

evolution

*A journey into where we're from
and where we're going*

BIOLOGY 409 - Teaching Evolution: Online Course for Teachers

<http://scied.fullerton.edu/biol409>

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Office Hours: By appointment. Emails responded to within 48 hours.

Optional face-to-face meeting: Monday at 6 pm during first week of class and by appointment. Meetings held in MH690.

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SYLLABUS

Evolution is one of the most important and most widely misunderstood concepts in science. Teaching Evolution is an online course to help you deepen your understanding of evolutionary concepts, develop instructional strategies, and address obstacles in the teaching of evolution. It may also be of interest to anyone who would like to learn more about evolution and how to teach it.

Course credit counts as an elective for a major in biological sciences. BIOL 409 may be included on the study plan for a master's degree with completion of at least one additional assignment: a scholarly paper about some aspect of the teaching evolution with bibliographic emphasis on primary sources of data.

The course covers theoretical basis and strategies for improving teaching and learning about evolution in secondary school classrooms through education technologies. The technology content meets the ISTE National Educational Technology Standards for Teachers General Preparation Performance Profile (<http://cnets.iste.org/teachers/>), the National Council for the Accreditation of Teacher Education /National Science Teachers Association (NCATE/NSTA: <http://www.ncate.org/standard/programstds.htm>) Standard 5 Skills of Teaching, and California computer requirement for the single subject preliminary credential to teach in the sciences.

Teaching Evolution addresses the history of evolutionary thought and how scientists investigate the history of life on earth. The instructional strategy is to focus on “why” questions about ultimate causation: Why do specific organisms have particular features rather than others? Upon successful completion of this course, students will demonstrate knowledge of these causal processes of evolution: (1) to understand the origins of hereditary variations; (2) to understand how various processes act to affect the fate of those variations; (3) to understand the relative importance of the many co-acting processes of change; (4) to understand how rapidly changes occur; (5) to understand how processes such as mutation, natural selection, and genetic drift have given rise to the diverse molecular, anatomical, behavioral, and other characteristics of different organisms; and (6) to understand how populations become different species.

Evolution as a context reveals major principles unifying science disciplines. Upon successful completion of this course, students will know: (1) The nature of scientific processes, (2) The value and limitations of scientific process, (3) The scientist's use of terms such as fact, law, theory, and hypothesis (4) How multiple forms of evidence are used to test theories (5) Applications of scientific processes in different situations (6) That new observations and evidence change our understanding of the world, and (5) Understand how and why evolution is a cornerstone of biology.

Throughout their study of evolution, students will (1) Explore teaching methodologies, and address obstacles to teaching evolution (2) Examine how student misconceptions about evolution can be raised and addressed, (3) Understand how assessment strategies are integrated into inquiry-based science lessons, (4) Examine how questions facilitate diverse student thinking about and discussion of science, (5) Examine how lesson design, instructional strategies, and the learning environment affect science learning experiences for diverse students, (6) Identify what it takes to develop a respectful, productive learning environment, (7) Understand legal and professional support for teaching evolution, (8) Learn strategies for minimizing conflict about teaching evolution by understanding how students of diverse race, ethnicity, religion, and cognitive abilities perceive the idea of evolution (9) Engage in reflective practices and make continuous efforts to improve the use of technology for the design of instruction, and. (10) Work willingly with peers, professors and others in a professional manner.

Pre-requisite: Prior permission of the instructor and completion of general education math and science courses with junior or senior standing or admission to a graduate program. Within the context of this course, students must be prepared to use PowerPoint, Web Publishing, MSExcel, MSWord, spreadsheets for record keeping and data analysis, Internet search and retrieval, and abide by copyright laws.

INSTRUCTIONAL MATERIALS

Required: Zimmer, Carl. *Evolution*, HarperCollins Publishers, New York, NY, 2001. ISBN 0060199067.

Required: Interactive Web at <http://scied.fullerton.edu/biol409/intro.html> © 2001
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Science Unit and Clear Blue Sky Productions, Inc.

In addition to reading assignments, students must use the interactive web to complete eight interactive online course sessions that cover rigorous evolutionary content (sessions 1-5); methodologies for teaching evolution in technology-rich high school classrooms (sessions 6-7); and strategies for dealing with the controversy that sometimes arises in teaching evolution (session 8). Each session uses a variety of multimedia resources to explore different facets of evolution and teaching. The course draws on the PBS *Evolution* broadcast series, primary data sources, interactive Web activities, streaming videos illustrating concepts and instructional strategies, and a digital *Evolution* library to extend conceptual learning. Activities include reading, reflective writing, discussion, concept mapping, and peer review.

SCHEDULE

The assignment schedule is at <http://scied.fullerton.edu/biol409/schedule.html>
At least fifteen hours of asynchronous online activity are expected weekly during the six-week summer session in addition to readings and assignments according to the schedule posted. Activities plus reading assignments and assessments are due on Mondays before midnight. Details appear on the schedule. Questions will be answered and assignments submitted using the Blackboard Discussion Board at <http://fullerton.blackboard.com>.

Course Assignments

Textbook and reading assignments. Textbook readings and assigned activities, including quizzes, and should be done by the Monday following the week when the assignment appears on the schedule. It is essential that you complete these activities throughout the scheduled week rather than put them off until the last minute. You are expected to read each text chapter early in the scheduled week, explore the associated web pages including provided web links, answer the posted review questions both for yourself and in the corresponding discussion forums (see below), respond with thoughtful discussion to other posted answers in these discussion forums, take a “pre-quiz” on the material for a particular chapter, discuss the concepts more, and *then* take the culminating quiz for the chapter. Note that your pattern of posting to the discussion forums will be one criterion in evaluating how involved you are with the content of the course. If you regularly post only in the last day before the quiz deadline, then you are not allowing sufficient time for your peers to respond to your posts. Likewise, if you post only early in the scheduled week failing to follow up on your peers’ subsequent comments on your posts then you are not engaging in the intended discussion.

Email and Discussion Forums

Weekly review questions will be addressed through participation in an online collaborative Blackboard Discussion Board. The goal is for you to participate in educated

discussions with other students. Weekly participation in the review discussion is required and will be scored by a rubric that will be posted during the first week of class. The instructor will be Online daily to guide the discussion from Monday through Friday but may check in only once over the weekend. Ideas presented are to be substantive and supported by reference to the textbooks, online resources, or empirical evidence. Try to post on a wide variety of discussion questions. Post responses, present issues, and respond to ideas or issues presented by other students. You should try to be a "first poster" on one discussion question each week. But please ***be the first for only one item for each chapter of assigned reading***. The review questions are to help you discuss what you learn from the assignments and to clarify your thoughts about the content presented.

Course FAQs is a discussion for general questions and problems you have with the mechanics of the course. Additional details about specific assignments will be posted. Participation in this forum will not be graded. Contact us directly by email or post new threads as soon as you get frustrated. If we get several questions that are similar, we will post new threads or answers. Threads should be specific to an assignment or tool. In this forum, you can add new threads, attach files, edit your own posts, or even post anonymously, if you prefer, within the Netiquette guidelines specified.

Email should be sent to the instructor of record (Dr. Pelaez for the summer, 2006). You will get a response to each email within 48 hours if you **send each email with BIOL409 in the subject line**. In case of technical problems or emergencies, you can also contact the instructor via phone or fax through the Department of Biological Science by providing a phone number and times when you can be contacted. **Extra credit** (5 pts.) will be assigned if you *reply within 48 hours* to special emails sent by the instructor to clarify tasks. *Extra credit BIOL409* will appear in the subject line of emails when a response is expected. Please make every attempt to follow this subject line convention because email SPAM has become so common, including emails with subjects such as "Urgent reply requested."

Assessment of knowledge and ability to use the course content

Each week, students are assigned either a practice quiz and quiz or an essay writing assignment followed by peer review.

Quizzes: Practice self-assessment quizzes for discussion of questions that require critical thinking about the readings and online activities will be posted on Blackboard. After each quiz deadline, explanations of the answers will be posted on a Blackboard Quiz Discussion forum. Once you are ready, based on your self-assessment and discussion board participation, you will take a timed quiz on Blackboard for credit. Self-assessment quizzes and graded quizzes will be scheduled with alternating deadlines.

Calibrated Peer Review™ Essay Assignments

Calibrated Peer Review™ is a network tool that will be used to help you practice writing and revising scholarly essays. CPR is accessible from a campus computer or any place that has Internet access. Please use the following URL: <http://cpr.molsci.ucla.edu>. CPR has three important deadlines per assignment: the release of source material, the text

entry deadline, and the peer/self review deadline. The tentative deadlines are specified within each CPR assignment to alternate with quiz deadlines. Please check the schedule on the Web site and the Blackboard announcements for any changes to the deadline information. Below is a table with the deadlines expected for the four CPR assignments to be completed this semester. You will be asked to write an essay with a word limit around 500-1200 words for each CPR assignment. Check each assignment for the specific word limit.

Week	CPR Assignment	Source Available	Text Entry Deadline	Peer/Self Review Deadline
1-2	Darwin's Discovery	06/05/06	06/12/06	06/19/06
3	Applied Natural Selection	06/19/06	06/26/06	07/03/06
4	Human Influence	07/03/06	07/10/06	07/17/06
5-6	Evolution Misconceptions	07/17/06	07/22/06	07/26/06

Teaching Evolution Portfolio

At the end of the course, you will be required to submit a portfolio with an overall plan to be used to teach evolution in the classroom. This may be a unit plan with a few lessons as examples, or if one teaches evolution as a unifying theme throughout a course, then the structure of that approach would be described and samples of lessons would be included. The lessons should be developed during the course of the semester using the principles of "Backward Design" as outlined by *Intel* at <http://www97.intel.com/en/ProjectDesign>. The portfolio will be made public on the web using KEEP Toolkit at <http://www.cfkeep.org>.

One expectation of the "Backward Design" approach is to facilitate accommodation of instruction to diverse learners with sensitivity for students with disabilities, second language learners, and those who face reading, emotional, intellectual, or educational challenges. Accommodation plans will be developed collaboratively to support you in being open and interested in new ideas as you develop attitudes of commitment to keeping the joy of learning alive for all students. Through thoughtful approaches to problem-solving you will gain confidence in your own abilities to access resources and gain understanding of how to make evolution content meaningful to diverse learners.

While working with a partner on these assignments, as one portfolio is due for the pair of students, you will distribute the work and self-assess and peer evaluate each other's participation. Components of the portfolio will be submitted periodically for assessment by the instructor and your peers. You should use feedback received to revise your work for the final portfolio before the end of the course.

Concept Maps

Concept Maps are visual representations of the relationship between concepts. Many of our students have found these to be extremely helpful ways to organize concepts and their connections. For instance, at the start of an online session they can be used to identify prior knowledge and at the end of a session they can be revised to document new science knowledge. Given that this class is entirely on-line, concept maps also help substitute for

the conventional classroom activities that especially assist visual learners. Many students who are already or expect to soon be teachers also find this approach to be effective for classroom implementation. For these reasons, we have provided tools for you to create and explore concept mapping. Concept maps can be created using CMAP software that you can download free of charge to run on your computer. The software works by accessing a file either on your own desktop computer or on our science education server so that you can work on it from any computer with CMAP software. Details on how to create a Concept Map using CMAP are found within the course blackboard site. If you need a suggestion of where to start you might attempt the following, which in previous terms have been required: (1) a Concept Map on Scientific Processes and (2) a Concept Map on Evidence for Evolution. It is recommended that you work on each of these (or other) concept maps over a period of time. When the concept map is done, we encourage you to post the image for peer review in the Open Discussion Board on Blackboard.

Graduate students who take this course for credit toward their degree must complete one additional assignment according to UPS 411-100: a scholarly paper about an aspect of the teaching evolution with bibliographic emphasis on primary sources of data. The topic and an annotated list of the reference sources to be used must be approved by the instructor before mid-term. An outline of the paper is due the week after topic approval.

Final Exam

The final exam will take place in MH690 on Friday, July 29, from 1-3:30 pm. The exam consists of two parts: (1) a mini-lesson from your Teaching Portfolio that you will present within 10 minutes and (2) a multiple choice, short question, and essay exam on the Evolution course content. Possible points expected are distributed as follows:

Discussion Forums (5, 20 points each)	100
Pre-quizzes (5, 5 points each)	25
Quizzes (5, 15 points each)	75
CPR™ assignments (4, 20 points each)	80
Portfolio development modules	60
Peer review of portfolios	20
Cladogram Assignments (2, 10 pts each)	20
Final Exam	60
Final Portfolio	60
TOTAL POINTS POSSIBLE (TENTATIVE)	500
Graduate student research paper	100
TOTAL POINTS POSSIBLE (GRAD STU)	600

GRADING:

Your final grade in the course will be based on the percentage of the total points you accumulate according to the scale depicted below. Course grades are based upon mastery, not a normal curve. The number of A's depends only on how well you perform. There will be no grading on the curve because this would mean you would be competing with your fellow classmates. Instead, you should help each other meet the standards for

each assignment. A PASSING GRADE IS REQUIRED ON EACH ASSIGNMENT CATEGORY TO PASS THE COURSE. Since all exams and written work will be given a numerical score, you can estimate where you stand in the course at any time with the following letter grades and their corresponding values, assigned as follows:

Percent of Possible Points, Letter Grades and Their Corresponding Grade Points

97-100%	A+	4.0
93-96.9%	A	4.0
90-92.9%	A-	3.7
87-89.9%	B+	3.3
83-87.9%	B	3.0
80-82.9%	B-	2.7
77-79.9%	C+	2.3
73-76.9%	C	2.0
70-72.9%	C-	1.7
67-69.9%	D+	1.3
63-66.9%	D	1.0
60-62.9%	D-	0.7
below 60%	F	0.0

INSTRUCTIONAL SUPPORT

Up-to-date assistance for prospective and current BIOL409 students is announced on the public course web page at <http://scied/fullerton.edu.BIOL409> Services for enrolled students are available through the CSU Fullerton student portal.

The following instructors will work with us to help you throughout the course:

Ross Durand (rdurand@socal.rr.com) teaches high school Biology and AP Environmental Science at Rancho Alamitos High School in Garden Grove, California. Ross investigated the effects of an interdisciplinary project on student learning of natural selection for his CSU Fullerton Master of Arts in Teaching Science graduate research.

Prof. Pelaez will focus on the pedagogy aspects of the course while Prof. Durand will guide you through the Evolution content portion, and these portions are roughly equal in importance. Ross completed several graduate-level courses in evolutionary biology and this is the fourth time he co-teaches this course. Since 1997, Ross has taught in an interdisciplinary program called the Freshmen Advanced Curriculum Team (FACT) using the methods of interdisciplinary instruction with groups of gifted and high achieving students. The underlying assumption of the FACT is that by correlating their instruction to break down barriers between separate areas of study the students will learn in more powerful ways and improve their ability to be lifelong learners. Nancy Pelaez is a bilingual teacher who previously taught high school for Indianapolis Public Schools as well as teaching middle school and directing the K12 science scope and sequence for a school in Bogota, Colombia. Nancy served on the Committee that wrote *America's Lab Report: Investigations in High School Science* for the National Academies' National Research Council.

MAKE-UP POLICY

Missed assignments can be made up or rescheduled ONLY under the following conditions:

1. Arrangements are made a week or more prior to the exam or assignment for important, unavoidable conflicting activities (e.g., surgery, out-of-town job interview, etc.). Documentation is required.
2. For illness, personal tragedy, or unavoidable emergencies, call the instructor or leave a message with the department before the assignment or within two days thereafter.

All make-up assignments will be done immediately following the final exam (not during the course of the semester). Contact your instructor to confirm whether you meet the requirements for make-up exams or assignments. That is **your** responsibility. Failure to follow the above guidelines will result in a zero grade for an exam or assignment. Failure to complete any graded assignment may result in a grade of “incomplete” for the course.

TECHNOLOGY AND ASSESSMENT TOOLS

Calibrated Peer Review: <http://cpr.molsci.ucla.edu>

Blackboard <http://fullerton.blackboard.com> (not available June 5, 2006)

It is your responsibility to remember your Username and Password for the CPR and Blackboard tools.

Concept maps: <http://cmap.coginst.uwf.edu>

CCTC Preliminary Educational Technology Standards: Using Technology to Support Student Learning

Your teaching portfolio must show how course assignments demonstrate your preparation for the comprehensive use of appropriate computer-based technology to facilitate the teaching and learning processes. You will demonstrate knowledge of basic computer operations, concepts, and issues, use science-specific applications of computer technology, and demonstrate educational applications of computer technology appropriate to science disciplines. Plans should be made to integrate the technology-related tools into the educational experience of students, including those with special needs. Documents should show that you are a fluent, critical user of technology, able to provide a relevant education and to prepare your students to be life-long learners in an information-based, interactive society. You should make appropriate and efficient use of software applications and related media to access and evaluate information, analyze and solve problems, and communicate ideas in order to maximize the instructional process. You will receive a certificate showing that you completed the *Intel Teach to the Future* program upon successful submission of your technology-rich teaching portfolio.

Preliminary Educational Technology Proficiencies

Basic Computer Operations, Concepts, and Issues

Demonstrate knowledge of current basic computer hardware and software.

Intel Module 1-3, MS Word, Internet browsers, PowerPoint presentation of teaching goals and sample "student" presentation.

Intel Module 5-7, Design and publish a teacher web site that students and parents can use to follow guidelines for one lesson.

Implement basic trouble-shooting techniques.

Download CMAP software to run on your computer.

Understand legal and ethical issues associated with the use of computer-based technology.

Intel Module 2, Copyright and Fair Use guidelines.

Demonstrate knowledge of privacy, security, and safety issues.

Intel Module 5-7, Identify a professionally designed lesson plan and outline the “procedures section” of the Unit Plan Template.

Professional Applications of Computer Technology in Science

Understand uses of computer applications for managing records

Interactive Web sessions 6 and 8, Calibrated Peer Review, Intel Module 6.

Understand the use of computers to communicate science through printed media

Using a Web form http://scied.fullerton.edu/biol409/feedback_Mod8a.htm peer review lesson plans; Intel Module 4, create a sample “student” publication.

Understand the use of e-mail to communicate with others about science.

Email, Discussion forums, shared Concept Maps.

Demonstrate familiarity with computer-based collaborative tools.

Email, Discussion forums, Interactive Web sessions, shared Concept Maps.

Demonstrate competence in the use of electronic science research tools.

Intel Module 3, Share web site evaluations; Interactive Web session 7, Digital Evolution library.

Demonstrate the ability to assess the authenticity, reliability, and bias of data gathered from electronic information sources.

Interactive Web session 7, Digital Evolution library, Intel Module 8.

Educational Applications of Computer Technology

Understand appropriate use of computer technology in teaching and learning science.

Online discussion forum rubric development, Interactive Web session 6, Intel Module 10.

Analyze a variety of educational digital media and use established selection criteria to evaluate science materials.

Intel Module 3, Share web site evaluations; Calibrated Peer Review on Evolution Misconceptions, Interactive Web session 7.

Apply criteria for choosing software for its relevance, effectiveness, alignment with science content standards, and value added to student learning.

Intel Modules 4, 8, 9 and 10, Interactive Web session 7.

Identify student learning modalities and determine appropriate technological resources to facilitate individual learning of science.

Intel Modules 4, 8, 9 and 10, Interactive Web session 7.

Demonstrate understanding of best practices in science teaching and research findings on the use of technology and design science lessons accordingly.

Intel Modules 4, 8, 9 and 10, Interactive Web session 7.

Demonstrate an ability to create and maintain effective science learning environments using computer-based technology.

**Intel Module 4, CPR on Evolution Misconceptions, Interactive Web session 7.
Intel Module 5-7, Identify a professionally designed lesson plan and outline the
"procedures section" of the Unit Plan Template. Create a rubric form or template
to assess evolution content and higher-level thinking skills.**

TECHNOLOGY REQUIREMENTS

Ideally, users should have “fully enabled browsers,” but we recognize that there may be limitations. In that event, here is an outline of what is needed to make the most of the course features at the “user level.”

User Types:

Fully enabled web browsers

Some content will be provided in interactive formats such as Flash, Shockwave and streaming video in order to enhance understanding and motivation for learning. Use of these materials may require higher bandwidth or greater download time for modem users and will require installation of Flash, Adobe Acrobat Reader, Real Player or QuickTime, and Macromedia Shockwave.

Text and graphics browsers

Interactive content will also be represented in a non-interactive way as text and graphics.

Text-only users & Screen-Reader users

Non-interactive content will be fully accessible with images turned off. Interactive content will be accessible in versions that are compatible with current screen reader technologies.

System Requirements:

Minimal requirements for Interactive browsers:

Mac: any Power Macintosh running System 8.1 or higher

PC: any Pentium running Windows 95, 98, or 2000

Minimal requirements for text and graphics browsers:

Any web-enabled computer that can support 16bit graphics on a 800x600 display.

Minimal requirements for text-only users:

Any web-enabled computer

Browser Requirements:

Minimal requirements for Interactive browsers:

Internet Explorer 4 or higher, Netscape 4.7 or higher with Shockwave plugin/Active X control version 8 or higher, Flash 5 or higher plugin

Minimal requirements for text and graphics browsers:

Any HTML 4.01 or higher browser

Minimal requirements for text-only users:

Any Web browser

Internet Connection:

Minimal requirements for interactive content:

56kbps connection

Interactive pages shall not exceed 120K of uncached content to allow for streaming.

Minimal requirements for text/graphics content:

56kbps connection

The text and graphics portion of any page shall not exceed 50k of uncached content.

Minimal requirements for text connection:

28.8kbps connection

The text portion of any page shall not exceed 20k.

RULES ABOUT WITHDRAWING FROM COURSES: CSUF has a policy (UPS 300.016) regarding withdrawal from classes. After the first census date, students may be granted withdrawal **only** by presentation of documentation outlining a physical, medical or emotional condition that prevents completion of the course. **POOR ACADEMIC PERFORMANCE IS NOT A REASON FOR WITHDRAWAL.** Students unable to produce official documentation will take the grade they have earned in the class.

ACADEMIC DISHONESTY POLICY

Academic dishonesty includes such things as cheating, inventing false information or citations, plagiarism, and helping someone else commit an act of academic dishonesty. It usually involves an attempt by a student to show possession of a level of knowledge or skill that he or she does not possess. Cheating is the act of obtaining or attempting to obtain credit for work by the use of any dishonest, fraudulent, or unauthorized means. Plagiarism is the act of taking the specific substance of another and offering it as one's own without giving credit to the source. Although you will be conducting several group projects, when assignments are clearly to be completed individually, the work must be your own. Use online forums, work together, and get information from the Web, but when you write your answers, your work must reflect your independent thinking. When you use information from sources external to yourself, you must reference the source appropriately (literature citation, URL for web-derived material). Just because you referenced a source does not give you the right to insert segments, verbatim, into papers you write. A web resource to be used by the instructors will check for plagiarism (See <http://turnitin.com>). An instructor who believes that an act of academic dishonesty has occurred is obligated to discuss the matter with the student involved. The instructor should possess reasonable evidence, such as documents, personal observation, or a turnitin.com report. An instructor who is convinced by the evidence that a student is guilty of academic dishonesty shall (1) assign an appropriate academic penalty; and (2) report to the student involved, to the department chair, and to the vice president for student affairs the alleged incident and make recommendations for action. See the CSU Fullerton Catalog for further details.

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