Teaching and Learning Chemistry (CU Teach)
EDUC 4822/ 5822 and GRTE 5030
Spring 2015

Instructors | Enrique Lopez | Julie Andrew | Guest Instructor: Laurie Langdon
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Office | EDUC 216 | EDUC 344 | EDUC 320C
Office Hours | Thursday 3:30-4:30 or by appointment | Tuesday 11 am - noon or by appointment | By appointment
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Class time & location: R 4:30-7:00 pm, EDUC 346 Credits: 3
Pre-requisites: One year of General Chemistry at the College or University Level

Link to Weekly Overview

Quick Links within the Syllabus
- Course Description
- Required Books
- Course Objectives
- Course Expectations and Grading
- Course Assignments
- Additional Resources
- University Policies

Course Description
This is a course for those interested in exploring issues related to how people learn and teach chemistry. We will review high school and early college chemistry concepts both from the content and pedagogical perspectives. We will also delve into the chemistry education research, education, psychology and cognitive science literature. You will have an opportunity to observe and/or teach K-12 or college chemistry classes.

This class is designed to be engaging, provocative, and enjoyable. The class will largely depend upon your input. You will help create and direct the class.

Required Books:
You should have access to a General Chemistry Textbook for reference to the content. (Any college level text is fine)

**Course objectives:**
- To use data and evidence to infer and test the big ideas in chemistry.
- To know the key experiences and data that lead us to an understanding of how atoms, molecules and ions behave, and to describe the thermodynamic driving forces behind their interactions.
- To use multiple representations to model concepts and ideas in chemistry.
- To relate what is known about the cognitive aspects of learning to the design of effective chemistry lessons.
- To evaluate the pedagogical potential of chemistry education materials.
- To develop skills that are important both for becoming a more reflective teacher and for conducting classroom research.
- To use chemistry education research (CER) literature to evaluate chemistry curriculum.
- To further develop a professional community of K-16 chemistry teachers and education researchers.
- To develop skills in using appropriate technologies for teaching and learning chemistry.
- To enable students to understand how chemists develop new knowledge and insights, the most important of which are eventually presented in textbooks and taught in conventional science classes.

**Course Expectations**
- **Preparation.** Come to class having completed the reading and assignments for that day and be prepared to participate actively in class discussions and activities, as well as to listen carefully and respectfully to your colleagues. Please understand that the workload for this course is heavy, yet essential to reach the course goals. Much of what we do in class will require collaboration, so we will be creating opportunities for you to work together and serve as resources for each other’s learning. Participants are expected to devote 7-10 hours per week outside of class on class assignments, reading, and online discussion.

- **Late Work Policy** All assignments are due prior to or at the beginning of class on the appropriate due date. Late work will only be accepted without penalty if you have contacted CU Teach Instructors prior to the due date, discussed the situation, and negotiated an alternative due date. Assignments will be marked down 20% per day and will not be accepted later than one week past their due date (in case of credit/no credit assignments, all late work will receive zero credit for assignment).

- **Grading** Since many of you are preparing to become teaching professionals, you need to practice preparing documents that are ready for students, fellow teachers, colleagues, administrators, and parents to read. All email communications should be written formally, as though you were communicating with a colleague, parent or administrator. All assignments handed in should be carefully proofread and should contain no spelling or grammatical errors; multiple errors will adversely impact your grade for that assignment.

- **Final grades** will be assigned in the following manner, in accordance with the proportions of credit for each assignment shown in the table below:

  93-100% = A;
  90-92% = A-;
  87-89% = B+;
  83-86% = B;
  80-82% = B-;
  77-79% = C+;
  73-76% = C;
  70-72% = C-;


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<thead>
<tr>
<th>Assignment</th>
<th>4822</th>
<th>5822</th>
<th>GRTE 5030</th>
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<tbody>
<tr>
<td>1. Class participation / attendance</td>
<td>15%</td>
<td>10%</td>
<td>20%</td>
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<td>2. Online reading discussions</td>
<td>15%</td>
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<tr>
<td>3. Unit Summative Assignments</td>
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<td>(3 x 10%)</td>
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<td>4. Unit Quizzes</td>
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<tr>
<td>5. Equilibrium Project</td>
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<td>EC</td>
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<td>7. End of Semester Test</td>
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**Course Assignments**

1. **Class Participation/Attendance**: You are preparing for a profession in which your daily presence is imperative to the success of your students and your attendance in this class represents that commitment. We will do our best to bring in as many voices to our discussions as possible, but we ask that you also monitor your own contributions to class. If you have spent more time listening, speak up. Listen up if you have spent more time speaking. If you must miss class, you must notify us prior to class. The semester will begin with every student being given full credit for participation/attendance. Every student is allowed ONE absence/personal day without penalty. **Up to two points will be deducted for each absence after the first absence.** Each student will be required to review and score 2-3 of the Equilibrium Projects that the Graduate students will be preparing.

2. **Virtual Reading Discussions**: We will assign 1-2 students to begin a discussion on D2L/Google Groups regarding that week’s reading. In addition to leading at least one discussion, you are required to respond at least once a week to the discussion prompts throughout this semester. Please feel free to respond more. When you are assigned to initiate the discussion, you must post your prompt by Sunday evening at 8pm, so that the rest of the class will have time to respond by Weds evenings at midnight. (2 points for initiating the discussion, 1 point for thoughtfully responding each week).

3. **Unit Quizzes**: There will be a short quiz covering the chemistry and pedagogical content for the first 3 units. Expect 7-10 multiple choice and 1-4 short answer questions on each quiz.

4. **Unit Summative Assignments**: There will be one assignment after each of the quizzes that will provide you with an opportunity to reflect on your learning and make connections between the different chemistry ideas that emerge. The assignments will be of the following format:
   - a. Self reflection paper (1-3 pages)
   - b. Activity Analysis
   - c. Group Quiz

5. **Model an equilibrium system (5822 requirement; Extra Credit for 4822)**: Equilibrium is a “big idea” in chemistry, but we are not devoting much class time to it this semester. Thus, the graduate students will take on this additional project in which they will model an equilibrium system by connecting macroscopic phenomena, quantitative aspects, and symbolic and molecular representations. The system may be physical or chemical in nature. Projects will be presented during the last class.

**Additional Resources**
Curriculum/Texts:
- Hutchinson, John: Concept Development Studies in Chemistry (http://cnx.org/content/col10264/latest/)
- Chemistry in the Community (ChemCom): American Chemical Society
- Chemistry, Life, the Universe, and Everything (CLUE)
- Model-Observe-Reflect-Explain (MORE) Thinking Frame
- ChemConnections
- Process Oriented Guided Inquiry Learning (POGIL)
- ACS Chemistry

Learning theories and pedagogy
- They’re Not Dumb, They’re Different by Sheila Tobias; Research Corporation, 1990.
- Survival Guide for the New Chemistry Instructor, Diane Bunce
- Multiple Pathways to the Student Brain: Energizing and Enhancing Instruction. Janet Nay Zadina

Student ideas in chemistry and science

Websites
- Learning to Learn from Data: http://serc.carleton.edu/earthandmind/posts/datalearningpro.html
- Duit, R. Students’ and Teachers’ Conceptions and Science Education, http://www.ipn.unikiel.de/aktuell/stcse/stcse.html
- Resources in Chemical Education: http://www.chem1.com/chemed/
- Brain Animation: http://www.g2conline.org/2022
- PhET simulations
- MIT Chemistry for High School: http://ocw.mit.edu/high-school/chemistry/index.htm#labs

University of Colorado Policies
Mandated Reporters
Mandated reporters are individuals who are obligated by law to report suspected cases of child abuse and neglect. Any person who has contact with children in a professional capacity is a mandated reporter. Mandated reporter laws are designed to catch child abuse in its early stages, so that children do not suffer long-term damage. All teacher licensure candidates are a mandated reporter. http://www.cde.state.co.us/cdeprevention/download/pdf/child_abuse_manual_2002.pdf

Accommodations
If you qualify for accommodations because of a disability, please submit to me a letter from Disability Services in a timely manner so that your needs be addressed. Disability Services determines accommodations based on documented disabilities. Contact: 303-492-8671, Willard 322, and http://www.Colorado.EDU/disabilityservices. If you have a temporary medical condition or injury, see guidelines at http://www.colorado.edu/disabilityservices/go.cgi?select=temporary.html. Disability Services' letters for students with disabilities indicate legally mandated reasonable accommodations. The syllabus statements and answers to Frequently Asked Questions can be found at http://www.colorado.edu/disabilityservices

**Religious Observance**
Campus policy regarding religious observances requires that faculty make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. See full details at http://www.colorado.edu/policies/fac_relig.html

**Classroom Behavior**
Students and faculty each have responsibility for maintaining an appropriate learning environment. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, culture, religion, politics, sexual orientation, gender, gender variance, and nationalities. Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records. See policies at http://www.colorado.edu/policies/classbehavior.html and at http://www.colorado.edu/studentaffairs/judicialaffairs/code.html#student_code

**Discrimination and Harassment**
The University of Colorado Boulder (CU-Boulder) is committed to maintaining a positive learning, working, and living environment. CU-Boulder will not tolerate acts of discrimination or harassment based upon Protected Classes or related retaliation against or by any employee or student. For purposes of this CU-Boulder policy, "Protected Classes" refers to race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation or political philosophy. Individuals who believe they have been discriminated against should contact the Office of Discrimination and Harassment (ODH) at 303-492-2127 or the Office of Student Conduct (OSC) at 303-492-5550. Information about the ODH, the above referenced policies, and the campus resources available to assist individuals regarding discrimination or harassment can be obtained at http://hr.colorado.edu/dh/

**Academic Integrity**
All students of the University of Colorado at Boulder are responsible for knowing and adhering to the academic integrity policy of this institution. Violations of this policy may include: cheating, plagiarism, aid of academic dishonesty, fabrication, lying, bribery, and threatening behavior. All incidents of academic misconduct shall be reported to the Honor Code Council (honor@colorado.edu; 303-735-2273). Students who are found to be in violation of the academic integrity policy will be subject to both academic sanctions from the faculty member and non-academic sanctions (including but not limited to university probation, suspension, or expulsion). Other information on the Honor Code can be found at http://www.colorado.edu/policies/honor.html and at http://www.colorado.edu/academics/honorcode/