Biology 452: Concept Development & Integration
Spring, 2007 Credit: 3 units

Regular Class Meeting: Wednesday, 1400 – 1540
Individualized Activities: To Be Arranged
Schedule # 38802

Instructor:

Dr. Kathleen Fisher	kfisher@sciences.sdsu.edu	PFSA 372	594-7442

Guest Speaker:

Dr. Kathy Williams	kwilliams@sciences.sdsu.edu	PS 151	594-4358

Course Description: Development and integration of biological science content knowledge, introduction to learning theory, and *transformation* of knowledge for teaching. Designed for students who anticipate becoming teachers in middle-high school, community college, college, or university level. This class aims to deepen participants' understanding of the *big ideas* in biology, the challenges involved in making those ideas accessible to students, and strategies for addressing those challenges to become an effective teacher.

Thus, Biology 452 is open to biology majors in who are interested in teaching. Each student will observe/assist a biology teacher at the level of interest to them for part of the semester and complete several other projects as part of an independent weekly activity.

Desired Student Learning Outcomes:
Upon completion of this course you should be able to **. . .**

1. explain how prior knowledge influences biology learning,
2. identify methods for eliciting students' prior biology knowledge,
3. be prepared to build on what students already know,
4. describe ways to analyze students' preconceptions and misconceptions in the domain of biology;
4. identify strategies for challenging students' common 'alternative conceptions' (='misconceptions' ='naive conceptions' ='preconceptions') in biology,
5. analyze various teaching situations including both effective and ineffective science teaching you may observe, identifying their strengths and weaknesses and how they my be improved;
6. be familiar with the State of California Biology Framework
7. develop activities that integrate concepts and fulfill the requirements of the California State Biology Framework;
8. use Semantica mapping to demonstrate interrelationships among concepts;
9. recognize that students have different learning styles and identify ways to enhance instruction so as to maximize effectiveness for various learning styles

Detailed Description

A. Regular Class Meeting: Wednesdays, 2:00 pm to 3:40 pm,

1. Graded Activities: DISCUSSION & APPLICATION. During most weeks, students will
   1. read one or more papers from the literature about major misconceptions regarding a key topic area in biology
   2. participate in discussions of those misconception in class
   3. discuss the proposed methods for addressing the misconceptions
   4. engage in using diagnostic test questions

2. Challenging concept areas:
   Nature of Science
   Meiosis, Mitosis, & related aspects of cell division
   Osmosis and Diffusion
   Natural Selection
   Transformation of matter and energy (including both metabolism and exchanges between living and non-living worlds)

B. Individualized Activities at times to be arranged. The 'activity" portion of the course will be independent (outside class) and will involve three components.

You will complete a field experience as required for application to the SSTC program, which will require additional time each week (activity[1]).

1. Graded Activities

a) OBSERVATION. Students will observe an experienced (and preferably outstanding) teacher in middle school, high school, community college or university for 30 hours, and submit weekly reports of two key observations. When possible, students will work in pairs to make and/or discuss observations.

b) TEACHING/LEARNING STRATEGIES. Students will identify a set of key concepts and become Teaching-Learning experts on those topics, then practice strategies on other students to help others learn those concepts. The assessment will consist of written reflections on what was learned, to be shared with the class.

c) INTERVIEWS (2). Students will work in pairs to interview 2 middle, high or college students about a particular concept to be assigned, using props to elicit and/or challenge students' thinking. The interview results will be presented in class and summarized in a 1-2 page paper that includes:

- Evidence that the chosen concept was difficult (or not) for the interviewed students
- Explanation for nature of questions and choice of props

- Summary of interview results (2)
- Typed summary of notes recorded in the interviews (2)
- Identification of strategies to distinguish between *understanding* of an idea and *ability to memorize and recite* an idea
- Reflection on what was learned

C. Proposed Grading Scheme:

In-class discussions of TL strategies	30
Classroom observation report	20
Interview summaries (2)	15
Interview transcripts (2)	15
final reflection	20
	100

Note: Students will be given Add codes in class, since the schedule number has been blocked on line. For questions, please contact Dr. Kathleen Fisher at any of the following telephone numbers:

594-7442 (Biology)
594-6961 (Center for Research in Mathematics & Science Education)
851-4479 (cell)

or send e-mail to <kfisher@sciences.sdsu.edu>.