

Evolution: IB 536

Course description

This fully online, 8-week course examines the topic of Evolution. Evolution is the unifying principle for all of Biology and is one of its most exciting and also controversial topics. Evidence for evolution is all around us, and learning how to view life through 'evolutionary tinted' lenses changes our perspective dramatically. This course covers fundamental topics for studying an understanding evolution, and emphasizes the creative ways that scientists are gaining insights into how and why life evolved as it is.

Course structure

This course is part of the Biology Masters-in-Science Teaching Program. During this course you will learn about advanced topics that you can bring into your classroom. You will create teaching objects, such as lesson plans and presentations that can be used in your classroom.

This course is completely on-line; you will never set foot onto the campus. Everything you need is either on the course site, or has a link from the course site to the internet. Even office hours are online! You may reach your instructor by accessing the online chat room during your instructor's office hours.

The on-line learning platform will allow you some leeway to take the course at your own pace. Due dates of assignments will aid your success. So pay close attention to the course calendar, the bulletin board and the occasional emailed reminder. Broad learning objectives are broken up into learning modules.

Textbook

Zimmer, C. and Emlen, D. Evolution: Making Sense of Life. Sinauer.

Modules

The course is organized into learning modules. Each module is complete with its own learning materials and assessments. The modules consist of an introductory lecture, readings and online activities such as videos and online exercises.

Introductory Lecture: Modules begin with introductory lectures. These are designed to give an overview of the topic and illustrate how ideas interact. The lectures can consist of powerpoint or prezi presentations, video or audio lectures, or a combination thereof. The lectures are designed specifically for the online environment.

Readings: Each module has required readings from the textbook that will allow you to gain more insight into the topic.

Online activities: Videos are arguably one of the best tools for learning when actual experience is unattainable. A myriad of videoed experiences on the world-wide-web are available, and there are several excellent online resources specifically developed for teaching evolution (HHMI, UC Berkeley, PBS).

Assessments

In order to track your progress in the course, the following assessments will be used.

Discussions. You will be required to log-on to the website for discussions at least twice a week. A asynchronous or a "delayed- timed" chat discussions will allow you to interact with your classmates and your instructor. A discussion question will be posted by the instructor which you will answer using what you have learned from class. You will also be required to respond to your classmates' posts. You will be graded on the extent to which you use your knowledge of the

subject to think critically about the questions. More information on discussion posts will be provided under its web-link. On occasion, we will also have synchronized chats, during which we will have discussion in real time. Here we can discuss or you can ask me questions related to our course work. We can even have study sessions. We all have other obligations in our daily lives. Consequently, for each synchronized discussion I will have several appointment times throughout the week.

Quizzes. This course will have a total of four quizzes in order to assess your understanding of the material. Quizzes are designed to ascertain your ability to think critically about what you have learned. It is imperative that you study with this in mind.

Create a teaching object. For each module you will be required to produce a teaching object on the topic discussed that you can bring into your own classroom. These teaching objects can be presentations, video or audio, lesson plans, etc. Sometimes these objects are produced individually, other times you will work collaboratively within a group to produce one. Thinking about how you can use the knowledge gained in this course for your own teaching will ensure that you understand the material and its importance. All teaching objects should show the state standards that are met by the activities proposed.

Reflection. At the end of each module student will be required to fill out a reflection/feedback form that helps you identify what was the most valuable thing they learned during the module, identify where you may still have questions, give feedback on the value of the media content presented, and on how well you feel they did in the class (relative to the amount of effort put in). This is intended to be a formative assessment of your experience in the course.

Final exam. The final exam is designed to test your cumulative knowledge gained throughout the course. Each topic either builds upon the previous topic or the topics themselves share commonalities.

Method of Evaluation	Number of evaluations	Points	Total	Grade Percentage
Discussions	8	25	200	20%
Quizzes	4	50	200	20%
Create a teaching object	8	16.88	135	30%
Reflection	8	18.75	150	15%
Final Examination	1	150	150	15%
			1000	100%

Module	Topics	Learning activities and assessments
1	Misconceptions about evolution How we study evolution	Introductory lecture produced by the instructor <i>Readings:</i> Chapters 1 and 2 from Zimmer and Emlen <i>Online activities:</i> Lecture: Evolution: Fossils, Genes and Mousetraps (HHMI); video: Ken Bingman (PBS) <i>Discussion:</i> initial questions posed will cover the misconceptions about what is evolution <i>Teaching Object:</i> through group work the students will brainstorm how to respond to controversy about teaching evolution <i>Reflection:</i> formative assessment of your experience in this module
2	Phylogeny Genetic variation	Introductory lecture produced by the instructor <i>Readings:</i> Chapters 4 and 5 from Zimmer and Emlen <i>Online activities:</i> video: Marilyn Havlik (PBS), Bonnie Chen (PBS) <i>Discussion:</i> initial questions posed will cover different methods for building phylogenies, and the sources of genetic variation <i>Teaching Object:</i> through group work the students will discuss how and whether to modify the online activity 'Hardy-Weinberg equilibrium according to Hoyle' (UC Berkeley) <i>Reflection:</i> formative assessment of your experience in this module Quiz #1
3	Genetic drift Natural selection Quantitative traits Phenotypic evolution	Introductory lecture produced by the instructor <i>Readings:</i> Chapters 6 and 7 from Zimmer and Emlen <i>Online activities:</i> Genetic drift (UC Berkeley) <i>Discussion:</i> initial questions posed will challenge students' understanding of genetic drift, and will challenge students to think 'through the lens of variation' <i>Teaching object:</i> through group work the students will formulate a lesson plan using HHMI resources for teaching about the genetics of adaptation <i>Reflection:</i> formative assessment of your experience in this module

4	<p>Evolution in the wild Molecular evolution</p>	<p>Introductory lecture produced by the instructor <i>Readings:</i> Chapters 8 and 9 from Zimmer and Emlen <i>Online activities:</i> Short film: The birth and death of genes (HHMI); Evolving switches, evolving bodies (HHMI)</p> <p><i>Discussion:</i> Initial questions posed will challenge students to explain how examples of evolution in the wild illustrate different evolutionary mechanisms <i>Teaching object:</i> students will develop a plan for using The Beak of the Finch and associated online resources (HHMI) <i>Reflection:</i> formative assessment of your experience in this module</p> <p>Quiz #2</p>
5	<p>Genetic basis of adaptation Evolution of sex</p>	<p>Introductory lecture produced by the instructor <i>Readings:</i> Chapters 10 and 11 from Zimmer and Emlen <i>Online activities:</i> Short film: Natural selection and adaptation (HHMI); Sex and the single guppy (PBS); The red queen hypothesis (PBS) <i>Discussion:</i> Initial questions posed will challenge students to develop ideas about why sexual reproduction evolves <i>Teaching object:</i> evaluate the effectiveness of using 'Evolution in the fast lane?' (UC Berkeley) to teach recombination <i>Reflection:</i> formative assessment of your experience in this module</p>
6	<p>Life history evolution Speciation</p>	<p>Introductory lecture produced by the instructor <i>Readings:</i> Chapters 12 and 13 from Zimmer and Emlen <i>Online activities:</i> Series: The Origin of Species (HHMI) <i>Discussion:</i> initial questions posed will encourage students to think about why it is difficult to study speciation <i>Teaching object:</i> Develop a plan for utilizing the resources in 'Why is evolution controversial?' (PBS) in their classroom <i>Reflection:</i> formative assessment of your experience in this module</p> <p>Quiz #3</p>

7	<p>Macroevolution</p> <p>Coevolution</p>	<p>Introductory lecture produced by the instructor</p> <p><i>Readings:</i> Chapters 14 and 15 from Zimmer and Emlen</p> <p><i>Online activities:</i> short film: Natural selection in humans (HHMI)</p> <p><i>Discussion:</i> initial questions posed will challenge students to think over different timescales</p> <p><i>Teaching object:</i> Evaluate the effectiveness of the online resource 'A case study of coevolution: squirrels, birds and the pinecones they love' (UC Berkeley</p> <p><i>Reflection:</i> formative assessment of your experience in this module</p>
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8	<p>Sexual selection</p> <p>Evolution of cooperation</p> <p>Human evolution</p>	<p>Introductory lecture produced by the instructor</p> <p><i>Readings:</i> Chapters 16 and 17 from Zimmer and Emlen</p> <p><i>Online activities:</i> Short film: Got lactase? (HHMI); Great Transitions (HHMI); Interactive film: Origin of humans with a quiz (HHMI); Activity: Human skin color: Evidence for selection (HHMI)</p> <p><i>Discussion:</i> initial questions posed will encourage students to think about anthropocentrism and anthropomorphism</p> <p><i>Teaching object:</i> Develop a plan for utilizing the resources in 'How did humans evolve' (PBS) in their classroom</p> <p><i>Reflection:</i> formative assessment of your experience in this module</p> <p>Quiz #4</p>
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