Introduction to Chemistry Education (CHEM 387)
Course Information & Syllabus

Instructor: Emily L. Buginsky and Darrin M. York
Office: CIPR (Proteomics) Rm. 306, Busch Campus
Office Hours: Wednesdays 12-2pm or by appt.
Phone: (862)-571-3521
Email: embugins@scarletmail.rutgers.edu
Meeting Time/Location: TBD

COURSE INFORMATION

Description
This course is designed to serve as an introduction to pedagogy in the science, technology, engineering, and mathematics fields, with emphasis on gaining experience in teaching chemistry as a teaching intern. The course has two main components:

- Lecture – class will meet once per week for 80 minutes.
- Learning Session – as a teaching intern in training, each student will hold a 1-hour teaching session per week in the form of an office hour, thematic workshop, review session, etc. The mode of instruction will be decided prior to the second week of class, during the first lecture.

These two components will constitute the three (3) credits in the course, and each will count toward the letter grade.

Pre-Requisites
This course is by invitation only. Invitations are made based on success in General Chemistry I and II (01:160:161-162 OR 01:160:163-164).

Relationship to CHEM 393/394 and 493/494
CHEM 393/394 and 493/494 are Chemistry Teaching Internship courses that focus primarily on General Chemistry I (CHEM 393) in the fall and General Chemistry II (CHEM 394) in the spring, and higher-level chemistry courses, particularly organic chemistry (CHEM 493/494). The activities and content focus of 393/394 relative to 493/494 are quite different, and unlike CHEM 387, concentrate more fully on the practical application of peer mentoring as opposed to formal pedagogical training. Although not a strict requirement for all students, it is expected that many students will take these internship courses after having taken CHEM 387. However, CHEM 387 is a requirement for students enrolled in the Certificate in Chemistry Education program. Since CHEM 387 already includes one learning session as part of the course, students do not need to sign up for the fall Teaching Internship (01:160:393) separately.

Course Goals
I. Gain insight into a variety of general topics in education and pedagogy in the STEM fields, with strong emphasis in chemistry

II. Become familiar with literature in the realm of Science and Chemistry Education Research, by reading, analyzing, and applying the literature throughout the course.

III. Apply newly acquired pedagogical knowledge to weekly learning sessions with General Chemistry students.

IV. Reflect on knowledge and experiences, and use those reflections to evaluate and improve as both an instructor and as a learner.

V. Students equip themselves to gain the necessary knowledge and formulate their own thoughts about education and teaching to prepare them for the remainder of the teaching certificate program.

VI. Students will recognize that they are life-long learners, and that their own thoughts and understanding of their thoughts may and should evolve over time.

**Required Materials**

- No textbook is required for the course. All assigned readings will be posted on Sakai under Resources. Other optional materials may be available through the indexes on the Rutgers Library website.
- For each class, please bring:
  - Something to write with
  - Sheets of lined (filler) paper with 3 holes (not a notebook)
  - A calculator
  - A folder or binder to keep all materials in
- It may be helpful at times to have a laptop, iPad, etc. in class.

At the end of the course, students will gather all work, including papers, activities, and assignments from class, and place them neatly in a binder. These will become a part of their teaching portfolio (See: Part III – Artifacts).

**Classroom Etiquette**

- Cell phones are not permitted during class. Please silence them and put them away. If there is an emergency and a cell phone may be necessary, please speak with the instructor ahead of time.
- Laptops are to be used for research and note-taking purposes only. It is expected that while others are presenting or speaking, students will not be surfing the web. Social media and other irrelevant sites will not be permitted during class.
- All students are to be respectful towards their fellow classmates. This includes being respectful of others’ opinions, giving a speaker their full, undivided attention, and always being polite and constructive in comments.
- Be respectful of all instructors and students. Students in this course should understand that they are now an instructor too – a face of the chemistry department. They are to always remain professional, calm, and polite when speaking to or about students and other faculty members.

**Course Policies**
• It is 100% absolutely important that students check Sakai and their email on a frequent basis. Sakai will serve as information central, and all announcements/emails will be sent through the MailTool. An email will be sent out via Sakai during the first week in order for students to see whether or not they are able to receive emails sent through Sakai. If not, students must let the instructor know as soon as possible.

• Students are solely responsible for getting notes and making up work for any class that is missed. Excessive absences or lateness will result in a deduction of points from the final grade. Students are to speak to the instructor privately ahead of time if they are unable to make it to class.

Special Needs
Specific accommodations may be made for students who require such support. Visit the Office of Disability Services in person or online (https://ods.rutgers.edu/) to learn more about potential support and eligibility. Students should speak with the instructor as early as possible in the semester about such accommodations or if there are any additional concerns.

Honors Credit
Students enrolled in the Honors program may receive Honors credit for this course by completing additional work. See the “Honors Assignments” under the Grading Policy below.

COURSE ASSIGNMENTS AND GRADING

Final grades in the class will be based on the following assessments. Each component has a rubric associated with it in order for students to evaluate their own work before handing it in. Likewise, it will help to provide an insight of the instructor’s expectations for each assignment. Students should see the Resources folder on Sakai, under “Rubrics” for a copy of each.

Participation – 10%
This course will be entirely activity-based, and thus requires active participation in every class. Students are expected to have completed the readings and come prepared to discuss and answer questions about them during class. Participation assumes attendance.

Weekly Reflections – 15%
Reflections are due every Friday by 11:59pm. These reflections should be posted under “Blogs” on the Sakai side panel. The reflection is two-fold: first, students are to reflect on their weekly learning session. Secondly, students are to reflect on their time in class. The two reflections should be separated by using different headings, but posted as a single blog each week. Instructions and questions for students to address will be posted on Sakai under Resources.

In addition to submitting one’s own reflection, students should comment on at least two of their colleagues’ blogs. Comments should be meaningful, either by offering a suggestion,
words of encouragement, or other useful remarks. Students should submit their comments by Monday morning at 9:00am, following the submission of their own blog.

Because reflections are essential to becoming more self-aware of one’s own strengths and areas of improvements, the instructor will also post a blog reflection each week for students to read as they wish.

**In-Class Activities – 20%**
Each week students will be assigned an activity related to the readings to be performed either individually or in groups. When working with a group, it is important to be sure that each member contributes fairly. Following each activity will usually be a full-class discussion, giving students a chance to learn from one another and share ideas. The grade on the activities each week is a group grade, and depends on teamwork, creativity, and the ability to stay on task.

**Midterm Examination – 20%**
One midterm examination will be given during the course. The midterm will be entirely open-ended, and will typically ask questions about activities and readings that students have done in class. Some questions may ask about students’ personal experiences, and how they relate to what they have learned. More information will be given as the exam approaches.

**Paper I: Learning Session Evaluation – 15%**
At the beginning of the semester, students will choose a fellow classmate to observe during their learning session. Observers should take detailed notes during their observations, but be cautious so as to not interfere. These notes will help mold the first paper, in which students will address what happened and how it pertains to the readings and topics discussed in class. The paper should be between 3-5 pages (double-spaced). More details about formatting and content will be available on Sakai under Resources.

**Paper II: Teaching Philosophy – 15%**
The Teaching Philosophy is a 1-2 page (single-spaced) statement about students’ beliefs as a teacher. While all teaching philosophies are unique, they should contain four parts:

I. Objectives as a teacher
II. Methods of teaching to achieve the objectives
III. Plan of measuring self-efficacy
IV. Why the individual chose to do this

There are various web resources that may be of help, which will be discussed in class. Development will take place over time in the class, but a final statement should be submitted at the end for grading. More details about formatting and content will be available on Sakai under Resources. This will become Part I of the teaching portfolio.

**Peer Presentation Evaluations – 5%**
At the conclusion of the course, students in the Honors program must give a presentation on a topic of their choosing (see below for details). As an audience member, students will
fill out an evaluation to be handed in. Audience members’ names will be on the front page of the evaluation for grading purposes only, but it will be removed prior to giving the evaluation to the presenter so as to ensure anonymity.

**Honors Assignments**

*Draft of Literature Review Proposal*
Part of earning the Certificate in Chemistry Education with Honors is the creation of a full literature review. In order to help students prepare, a first draft proposal will be due at the conclusion of the course. Students should pick a topic that they are interested in studying prior to Thanksgiving Break, and submit it to the instructor for approval. No more than two students may choose the same topic, so it is best to have a back-up plan. Students may choose any topic that was discussed in class, or a different topic that they may have come across with my permission. The draft should be approximately 3-6 pages, and will help to jumpstart the long-term paper. A detailed rubric and guidelines for a literature review will be posted on Sakai.

*Presentation of Preliminary Work*
At the conclusion of the course, honors students will present their preliminary findings to their classmates in any manner that they choose. The topic will be the same as that of the literature review. The presentation should last between 7-10 minutes, and will touch upon the points and ideas of the literature review draft. A short Q&A session will follow, in which presenters will pose some of their own questions to the audience and answer any other questions that may arise. Each audience member will fill out an anonymous evaluation that presenters may keep for their own records.

**Grading Policies**

*Grading Scheme*
Grades in the course will be broken down as follows:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>A</td>
<td>90-100</td>
</tr>
<tr>
<td>B+</td>
<td>85-89</td>
</tr>
<tr>
<td>B</td>
<td>80-84</td>
</tr>
<tr>
<td>C+</td>
<td>75-79</td>
</tr>
<tr>
<td>C</td>
<td>70-74</td>
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<tr>
<td>D</td>
<td>60-69</td>
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<tr>
<td>F</td>
<td>&lt;59</td>
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Extra credit will not be given unless an extenuating circumstance warrants it, and in such cases it will be offered to the entire class. Poor attendance or performance will be dealt with early on. If students have any questions or concerns about their grade, they are encouraged to bring them up with the instructor immediately, rather than waiting until the end of the semester.

*Resubmission Policy*
With the exception of the midterm, all assignments may be resubmitted in order to earn back a maximum of half of the points lost. For example, if a student receives an 80% on Paper I, he or she may resubmit it within one (1) week of receiving a grade to earn up to 10% back, leaving a final grade of a 90%.

**COURSE SYLLABUS**

The schedule below provides a list of topics for the entire semester. Note that changes may be made during the semester to accommodate for inclement weather or other unexpected occurrences. With the exception of the first class meeting, all readings and other assignments are due before coming to class. In other words, students should read the select papers by the date listed in the first column.

<table>
<thead>
<tr>
<th>Date</th>
<th>Topics</th>
<th>Due</th>
</tr>
</thead>
</table>
| 9/04 | Syllabus Review  
Introduction to Course  
Classroom Discourse | Readings (in-class for today):  
| 9/11 | Meaningful Learning& Constructivism  
Neural Networks | Readings:  
| 9/18 | Multiple Representations  
Teaching with Analogies | Readings:  
| 9/25 | Cognition  
Memory | Readings:  
### 10/02 Metacognition & Reflection

**Readings:**

### 10/09 No Class Meeting This Week

### 10/16 Cooperative Learning

**Readings:**

### 10/23 Bloom's Taxonomy Problem Solving Approaches

**Readings:**

[Choose 1 of the following:]

2a. Parker Siburt, C. J., Bissell, A. N., Macphail, R. A.,
<table>
<thead>
<tr>
<th>Date</th>
<th>Activity</th>
<th>Readings</th>
</tr>
</thead>
<tbody>
<tr>
<td>11/06</td>
<td>MIDTERM EXAM</td>
<td>----<em>Paper I due</em>----</td>
</tr>
</tbody>
</table>
## Motivation

**Self-Regulated Learning**

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Readings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><em>Honors Option – Choose top 3 topics</em></td>
<td>----------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td><em>Paper II due</em></td>
<td>----------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>

*Change in designation days, Wednesday 11/25 – go to Friday classes!