedback, and monitor attendance.
- [TopHat](#) help guide

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 the Course Coordinator or 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://tm.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.

Title IX:

Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the

appropriate resources at <http://titleix.osu.edu> or by contacting the Ohio State Title IX Coordinator at titleix@osu.edu.

Diversity:

The Ohio State University affirms the importance and value of diversity in the student body. Our programs and curricula reflect our multicultural society and global economy and seek to provide opportunities for students to learn more about persons who are different from them. We are committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters sensitivity, understanding, and mutual respect among each member of our community; and encourages each individual to strive to reach his or her own potential. Discrimination against any individual based upon protected status, which is defined as age, color, disability, gender identity or expression, national origin, race, religion, sex, sexual orientation, or veteran status, is prohibited.

Academic Misconduct:

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed, illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct <http://studentlife.osu.edu/csc/>. We will adhere to this policy.

- 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.

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 or course coordinator.

Spring 2025 TENTATIVE SCHEDULE

Week	Lecture Topics	Chapters and Readings	Assignments Due
1	Introduction to Science and Malarkey	1	Workshop Assignment 1: Understanding Sources
2	The Philosophy of Science and the Community of Scientists <ul style="list-style-type: none"> Focus on the unifying theories of modern biology (Cell Theory, Evolution, Central Dogma/Hereditiy) The colloquial "It's just a theory." 	2	Workshop Assignment 2: How to read a scientific paper
3	Biological Methodologies: <ul style="list-style-type: none"> Types of research studies in biology Qualitative vs Quantitative biology Observational studies and clinical trials in Biology Pilot Studies 	3, 4	Writing Assignment 1 due; Lecture Quiz 1
4	Biological Research in Our Modern Lived Environment <ul style="list-style-type: none"> In the lab/field – what happens? Publishing – What are journals? How does the public find out about research? Peer Review The politics of public funding for studies 	3, 4	Workshop Assignment 3: Visit a journal website: How do you submit a paper?
5	Correlation and Causality in Biology <ul style="list-style-type: none"> Storks deliver babies? Interpreting correlations Common Causes in correlation Determining Causality 	6	Writing Assignment 2 due; Workshop Assignment 4: Storks Deliver Babies (p = 0.008)
6	Statistical Traps in Biological research <ul style="list-style-type: none"> Interpreting p-values in biological research Multiple tests and the p-value False positives and negatives 	6	Lecture Quiz 2
7	Common Data Visualization practices in biology <ul style="list-style-type: none"> Bar Charts Line Graphs Y-axis values Misleading figures in the media and how to spot them 	7	Workshop Assignment 5: Data Analysis Skills and reading figures
8	Publication Bias within the natural sciences <ul style="list-style-type: none"> What studies get published? Negative results are just as interesting? How to spin a publication? 	National Academies of Sciences, E. (2019); West and Bergstrom (2021)	Writing Assignment 3 due Workshop Assignment 6: Conflicting Information – Vitamin E
9	Predatory Publishers <ul style="list-style-type: none"> What are they? How do we spot them? How do we fight back? 	West and Bergstrom (2021)	Lecture Quiz 3
10	Evaluating Biological Claims <ul style="list-style-type: none"> Wakefield et al. controversy surrounding vaccines and autism Why are most biological claims you come across false? 	(Idso et al., 2016)	Workshop Assignment 7: Lateral Reading – Determining the credibility of biological claims
11	How to spot biological misinformation <ul style="list-style-type: none"> Where do we find this? What do we look for? 	3; (Idso et al., 2016); Cook (2022)	Writing Assignment 4 due Workshop Assignment 8: Why scientists disagree about global warming
12	Critical Thinking in Biology <ul style="list-style-type: none"> Find the source Think about the big picture – linking multiple biological ideas together 	6; Osborne et al. (2022)	Lecture Quiz 4

13	Strategies to correct biological misinformation <ul style="list-style-type: none"> • Finding correct information • Methods to correct • Strategies to engage with misinformation 	Loss et al. (2018); Mammola et al. (2022)	Workshop Assignment 9: Bluff the listener
14	Misconduct in biology <ul style="list-style-type: none"> • The Legacy of Wakefield • Spider Misconduct • Misconduct at OSU 	Chapter 5; (Carroll, 2019)	Final Project Due Friday at 11:59 p.m. Workshop 10: Who can be trusted as a credible scientist?
15	Final Exam Week	No readings	Lecture Quiz 5 on assigned final exam day

Information in this syllabus is subject to change with as much notice to students as possible.

GE Theme course submission worksheet: Lived Environments

Overview

Courses in the GE Themes aim to provide students with opportunities to explore big picture ideas and problems within the specific practice and expertise of a discipline or department. Although many Theme courses serve within disciplinary majors or minors, by requesting inclusion in the General Education, programs are committing to the incorporation of the goals of the focal theme and the success and participation of students from outside of their program.

Each category of the GE has specific learning goals and Expected Learning Outcomes (ELOs) that connect to the big picture goals of the program. ELOs describe the knowledge or skills students should have by the end of the course. Courses in the GE Themes must meet the ELOs common for **all** GE Themes and those specific to the Theme, in addition to any ELOs the instructor has developed specific to that course. All courses in the GE must indicate that they are part of the GE and include the Goals and ELOs of their GE category on their syllabus.

The prompts in this form elicit information about how this course meets the expectations of the GE Themes. The form will be reviewed by a group of content experts (the Theme Advisory) and by a group of curriculum experts (the Theme Panel), with the latter having responsibility for the ELOs and Goals common to all themes (those things that make a course appropriate for the GE Themes) and the former having responsibility for the ELOs and Goals specific to the topic of **this** Theme.

Briefly describe how this course connects to or exemplifies the concept of this Theme (Lived Environments)

In a sentence or two, explain how this class “fits” within the focal Theme. This will help reviewers understand the intended frame of reference for the course-specific activities described below.

In our modern world, Biology tends to be the center of many misinformation (unintentionally spreading wrong information) and disinformation (intentionally spreading wrong information) campaigns making it difficult to discern fact from fiction. Many social, ethical, and cultural issues of our modern social and cultural environment – climate change ecology, genetic engineering and genetic testing, food and agriculture, drug testing, environmental conservation, medical treatments, disease outbreaks, invasive species, and others – are inherently biological issues. Therefore, we are proposing a new course that would fulfill the General Education Lived Environments theme and serve as an elective to the Biology Major curriculum.

Connect this course to the Goals and ELOs shared by *all* Themes

Below are the Goals and ELOs common to all Themes. In the accompanying table, for each ELO, describe the activities (discussions, readings, lectures, assignments) that provide opportunities for students to achieve those outcomes. The answer should be concise and use language accessible to colleagues outside of the submitting department or discipline. The specifics of the activities matter—listing “readings” without a reference to the

topic of those readings will not allow the reviewers to understand how the ELO will be met. However, the panel evaluating the fit of the course to the Theme will review this form in conjunction with the syllabus, so if readings, lecture/discussion topics, or other specifics are provided on the syllabus, it is not necessary to reiterate them within this form. The ELOs are expected to vary in their “coverage” in terms of number of activities or emphasis within the course. Examples from successful courses are shared on the next page.

Goal 1: Successful students will analyze an important topic or idea at a more advanced and in-depth level than the foundations. In this context, “advanced” refers to courses that are e.g., synthetic, rely on research or cutting-edge findings, or deeply engage with the subject matter, among other possibilities.

Goal 2: Successful students will integrate approaches to the theme by making connections to out-of-classroom experiences with academic knowledge or across disciplines and/or to work they have done in previous classes and that they anticipate doing in future.

	Course activities and assignments to meet these ELOs
<p>ELO 1.1 Engage in critical and logical thinking.</p>	<p>Students will analyze the processes central to scientific endeavors specifically within the biological sciences and examine the effect of these processes in the context of historical and contemporary social responses. They will develop skills to effectively evaluate the validity of biological claims and practice those skills studying modern biological issues encountered encounter in everyday lived environments.</p> <p>All course activities and assignments are designed with critical and logical thinking as a primary goal. Specifically, examples of topics covering this are discussed in lecture during week 12 (Critical Thinking in Biology), with the Osborne <i>et al.</i> (2022) and West & Bergstrom (2021) readings.</p> <p>The course includes discussions, readings, and assignments on climate change research and climate change denial, COVID -19 and vaccine misinformation, GMO’s, misinformation on invasive species, nutrition misinformation, alternative medicine, Conservation Biology, Evolution misinformation, and genetic engineering techniques. Examples of these assignments are designed to help students:</p> <ol style="list-style-type: none"> 1. Better understand credible biology sources (Workshop Assignments 1, 2, and 3), 2. Use lateral reading to determine source credibility (Workshop assignments 6, 7, 8, 9, and 10), 3. Discuss the role of expertise in biological fields (Workshop Assignments 7, 8, and 10), and 4. Parse conflicting credible information within the field of biology itself (Workshop assignment 6, 7, and 10).
<p>ELO 1.2 Engage in an advanced, in-depth, scholarly exploration of the topic or ideas within this theme.</p>	<p>Students engage in an advanced, in-depth, and scholarly exploration of the topic or ideas within this theme with each weekly module. There are many parts of our proposed course that accomplish this ELO.</p> <p>In lecture, we use the textbook and readings to introduce students to the weekly topics through discussion. During workshop, cooperative groups will apply knowledge gained in lecture to analyze relevant case studies. These case studies will vary each week but will primarily</p>

	<p>consist of short answer responses, graph and figure analysis, and some multiple-choice questions.</p> <p>Writing assignments will ask students to synthesize content from lecture, reading assignments, and individual research of articles in the popular and primary literature (we have included an example assignment at the end of this document – <i>Appendix C: Sample Writing Assignment Debunk the Bunk</i>).</p> <p>The final project will ask students to research an example of pseudoscience found in the media and provide a logical scientific counterargument. This will require students to combine multiple skills learned over the course of the term. They will submit their argument as a written document using credible scientific sources found in the literature.</p> <p>The Misinformation Inventory will ask students to track all misinformation and disinformation they encounter and interact with over a week. The student is then tasked with turning this data into a visual representation of their choice. They are encouraged to be creative in the way they display their data and will discuss their findings with classmates.</p>
<p>ELO 2.1 Identify, describe, and synthesize approaches or experiences.</p>	<p>We take a deep dive into the approaches that researchers often use by exploring the methods of biological research in our modern cultural environment. Specifically, as detailed in the attached syllabus, using Jeffrey Lee’s <i>The Scientific Endeavor</i> as a textbook for the course, we will take a stepwise progression through the history and methodology of scientific processes utilizing both historical and contemporary events as a framework for the effect science has on the student’s cultural and lived environment. We then explore how our cultural environment has changed in recent decades and engage students in discussions and analysis of this modern environment (internet-based) and its interactions with the scientific community. Students will be asked to consider how they interact with their environment (for example, through use of social media) and how these interactions may lead to the spread of misinformation. We use a variety of readings to facilitate these goals.</p> <p><u>Readings:</u></p> <p>Osborne, J., Pimentel, D., Alberts, B., Allchin, D., Barzilai, S., Bergstrom, C., Coffey, J., Donovan, B., Kivinen, K., Kozyreva, A., & Wineburg, S. (2022). <i>Science Education in an Age of Misinformation</i>. Stanford University, Stanford, CA.</p> <p>West, J. D., & Bergstrom, C. T. (2021). Misinformation in and about science. <i>Proceedings of the National Academy of Sciences</i>, 118(15), e1912444117. https://doi.org/10.1073/pnas.1912444117</p> <p>The Misinformation Inventory specifically will ask students to track all misinformation and disinformation they encounter outside of class and interact with over a week. The student is then tasked with turning this data into a visual representation of their choice. They are</p>

	encouraged to be creative in the way they display their data and will discuss their findings with classmates.
ELO 2.2 Demonstrate a developing sense of self as a learner through reflection, self-assessment, and creative work, building on prior experiences to respond to new and challenging contexts.	<p>Students will reflect on their sense of self and their learning in a few main ways in this course, The Final Project and the Misinformation Inventory, and the writing assignments. Assignments will require them to think about how they interact with their environment in both positive and negative ways.</p> <p>The <u>final project</u> will ask students to research an example of pseudoscience found in the media and provide a logical scientific counterargument. This will require students to combine multiple skills learned over the course of the term. They will submit their argument as a written document using credible scientific sources found in the literature.</p> <p>The <u>Misinformation Inventory</u> will ask students to track all misinformation and disinformation they encounter and interact with over a week. The student is then tasked with turning this data into a visual representation of their choice. They are encouraged to be creative in the way they display their data and will discuss their findings with classmates.</p> <p>The writing assignments (ex: Debunk the Junk) will allow them to explore their creativity and ability to defend an argument scientifically.</p>

Goals and ELOs unique to Lived Environments

Below are the Goals and ELOs specific to this Theme. As above, in the accompanying Table, for each ELO, describe the activities (discussions, readings, lectures, assignments) that provide opportunities for students to achieve those outcomes. The answer should be concise and use language accessible to colleagues outside of the submitting department or discipline. The ELOs are expected to vary in their “coverage” in terms of number of activities or emphasis within the course. Examples from successful courses are shared on the next page.

GOAL 3: Successful students will explore a range of perspectives on the interactions and impacts between humans and one or more types of environment (e.g. agricultural, built, cultural, economic, intellectual, natural) in which humans live.

GOAL 4: Successful students will analyze a variety of perceptions, representations and/or discourses about environments and humans within them.

	Course activities and assignments to meet these ELOs
ELO 3.1 Engage with the complexity and uncertainty of human environment interactions.	We will guide students in developing skills to effectively evaluate biological-based claims found in the media and primary literature so they can better navigate their modern cultural environment. From here, we build critical thinking skills to help spot misinformation and provide a framework to discuss uncertainty and variability in data using statistical techniques.

	<p>The <u>Misinformation Inventory</u> will ask students to track all misinformation and disinformation they encounter and interact with over a week. The student is then tasked with turning this data into a visual representation of their choice. They are encouraged to be creative in the way they display their data and will discuss their findings with classmates.</p> <p>The frequent writing assignments in the course, as outlined in the attached syllabus, will require students to analyze the impacts of scientific methodologies on society, through the development of technology, the effects of misconduct in science, and the perceptions of reality that exist – including those driving the rise in misinformation.</p> <p><u>Readings:</u></p> <p>Osborne, J., Pimentel, D., Alberts, B., Allchin, D., Barzilai, S., Bergstrom, C., Coffey, J., Donovan, B., Kivinen, K., Kozyreva, A., & Wineburg, S. (2022). <i>Science Education in an Age of Misinformation</i>. Stanford University, Stanford, CA.</p> <p>West, J. D., & Bergstrom, C. T. (2021). Misinformation in and about science. <i>Proceedings of the National Academy of Sciences</i>, 118(15), e1912444117. https://doi.org/10.1073/pnas.1912444117</p> <p><u>Workshops:</u></p> <p>Workshop Assignment 8: Why scientists disagree about global warming</p> <p>Workshop Assignment 9: Bluff the listener</p> <p>Workshop 10: Who can be trusted as a credible scientist?</p>
<p>ELO 3.2 Describe examples of human interaction with and impact on environmental change and transformation over time and across space.</p>	<p>The public outcry against some ‘useless’ research will provide us the backdrop to compare theoretical and applied research in biology. An understanding that technology, an applied science, is the product of theoretical research is key to this comparison. Debates that arise from where public research money should be focused will lead us to the discussion of the value of biology research and its contribution to society.</p> <p><u>Readings:</u></p> <p>Cook, J., Ecker, U. K. H., Trecek-King, M., Schade, G., Jeffers-Tracy, K., Fessmann, J., Kim, S. C., Kinkead, D., Orr, M., Vraga, E., Roberts, K., & McDowell, J. (2022). The cranky uncle game—combining humor and gamification to build student resilience against climate misinformation. <i>Environmental Education Research</i>, 4, 1–17. https://doi.org/10.1080/13504622.2022.2085671</p> <p>Loss, S. R., Will, T., Longcore, T., & Marra, P. P. (2018). Responding to misinformation and criticisms regarding United States cat predation estimates. <i>Biological Invasions</i>, 20(12), 3385–3396. https://doi.org/10.1007/s10530-018-1796-y</p> <p><u>Workshops:</u></p>

	<p>Workshop Assignment 5: Data Analysis Skills and reading figures</p> <p>Workshop Assignment 6: Conflicting Information – Vitamin E</p> <p>Workshop Assignment 7: Lateral Reading – Determining the credibility of biological claims.</p>
<p>ELO 4.1 Analyze how humans’ interactions with their environments shape or have shaped attitudes, beliefs, values and behaviors.</p>	<p>Students will analyze how humans interact with their cultural environment and how those interactions shape their beliefs, attitudes, values, and behaviors in a variety of ways while interacting with course content. Many of the assignments and modules in this course will help accomplish this ELO.</p> <p>This course will discuss the formation of misinformation in biology stemming from changes in the way research results make their way into the public sector through the rise of preprint servers that gain media attention, publication biases, predatory publishers, and malfeasance (example: Andrew Wakefield’s misconduct fabricating the link between vaccines and autism).</p> <p><u>Readings:</u></p> <p>Carroll, S. B. (2019). <i>The Story of Life: Great Discoveries in Biology (First Edition)</i>. Chapter 2. W. W. Norton & Company, Inc.</p> <p>Idso, C. D., Carter, R. M., S Fred Singer, Nongovernmental International Panel On Climate Change, & Heartland Institute (Chicago, Ill. (2016). <i>Why scientists disagree about global warming: the NIPCC report on scientific consensus</i>. NIPCC By The Heartland Institute.</p> <p>Loss, S. R., Will, T., Longcore, T., & Marra, P. P. (2018). Responding to misinformation and criticisms regarding United States cat predation estimates. <i>Biological Invasions</i>, 20(12), 3385–3396. https://doi.org/10.1007/s10530-018-1796-y</p> <p>Mammola, S., Malumbres-Olarte, J., Arabesky, V., Barrales-Alcalá, D. A., Barrion-Dupo, A. L., Benamú, M. A., Bird, T. L., Bogomolova, M., Cardoso, P., Chatzaki, M., Cheng, R.-C., Chu, T.-A., Classen-Rodríguez, L. M., Čupić, I., Dhiya’ulhaq, N. U., Drapeau Picard, A.-P., El-Hennawy, H. K., Elverici, M., Fukushima, C. S., & Ganem, Z. (2022). The global spread of misinformation on spiders. <i>Current Biology</i>, 32(16), R871–R873. https://doi.org/10.1016/j.cub.2022.07.026</p> <p><u>Workshops:</u></p> <p>Workshop Assignment 8: Why scientists disagree about global warming.</p> <p>Workshop Assignment 9: Bluff the listener.</p> <p>Workshop 10: Who can be trusted as a credible scientist?</p> <p>The <u>final project</u> will ask students to research an example of pseudoscience found in the media and provide a logical scientific counterargument. This will require students to combine multiple skills learned over the course of the term. They will submit their argument as a written document using credible scientific sources found in the literature.</p>

	<p>The <u>Misinformation Inventory</u> will ask students to track all misinformation and disinformation they encounter and interact with over a week. The student is then tasked with turning this data into a visual representation of their choice. They are encouraged to be creative in the way they display their data and will discuss their findings with classmates.</p>
<p>ELO 4.2 Describe how humans perceive and represent the environments with which they interact.</p>	<p>Overall, this course will provide students a framework to recognize misleading biological-based claims making them more informed citizens and better able to traverse the modern environment they find themselves in currently and after completing their undergraduate degree.</p> <p><u>Lecture:</u></p> <p>Weeks 10, 11, 12, 13, and 14 will provide students with opportunities to think critically about what and how they interact with scientific information in their lived environment and daily lives.</p> <p><u>Readings:</u></p> <p>Carroll, S. B. (2019). <i>The Story of Life: Great Discoveries in Biology (First Edition)</i>. Chapter 2. W. W. Norton & Company, Inc.</p> <p>Idso, C. D., Carter, R. M., S Fred Singer, Nongovernmental International Panel On Climate Change, & Heartland Institute (Chicago, Ill. (2016). <i>Why scientists disagree about global warming: the NIPCC report on scientific consensus</i>. NIPCC By The Heartland Institute.</p> <p>National Academies of Sciences, E. (2019). Reproducibility and Replicability in Science. In <i>nap.nationalacademies.org</i>. https://nap.nationalacademies.org/catalog/25303/reproducibility-and-replicability-in-science</p> <p>West, J. D., & Bergstrom, C. T. (2021). Misinformation in and about science. <i>Proceedings of the National Academy of Sciences</i>, 118(15), e1912444117. https://doi.org/10.1073/pnas.1912444117</p> <p><u>Workshops:</u></p> <p>Workshop Assignment 1: Understanding Sources</p> <p>Workshop Assignment 3: Visit a journal website: How do you submit a paper?</p> <p>Workshop Assignment 5: Data Analysis Skills and reading figures.</p> <p>Workshop 10: Who can be trusted as a credible scientist?</p>
<p>ELO 4.3 Analyze and critique conventions, theories, and ideologies that influence discourses around environments.</p>	<p>This course will discuss the formation of misinformation in biology stemming from changes in the way research results make their way into the public sector through social media, the rise of preprint servers that gain media attention, publication biases, predatory publishers, and malfeasance (example: Andrew Wakefield’s misconduct fabricating the link between vaccines and autism).</p> <p>The writing assignments will be designed with this ELO in mind. They will give students the chance to analyze and critique biological claims (See Writing assignment: Debunk the Junk).</p>

Readings:

- Carroll, S. B. (2019). *The Story of Life: Great Discoveries in Biology (First Edition)*. Chapter 2. W. W. Norton & Company, Inc.
- Loss, S. R., Will, T., Longcore, T., & Marra, P. P. (2018). Responding to misinformation and criticisms regarding United States cat predation estimates. *Biological Invasions*, 20(12), 3385–3396. <https://doi.org/10.1007/s10530-018-1796-y>
- Mammola, S., Malumbres-Olarte, J., Arabesky, V., Barrales-Alcalá, D. A., Barrion-Dupo, A. L., Benamú, M. A., Bird, T. L., Bogomolova, M., Cardoso, P., Chatzaki, M., Cheng, R.-C., Chu, T.-A., Classen-Rodríguez, L. M., Čupić, I., Dhiya'ulhaq, N. U., Drapeau Picard, A.-P., El-Hennawy, H. K., Elverici, M., Fukushima, C. S., & Ganem, Z. (2022). The global spread of misinformation on spiders. *Current Biology*, 32(16), R871–R873. <https://doi.org/10.1016/j.cub.2022.07.026>
- National Academies of Sciences, E. (2019). Reproducibility and Replicability in Science. In *nap.nationalacademies.org*. <https://nap.nationalacademies.org/catalog/25303/reproducibility-and-replicability-in-science>
- Osborne, J., Pimentel, D., Alberts, B., Allchin, D., Barzilai, S., Bergstrom, C., Coffey, J., Donovan, B., Kivinen, K., Kozyreva, A., & Wineburg, S. (2022). *Science Education in an Age of Misinformation*. Stanford University, Stanford, CA.
- West, J. D., & Bergstrom, C. T. (2021). Misinformation in and about science. *Proceedings of the National Academy of Sciences*, 118(15), e1912444117. <https://doi.org/10.1073/pnas.1912444117>

Workshops:

Workshop Assignment 5: Data Analysis Skills and reading figures

Writing Assignment 3 due

Workshop Assignment 6: Conflicting Information – Vitamin E

Workshop Assignment 8: Why scientists disagree about global warming

Workshop 10: Who can be trusted as a credible scientist?

Subject: Concurrence: BIOL 2750
Date: Monday, March 21, 2022 at 11:15:40AM Eastern Daylight Time
From: Hamilton, Ian
To: Andrews, Adam
CC: Vankeerbergen, Bernadette
Attachments: Outlook-uoehoa1g.png
Hi Adam and Bernadette,

EEOB offers concurrence on the proposed course, Biology 2750: Scientific Thought in an Anecdotal World.

Best regards,
Ian



Ian Hamilton
Professor
Vice Chair of Undergraduate Studies, EEOB
College of Arts & Sciences
Department of Evolution, Ecology and Organismal Biology & Department of Mathematics
390 Aronoff Laboratory, 318 W 12th Ave, Columbus, OH 43210
hamilton.598@osu.edu
Pronouns: he/him/his

Subject: Re: Concurrence Request
Date: Thursday, September 14, 2023 at 3:12:32 PM Eastern Daylight Time
From: Garrett, Kelly
To: Andrews, Adam
CC: Vankeerbergen, Bernadette
Attachments: image001.png
Thanks, Adam. We'll review and be in touch.

Kelly

From: Andrews, Adam <andrews.171@osu.edu>
Sent: Thursday, September 14, 2023 3:03 PM
To: Garrett, Kelly <garrett.258@osu.edu>
Cc: Vankeerbergen, Bernadette <vankeerbergen.1@osu.edu>
Subject: Concurrence Request

Dr. Garrett,

Some time back the CLSE requested concurrence for a new course, Biology 2750. You expressed concerns that the course was not sufficiently Biology-centric and overlapped too extensively with courses taught in the School of Communications. We've revised the content of the course with an aim to address those concerns and are re-requesting concurrence on the attached proposal.

We would appreciate your review by September 29. I'm happy to address any questions or concerns you have.

Thank you,
Adam



THE OHIO STATE UNIVERSITY

Adam L. Andrews

Assistant Director for Curriculum & Instruction
College of Arts and Sciences | Center for Life Sciences Education

240D Jennings Hall, 1735 Neil Avenue, Columbus, OH 43210
(614) 247-6345 Office / (614) 292-4390 Fax
andrews.171@osu.edu clse.osu.edu

The Ohio State University
College of the Arts and Sciences Concurrence Form

The purpose of this form is to provide a simple system of obtaining departmental reactions to course requests. **An e-mail may be substituted for this form.**

An academic unit initiating a request should complete Section A of this form and send a copy of the form, course request, and syllabus to each of the academic units that might have related interests in the course. Units should be allowed two weeks to respond to requests for concurrence.

Academic units receiving this form should respond to Section B and return the form to the initiating unit. Overlap of course content and other problems should be resolved by the academic units before this form and all other accompanying documentation may be forwarded to the Office of Academic Affairs.

A. Proposal to review

Initiating Academic Unit	Course Number	Course Title
Type of Proposal (New, Change, Withdrawal, or other)		Date request sent
Academic Unit Asked to Review		Date response needed

B. Response from the Academic Unit reviewing

Response: include a reaction to the proposal, including a statement of support or non-support (continued on the back of this form or a separate sheet, if necessary).

Signatures

1.	Name	Position	Unit	Date
2.	Name	Position	Unit	Date
3.	Name	Position	Unit	Date

Subject: RE: Concurrence request - New Course Biology (Scientific Thought in an Anecdotal World)
Date: Saturday, September 16, 2023 at 4:48:24 PM Eastern Daylight Time
From: Wegener, Duane
To: Andrews, Adam
Attachments: image003.png, image004.png, image005.png

Ah, this makes sense. I have looked at the new materials.
Psychology concurs.
Best wishes,
Duane



Duane T. Wegener (he/him/his)

College of Arts and Sciences Distinguished Professor of Psychology
Chair, Department of Psychology
Psychology Building, Room 225A, 1835 Neil Avenue, Columbus, OH 43210
614-292-3038 Office
wegener.1@osu.edu

From: Andrews, Adam <andrews.171@osu.edu>
Sent: Friday, September 15, 2023 8:56 AM
To: Wegener, Duane <wegener.1@osu.edu>
Subject: FW: Concurrence request - New Course Biology (Scientific Thought in an Anecdotal World)

Dr. Wegener,

Below, please find our previous correspondence with Dr. Emery regarding concurrence for Biology 2750.

Thank you!
Adam



Adam L. Andrews

Assistant Director for Curriculum & Instruction
College of Arts and Sciences | Center for Life Sciences Education

240D Jennings Hall, 1735 Neil Avenue, Columbus, OH 43210
(614) 247-6345 Office / (614) 292-4390 Fax
andrews.171@osu.edu clse.osu.edu

From: Emery, Charles <emery.33@osu.edu>
Date: Wednesday, March 23, 2022 at 2:01 PM
To: Andrews, Adam <andrews.171@osu.edu>, Vankeerbergen, Bernadette

<vankeerbergen.1@osu.edu>

Subject: RE: Concurrence request - New Course Biology (Scientific Thought in an Anecdotal World)

Yes, that would minimize the potential overlap with courses that we already offer.
Thanks.

Charles

Charles F. Emery, Ph.D.
Professor and Chair
Department of Psychology
Ohio State University
Columbus, OH 43210

Phone: 614-688-3061
Fax: 614-292-6798

Email: emery.33@osu.edu

From: Andrews, Adam <andrews.171@osu.edu>

Sent: Wednesday, March 23, 2022 1:38 PM

To: Emery, Charles <emery.33@osu.edu>; Vankeerbergen, Bernadette <vankeerbergen.1@osu.edu>

Subject: Re: Concurrence request - New Course Biology (Scientific Thought in an Anecdotal World)

Dr. Emery,

I appreciate these concerns. If we adjusted the proposal to make it clear we intend to focus primarily on the methodologies used in the natural sciences and Biology specifically, would this alleviate your concerns about the course?

Thank you,
Adam



Adam L. Andrews

Course Coordinator - Biology 1101, 1102, 1105, & 1110
Transfer Credit Coordinator
College of Arts and Sciences Center for Life Sciences Education

255B Jennings Hall, 1735 Neil Avenue, Columbus, OH 43210
(614) 247-6345 Office / (614) 292-4390 Fax
andrews.171@osu.edu clse.osu.edu

From: Emery, Charles <emery.33@osu.edu>

Date: Monday, March 21, 2022 at 4:00 PM

To: Vankeerbergen, Bernadette <vankeerbergen.1@osu.edu>, Andrews, Adam <andrews.171@osu.edu>

Subject: RE: Concurrence request - New Course Biology (Scientific Thought in an

Anecdotal World)

I've reviewed the course syllabus with my instructional team and we are concerned that the syllabus includes nothing specific to biology. We have two courses in psychology (Psych 4532 and Psych 2301) that address the critical thinking issues that are raised in the syllabus of this course. Therefore, there could be considerable overlap of the proposed course with courses that we currently teach in psychology. Based on the potential for a high degree of overlap, we can not support this proposed course as it is currently described.

Respectfully,

Charles Emery

Charles F. Emery, Ph.D.
Professor and Chair
Department of Psychology
Ohio State University
Columbus, OH 43210

Phone: 614-688-3061

Fax: 614-292-6798

Email: emery.33@osu.edu

From: Vankeerbergen, Bernadette <vankeerbergen.1@osu.edu>

Sent: Friday, March 18, 2022 3:11 PM

To: _ASC NMS Chairs Directors <ASC-nms-chairs-directors@osu.edu>; _ASC SBS-Chairs <ASC-SBS-Chairs@osu.edu>; Downing, Lisa <downing.110@osu.edu>; Armstrong, Philip <armstrong.202@osu.edu>

Cc: Andrews, Adam <andrews.171@osu.edu>

Subject: Concurrence request - New Course Biology (Scientific Thought in an Anecdotal World)

Dear all,

The Center for Life Science Education requests concurrence for a new 2000-level course entitled "Scientific Thought in an Anecdotal World". Please find attached the syllabus for the proposed course & a concurrence form. Could you review the attached syllabus and indicate whether your department provides concurrence?

Please respond by **April 4, 2022**. Please send your responses to *Adam Andrews.171* and *cc me*. You can return the attached concurrence form or you can simply respond to this e-mail. After this date, concurrence will be assumed.

Many thanks, and please contact me or Adam Andrews if you have questions or concerns.

My best,
Bernadette



Bernadette Vankeerbergen, Ph.D.

Assistant Dean, Curriculum

College of Arts and Sciences

154D Denney Hall, 164 Annie & John Glenn Ave.

Columbus, OH 43210

Phone: 614-688-5679 / Fax: 614-292-6303

<http://ascas.osu.edu>

Subject: Re: Concurrence request - New Course Biology (Scientific Thought in an Anecdotal World)
Date: Monday, March 28, 2022 at 6:31:30 PM Eastern Daylight Time
From: Craigmile, Peter
To: Andrews, Adam
CC: MacEachern, Steven, Vankeerbergen, Bernadette
Attachments: image001.png

Good evening.

The Department of Statistics gives concurrence to the new course Biology 2750, "Scientific Thought in an Anecdotal World". While this course does contain topics in Statistics, we do not offer a course that covers these statistical topics in the way covered by this course.

It might be good to mention to the students in this class that if they want to learn more about statistical methods that the Department of Statistics has many courses that could cater to them. For example, Stat 2480 covers statistical inference in a biological context. A full list of our courses can be found at <https://stat.osu.edu/courses>.

Good evening,
Peter Craigmile

Peter Craigmile, Ph.D.,
Professor, Department of Statistics, The Ohio State University.

From: "MacEachern, Steven" <snm@stat.osu.edu>
Date: Monday, March 28, 2022 at 2:05 PM
To: "Craigmile, Peter" <pfc@stat.osu.edu>
Subject: Fw: Concurrence request - New Course Biology (Scientific Thought in an Anecdotal World)

Hi Peter.

This one asks for concurrence - not much Stat content and no real overlap with our courses from the look of it.

My best,

Steve

From: Vankeerbergen, Bernadette <vankeerbergen.1@osu.edu>
Sent: Friday, March 18, 2022 3:10 PM
To: _ASC NMS Chairs Directors <ASC-nms-chairs-directors@osu.edu>; _ASC SBS-Chairs <ASC-SBS-Chairs@osu.edu>; Downing, Lisa <downing.110@osu.edu>; Armstrong, Philip <armstrong.202@osu.edu>
Cc: Andrews, Adam <andrews.171@osu.edu>
Subject: Concurrence request - New Course Biology (Scientific Thought in an Anecdotal World)

Dear all,

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Many thanks, and please contact me or Adam Andrews if you have questions or concerns.

My best,
Bernadette



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Assistant Dean, Curriculum
College of Arts and Sciences
154D Denney Hall, 164 Annie & John Glenn Ave.
Columbus, OH 43210
Phone: 614-688-5679 / Fax: 614-292-6303
<http://ascas.osu.edu>