

Biology I: Cell Biology and Genetics—A Human Approach

University of Massachusetts Boston (Biology 510)

July 5 - 15, 2011

SYLLABUS

Instructors:

Rachel Skvirsky, Associate Professor of Biology, UMass Boston

Class Meetings:

Dates: The course will meet for 9 weekdays, July 5 to 15, 2011.

Time: Class begins promptly at 9:00 AM and ends at 4:30 PM *except* on Fridays, which meets 9:00 AM to 3:30 PM. **It is essential that you arrive on time.**

Location: UMass Boston, Wheatley Building, Second Floor, Room 030.

Course description:

In-depth exploration of the biological principles, content knowledge, and pedagogical strategies needed for teaching cell and molecular biology and genetics at the middle and high school levels. The course takes a human biology approach to these areas, using activities and examples drawn from the human body. Content is aligned with the Massachusetts state standards and National Science Education Standards. The course consists of explanation of concepts, laboratory activities, problem-solving exercises, classroom discussion, readings, and other assignments. Emphasis is placed on gaining a rich understanding of biological concepts, while modeling the use of hands-on, inquiry-based teaching strategies.

Overview:

Biology I is a “contextualized content course.” The course emphasizes science content, providing teachers with a rigorous understanding of the basic biological concepts that underlie human biology. The pedagogical approaches used provide opportunities for science inquiry, model ways of presenting concepts to students, and in general, link the scientific content to the classroom experience. The science content is aligned with and supports the science curriculum taught in middle and high school science courses in the Boston Public Schools as well as schools in other Massachusetts districts. The goal is to provide effective tools for teaching all students, including English language learners and students with special needs.

Credit Hours:

3 graduate credits (at the 500 level) from the University of Massachusetts Boston

Target Audience:

The course is designed for middle and high school teachers in the greater Boston area. The course cannot be used as an elective option for M.S. and Ph.D. students in science. The course can be counted as a graduate-level science content course in any of the following graduate programs in Teacher Education, Department of Curriculum & Instruction, Graduate College of Education:

- M.Ed. Track B (initial licensure)
- 18-credit graduate certificate in Track C (professional licensure)
- M.Ed. Track C (professional licensure).

Students in these three programs should look over the requirements in their student handbooks and consult with their advisors and the Teacher Education office to determine how many science content courses they may take for these programs. The course may not be counted toward the 24-credit graduate certificate in Track B (initial licensure) in Teacher Education.

Required Textbook:

Campbell, Reece, Taylor, and Simon. *Biology–Concepts and Connections*. Fifth edition. Pearson Benjamin Cummings, 2005.

Students can borrow the textbooks from the program for the duration of the course.

Instructional Model:

The course combines science activities and discussions. Each day the course covers several units; each unit will be presented using the following “7E” model:

1. Engagement (a question or problem to engage and motivate students)
2. Eliciting of prior understanding
3. Exploration (laboratory experiment or other inquiry-based activity)
4. Explanation (students are introduced to models, laws, and theories)
5. Elaboration of concepts (students apply knowledge to new domains and solve related problems)
6. Evaluation (formative and summative evaluations of student learning)
7. Extension (knowledge is applied in a new context)

Overall Expectations:

Students are expected to attend **all** course sessions, complete all daily reading and written assignments, keep a laboratory notebook, write daily reflections, submit and present a final “Action Plan” (see below for details), and take pre- and post-course assessments and course evaluations. (See also Attendance Policy below.) All of these components are required in order to receive graduate credit.

Daily Homework and Reflections:

Students will complete daily reading assignments, which are detailed in the Daily Schedule. Either during or after class each day, students will also complete graphs, tables, and other results related to that day’s laboratory investigations, as well as answers to questions posed in the lab handouts and/or reflections on the day’s activities. Students are expected to keep a loose-leaf laboratory notebook (provided) containing all lab handouts, experimental results and analyses, answers to questions in the lab handouts, and daily reflections.

You are also required to keep a reflective daily journal based on your experiences in the course, your assigned readings, and class discussions. You may discuss any questions, challenges, or "ah ha's" that arise from a particular activity, topic, or reading. Journal entries are to be entered into your class notebook and will be shared at the beginning of each class.

Final Assignment—Action Plan:

This course aims to facilitate the growth of teachers both as educators and scientists. Looking at the curriculum that you are currently implementing in your classroom, what (and how) will you teach differently as a result of this course? For a final project, create an Action Plan for next year; in other words, develop a plan for implementing a new or existing lesson or unit in your classroom in a different way, based on what you have learned here. Do not depart from your currently implemented curriculum.

Please use the following outline for your Action Plan:

- Introduce the biological concept.
- Discuss how that concept was previously taught.
- Discuss how your understanding of the topic has changed, and changes you would make the next time you teach it.
- Include a 7-E modeled lesson plan, highlighting where changes have been made.

The Action Plan is due in written form and also will be presented to the class on the final morning of the course—Friday, July 15.

Grading:

Homework, daily reflections, lab notebook	20%
Final project: Action Plan	30%
Final exam	50%

Attendance Policy:

In order to receive graduate credit for this course, participants may not miss in excess of 8 instructional hours over the duration of the course. Any hours missed up until 8 hours must be cleared with the instructional team, and alternative arrangements must be made to make up the work if necessary. Your attendance also affects your ability to receive a full stipend.

Parking:

Parking passes will be provided to all course participants. It is recommended that you park in the South Lot that is immediately adjacent to Wheatley Hall where the classroom is located.

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Daily Schedule
July 5 - 15, 2011

<u>Date:</u>	<u>Topic:</u>	<u>Required Reading in Text:</u>
Tu 7/5 AM	Welcome and course overview Pre-course assessment.	
Tu 7/5 PM	How big are cells and why? Structure-function relationships of cells. The 7E instructional model.	1.1; 1.3; 1.7; 1.8; Ch 4; 20.1 to 20.7; 20.9; 20.10; 20.12 to 20.14
Tu 7/5 PM	Structure-function relationships of cells (continued)	1.1; 1.3; 1.7; 1.8; Ch 4; 20.1 to 20.7; 20.9; 20.10; 20.12 to 20.14
Tu 7/5 PM	Cell Membranes, diffusion, and osmosis.	5.10-5.21
W 7/6 AM	Macromolecules in cells	2.1 to 2.4; 2.7 to 2.10; 2.17; Ch. 3
W 7/6 PM	Enzymes	2.17; pp32-33; 5.5 to 5.9
Th 7/7 AM	Energy storage and transfer	5.1 to 5.4; 6.1 to 6.4
Th 7/7 PM	Cellular Respiration	6.1; 6.5 to 6.16
F 7/8 AM	Photosynthesis	pp 106-107; 7.1 to 7.11
F 7/8 PM	Chromosome and the cell cycle	8.1-8.12; 8.19; 11.4
M 7/11 AM	Mitosis	8.1-8.12; 8.19; 11.4
M 7/11 PM	Formation of gametes: meiosis	8.12-8.23
Tu 7/12 AM	Human genetics	Ch 9
Tu 7/12 PM	Human genetics	Ch 9
W 7/13 AM	Human genetics	Ch 9
W 7/13 PM	The genetic material and genetic code	10.1-10.8
Th 7/14 AM	Transfer of genetic information: transcription and translation; mutation	10.9-10.16; 11-2; 11.9
Th 7/14 PM	DNA and protein technology	3.11-3.15; 10.16; 9.14, Ch 12
F 7/15 AM	Summary; Final Student Reports;	
F 7/15 PM	Post-course assessment and evaluation	