Biology 452: Concept Development & Integration (3 units), Spring 2014
Schedule# 23955
Mondays 9-10:50am, NLS 134 (and 3 hr /week, to be arranged)
Office Hours: Monday 8AM (in our classroom); Friday 3-4PM (Skype: MarcyEllen); By appointment (recommended)

Instructor:
Dr. Marcy Richardson Marcy.Richardson@mail.sdsu.edu Office: N/A Phone: (603) 490-8176

Dr. Kathy S. Williams, Single Subject Credential Adviser, is also available at Kathy.Williams@sdsu.edu & (619) 594-5439.

Course Overview
Course Description: Development and integration of biological science content knowledge, introduction to learning theory, and transformation of knowledge. Designed for students preparing for the single subject teaching credential in life sciences.

Purpose and Course Content: This class aims to deepen participants’ understanding of both major science concepts and the challenges involved in making those concepts accessible to students of all ages and backgrounds. This course can be helpful to students taking general science exams (like the Biology GRE, CSET, or MCAT).

Biology 452 is open to science majors who are interested in becoming a science teacher, doing formal, informal, or non-formal education, and is specially designed for those aiming to teach in middle or high schools. It applies as an upper division elective for General Biology majors. Students will observe/assist a science teacher in grade 7 – 12 (or college) for part of the semester and complete several other projects as part of the independent weekly activity. This will take time each week in addition to class time! Topics will be geared to participant/school subject areas (biology, physics, chemistry, geology).

Desired Student Learning Outcomes:
Upon completion of this course you should be able to:
• explain how prior knowledge influences learning;
• understand the value of eliciting students’ prior knowledge;
• be prepared to build on what students already know;
• analyze ways to challenge students’ common alternative conceptions;
• compare similarities between processes of science & that of teaching/learning;
• analyze various teaching situations and describe effective science teaching;
• be aware of different learning styles and explain how you could address the different learning styles of your students;
• describe ways to analyze students' preconceptions and misconceptions concerning science;
• develop activities which will assist students in conceptualizing their science knowledge;
• recognize the need to accurately assess student learning and understanding;
• analyze textbooks and ancillary materials.

Relation to Other Courses:
The course is designed to help you learn how people learn science, as you yourself grapple with the most difficult basic science concepts to teach and learn, and develop skills to help you solve problems using scientifically accurate reasoning. It requires that you have understanding of the concepts from basic core biology courses (grades of C’s or better in Biol 203, 204, 352, & 354 are strongly advised as appropriate preparation). As the course title suggests, this course challenges you to integrate science concepts from biology, chemistry, and physics. It serves as a capstone course in a strong general biology program, in which you deepen your understanding of science, and also better learn how to learn.

Please note that there are rather unique requirements for the course - you will need to do at least 30 hours of
observations of a middle or high school class, or a college class (like intro Biology; not a course you are taking!). So you need to make sure you have time for that in your schedule for this course too. In addition, you will need to be motivated and have time to complete the assignments outside of class time. This is not a lecture class; it requires your full participation each class meeting, where you will share with the other students what you learned since the last meeting and practice using your knowledge in class. Being late or absent for any class is not a good thing, since what you do in class can't be repeated in the same way at another time. The course is structured, time-wise, like a 2 unit lecture and 1 unit lab, requiring 100 min in class each week and about 2 hr 40 min independently doing your classroom observations. Then you'll need to complete the assignments. It's a great class for the students who have the motivation and time to take it - and fun too. You'll learn more about the structure of it next Mon.

**Enrollment Information**

Prerequisites: Senior standing, or participation in the science single subject credential program. Completion of the Graduation Writing Assessment Requirement or the eligibility to enroll in an upper division writing course is a prerequisite for all upper division biology courses numbered 450 and above.

Add/Drop Procedures: Add codes may be available after the first class on Jan 27, 2014. The LAST DAY to add and drop courses is Feb.4.

**Course Materials**

While there is no formal text required, you will need to obtain materials from Blackboard and read journal articles that you’ll discuss in class. You will also need to find other articles, websites, on-line simulations, and various other information resources that you’ll share with other students in the class.

**Course Structure and Conduct**

Regular Class Meeting: Mondays 9-10:50 am, and ~3 hr per week of classroom observation times, to be arranged.

This is NOT a typical LECTURE class!

Both individual and group activities will be required (in informal pairs and groups)

Technology used in the course includes, and will not be limited to, fully using Blackboard, finding and using on-line simulations for biological processes like cell division, examining and using websites for learning and teaching, searching for and using videos online for learning, using online office hours, conducting literature searches in the library and via the internet.

**Concept Areas of Focus:**

This course will focus on five central, challenging concept areas: Natural Selection; Osmosis and Diffusion; Cell Division/Meiosis and Mitosis; Energy and Matter Transfer (Photosynthesis and Metabolism); Nature of Science.

**Class participation:**

Informed and thoughtful class discussion is a critical component of this course. Your attendance and active participation in these discussions is therefore important and valuable. There will be many graded *in-class assignments*. You will NOT be able to pass this course if you do not attend class (there are only 14 class meetings this semester)!

**Classroom Observations 30 hours during the semester (about 3 hours per week, at another class time):**

You will do a “field experience” as required for application to the Single Subject Teaching Credential (SSTC) program, that will require about 3 hours of additional time each week, totaling 30-45 additional hours over the semester (the “lab” portion of this course). A few meetings may be conducted in virtual time and space.
Graded Activities

1. **DISCUSSION & APPLICATION.** During most weeks, students will read one or more papers from the literature or websites on major misconceptions in biology, write a reflection, and then participate in the discussion of the misconception in class. Each student will also briefly describe how he or she would apply the main idea of the readings in teaching concepts related to the naive conception of the week. During class, you will practice various learning methods and strategies, like concept mapping, using concept inventories for learning and assessment, learning from concept cartoons, interviewing to learn how people learn and to uncover your level of comprehension, etc.

2. **ACTIVITY.** The “activity” (or “lab”) portion of the course will be independent (outside class) and will involve two components: classroom observations and interviewing other adults about their conceptions of science. Details for these assignments and scoring rubrics are attached and will be available on Blackboard and discussed in class.
   a. **OBSERVATION.** Students will observe an experienced (and preferably outstanding) biology teacher in middle or high school or college for 30 hours, and submit a weekly report of key observations. In addition, students will submit a final report on their observations at the end of the semester (Use instructions in the Early Field Experience Guide). Students may work in pairs to make and/or discuss observations. However, all written work must be original and completed independently.
   b. **INTERVIEWS.** Students will interview a middle or high school or college student for about 20 minutes about one of the concept areas of focus, using props to elicit and/or challenge students’ thinking. You will record the interviews, transcribe them, and prepare a 2-page evaluation of the level of understanding of the interviewee. Your evaluation will be scored based on your understanding of the subject as exemplified by the questions you ask and your assessment of their knowledge. The interview results will be presented in class and summarized in a 2-page paper that includes:
      - Statement of questions asked.
      - Explanation for nature of questions and choice of props
      - Description of the level of the interviewee’s understanding of the topic, supported by evidence from the interview
      - Reflection on what was learned about the interviewee's and interviewer's understanding of the topic.

   You will also turn in a complete transcript of the interview.

3. **TEXTBOOK REVIEW.** Students will examine at least 2 high school or college biology textbooks and evaluate the way that each textbook presents material on 3 of the 5 major misconception areas (Natural Selection, Cell Division, Osmosis and Diffusion, Energy and Matter, and Nature of Science). For each conception topic, you will describe strengths and weaknesses of the way the text deals with the topic and give supporting evidence. Assignment details will be discussed in class.

4. **FINAL REFLECTION.** Students will turn in a final reflection paper demonstrating the knowledge they have gained from this course. Assignment details will be discussed in class.

Late Policy:
Any work that is turned in at least a week before the due date may be revised to improve the student’s grade on the assignment. For some assignments, students may be allowed to revise their work again to earn additional points. Work that is turned in one day late will automatically lose 10% of the score (i.e. a 100% becomes a 90%), the next day will lose another 10% (i.e. a 100% becomes an 80%), and so on. After 5 days, the maximum credit that the student will receive on the assignment is 50% of the original points. Work later than 5 days will not be accepted.

Course Assessment and Grading

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<tr>
<th>Grading Scheme</th>
<th>Due Date</th>
<th>% of grade</th>
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<tbody>
<tr>
<td>Discussion and Application</td>
<td>n/a</td>
<td>30%</td>
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<tr>
<td>Textbook Review</td>
<td>March 10</td>
<td>10%</td>
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Interview Summary
The summary will provide your approach to your interviews and include the questions and/or pictures you’ll ask your subjects to describe or explain. March 24 10%

Interview Transcripts and Evaluations
Transcripts of interviews due with evaluations of interviewee’s level of understanding April 28 10%

Classroom Observation Report May 5 20%
Final Reflection May 5 20%

Other Course Policies

Academic Integrity: SDSU students are expected to “to be good citizens and to engage in responsible behaviors that reflect well upon their university.” This includes upholding principles of academic integrity. If your academic integrity is not maintained on a test or assignment, you will automatically receive a grade of zero for that test or assignment and you will be reported to the SDSU Center for Student Rights and Responsibilities, in accordance with SDSU academic integrity policy.

Section 41301, Title V, of the California Code of Regulations defines Standards for Student Conduct. The details are presented on the webpages of the SDSU Center for Student Rights and Responsibilities here http://csrr.sdsu.edu/index.html. SDSU students are responsible for reading, understanding, and following the policy and procedures regarding academic integrity as described in that code. Academic misconduct is defined as cheating or plagiarism in connection with an academic program, and examples include copying others’ work during an exam or any other assignment, receiving assistance from other individuals during quizzes or exams, copying other students’ answers, or not stating answers in your own words. More information is available from the SDSU Center for Student Rights and Responsibilities (http://csrr.sdsu.edu/index.html), in Library tutorials: http://library.sdsu.edu/guides/tutorial.php?id=28, and from Widener University here: http://science.widener.edu/svb/essay/plagiar.html “What is plagiarism?”

Students with Disabilities: Students who need accommodation of their disabilities should contact Dr. Williams privately, within the first two weeks of the semester to discuss specific accommodations for which they have received authorization from the SDSU Student Disability Services at 619-594-6473; Calpulli Center - Suite 3101.

Help: If you are having trouble in the course or would like to discuss the material or have questions, please see the instructor as soon as possible. Attend office hours – these are provided so you can ask questions directly of us. The Counseling Services Center offers help with improving academic and test-taking skills also.

Questions asked by email
I will do my best to reply quickly, with the following considerations. As much as I possibly can (but there may be exceptions), I will respond to questions within 24 hours Monday-Friday. This means emails received on Friday, Saturday, and Sunday may not be answered until Monday. Saturdays, Sundays, and evenings/night are NOT business communication times and I can’t make a commitment to respond to emails, including those about technical problems, during those hours.

• Note: Questions answered in this Syllabus, the course schedule, and other documents posted on Blackboard will not be answered. PLEASE, consult this syllabus and other documents before sending an email question!
• Questions about your grade will not be answered by email and specific grades will not be discussed by email (it is against university policy because email is not considered a “secure” platform). ANY questions about grades MUST be addressed in person or during a phone call. All such inquiries must be arranged in advance. However, you may send an email request to have a meeting concerning your grade.

There are many students in my classes, so please do not send multiple emails per day to the instructor. The first email will be answered additional emails will be responded to when time allows. Please check your spam filters to make sure you are getting SDSU emails. Also it is best to use Blackboard to send email questions. Emails sent from third party mail domains such as yahoo, etc., and with unusual email usernames maybe stopped by the Instructor spam or junk filters.