SCI 456  
Science Capstone  
Fall 2018

Instructors: Dr. Matthew d’Alessio  
Office: Live Oak 1228  
Phone: (818) 677-3647  
Office hours: Thu 9:30-10:30, or by apt.  
Email: matthew.dalessio@csun.edu

Dr. Virginia Oberholzer Vandergon  
Office: Chaparral 5418  
Phone: (818) 677-6362  
Office hours: Mon 8:30-9:30, Wed 2:30-3:30 by apt  
Email: virginia.vandergon@csun.edu

Class meeting  
Thursday 2:00-4:45 PM, Live Oak 1227

Resources  
Handouts and pdfs linked on the class Canvas site.  
Please bring tablets to each class meeting.

Upon completion of SCI 456, students will be able to:
1. Use problem solving to develop and connect a profound understanding of collegiate scientific knowledge.
2. Demonstrate an understanding of scientific process and be able to apply it through the design, implementation, and communication of scientific investigations.
3. Adapt, extend, and generalize collegiate level scientific investigations and problems.
4. Reflect on their own problem solving process.
5. Design and implement science experiments that can be shared with elementary students.
6. Create a lesson sequence that includes Science and Engineering Practices from the Next Generation Science Standards.

Course Requirements and Grading

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Points</th>
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</thead>
<tbody>
<tr>
<td>A. Class Attendance and Participation</td>
<td>75 pts</td>
</tr>
<tr>
<td>B. Satisfactorily pass all homework assignments</td>
<td>75 pts</td>
</tr>
<tr>
<td>C. Satisfactorily pass all reading quizzes.</td>
<td>100 pts</td>
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<tr>
<td>D. Meet all the criteria for the Rot it Right individual project.</td>
<td>40 pts</td>
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<tr>
<td>E. Meet all the criteria for the culminating POND research project.</td>
<td>100 pts</td>
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<tr>
<td>F. Meet all the criteria for the school outreach project and written lesson.</td>
<td>100 pts</td>
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<tr>
<td>G. Satisfactorily pass the final assessment.</td>
<td>100 pts</td>
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<tr>
<td>TOTAL</td>
<td>590 pts</td>
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</tbody>
</table>

Criteria for course requirements:
A. Class participation:
There will be plenty of opportunities for class discussions and participation in class group work. This means that **you will need to attend class and participate**
**every class meeting.** You will be asked to use technology tools during class so again part of your participation will be electronic. Another part of your success in this class will be evaluated on how prepared you are for class and your ability to work cooperatively in a group setting. Because of the nature of the course and the importance of classroom discussion and real time work there are **no make-ups** for class time. You will be docked points accordingly unless you have a doctor’s note for the afternoon in question.

You will also be asked to personally reflect on content and pedagogy throughout the course. Many times you will be given a sentence start. It is expected that you will provide a thoughtful and sufficiently detailed reflection each time.

**B. Homework:**

You will be assigned readings and short assignments throughout the semester. Some of this work may begin in class but you will be expected to finish it up as homework. These assignments will be to reinforce concepts discussed in the course. These will be uploaded to Canvas by the due date and time. **No homework will be accepted late.** If you miss class it is important for you to find out whether any assignments have been given out in class that day.

**C. Short quizzes:**

Students are expected to be prepared for class by doing the assigned readings for class. To help you keep up there will be a short reading quiz at the beginning of most classes (there may be a few exceptions). You must be present in class to take the quiz. You **will not be allowed to make up any quizzes** even if you are late for class. **So be on time because quizzes will be given at 2:00 pm sharp.** Since there are absolutely no make-up quizzes you can drop your lowest score.

**D. Rot it Right/Composting project**

You will be designing your own experiment using decomposition bottles as a model. After reading the background material on decomposition bottles you will design a testable hypothesis. Then you will create and do the experiments so that you can answer your hypothesis. The culmination will be a “public service announcement”.

Each project will be uploaded to Canvas on is worth **40 points** and should include the following.

1. **Hypothesis**
   a. A clearly written hypothesis that includes a prediction for what you will be testing. (10 pts)

2. **Data collection**
   a. Presented in a table or graphic form. This will be clearly labeled with appropriate titles and legends. It should include at least 9 data entries. (10 pts)

3. **Public Service Announcement**
   a. This needs to include an environmental challenge or problem (3 pts)
b. Evidence through your experiments and any other research you do (3 pts)
c. Use of Persuasion for why this is important (3 pts)
d. The announcement needs to be engaging (3 pts)
e. References you use properly sited (3 pts)

4. Reflection on what went well and what might be improved if you were to do this again. (5 pts)

E. Original Scientific Investigation around the pond environment.
You will be working in groups of two to three where you will come to a consensus on an investigable/testable scientific question around questions you ask about the pond environment.
The investigation will be due on October 25th, will be uploaded to Canvas and is worth 100 points should include:
- An investigable/testable scientific question. (10 pts, due 9/13)
- Collection of data (Notebook checks on 9/27 and 10/11) (10 pts)
  - A description of how you collected the data/observations (15 pts)
- Analysis of the data. (15 pts)
  - Data/observations will be presented graphically, or as tables, clearly illustrating the patterns seen in the data.
- A conclusion that attempts to answer the scientific question
  - A single diagram such as a concept map or flow chart that illustrates the scientific processes that you identified/discovered. And explanations to how these link to the Science and Engineering in NGSS. (15 pts)
  - A short explanation that claims to answer the original question (CER Rubric) (15 pts)
- Critically evaluate others projects (10 pts)
  - Be able to critique evidence to assure that it relates to the claims
- Self/Peer evaluation (10 pts)
  - Complete a thoughtful self evaluation survey which will be linked on Canvas.

F. Lesson Sequence
This is a lesson outline of how you would integrate the above experiment into a 5E lesson sequence for your future classroom. This project will be uploaded to Canvas and is due on November 29th at 2 PM.
1. Written
   a. Describe the full 5-E sequence that you will use that incorporates a version of the science experiment you did above. This will include a written explanation of the 5-E lesson sequence and a write-up of the portion outlined below. This portion is worth 25 pts.
      i. Fill in the 5E template of how you would implement this lesson.
1. Include a brief description of what you will do for each “E” (10 pts)
2. Include how long each section should take and if you need any special supplies. (5 pts)
3. Incorporate in ELA and math. (5 pts)
4. What type of assessment will you use and give an example. (5 pts)

2. Implement a portion with kids afterschool
   a. On **November 15**th we will be going to an elementary school site to run an engaging afterschool science experience for 3rd for 5th graders students. You will be working in groups of 3 (same groups as above) to design a 30 minute interactive science themed lesson around your research project. We will have the elementary students in groups of 10 and you will have two opportunities to do your lesson as the students rotate through your station. Each lesson will be a short interactive NGSS lesson related to your scientific investigation that you will share with the elementary students
      i. **This part of the project will be worth 75 points and will be uploaded to Canvas on November 29**th and will contain:
         1. A description of the Science and Engineering practices you will have the students engage in as they do your lesson and how you will engage them. (12 pts)
         2. A detailed list of what needs to be prepped, when you need to prep. Also what supplies you need and how much of each item you need and where to get the supplies. (8 pts)
         3. A description of how well you think the microteaching went and any changes you made based on peer feedback. (12 pts)
         4. A write-up that describes the activities you did and where they fit in with your original lesson sequence (see above). This will be written in such a way that someone else can pickup what you did and do it themselves based entirely on your description. (10 pts)
         5. What expectations did you have for your students? How well did they meet them and why or why not? How did you assess their understanding? Describe this or describe how you would do this given more time. If you had the opportunity to do this a month from now what would you change and why or why not? (10 pts)
   6. Instructor feedback on how the day itself went. (15 pts)
      • Did the activities flow?
      • Did the children walk away with some understanding of what they learned?
      • Did the children have fun?
      • Did you and your partner interact with the students?
• Did you have enough supplies?
• Did anything unexpected happen and if so how did you handle it?
• Did you have fun?

7. Self and group reflection of the process. This will be turned in separately as a response to a survey which will be posted on Canvas. (8 pts)

Final grades will be determined on a percentage basis according to the following scale:

<table>
<thead>
<tr>
<th>Percentage Range</th>
<th>Grade</th>
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<tbody>
<tr>
<td>93 - 100 %</td>
<td>A</td>
</tr>
<tr>
<td>90 - 92 %</td>
<td>A-</td>
</tr>
<tr>
<td>87 - 89 %</td>
<td>B+</td>
</tr>
<tr>
<td>83 - 86 %</td>
<td>B</td>
</tr>
<tr>
<td>80 - 82 %</td>
<td>B-</td>
</tr>
<tr>
<td>77 - 79 %</td>
<td>C+</td>
</tr>
<tr>
<td>73 - 76 %</td>
<td>C</td>
</tr>
<tr>
<td>70 - 72 %</td>
<td>C-</td>
</tr>
<tr>
<td>67 - 69 %</td>
<td>D+</td>
</tr>
<tr>
<td>63 - 66 %</td>
<td>D</td>
</tr>
<tr>
<td>60 – 62 %</td>
<td>D-</td>
</tr>
<tr>
<td>&lt; 60 %</td>
<td>F</td>
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</tbody>
</table>

We round your score to the nearest integer.

**Course policies**

A. **Cheating is not allowed.** Please review appendix E-2. Academic Dishonesty in the University catalog (www.csun.edu/catalog) concerning cheating. We will make every effort to prevent cheating and will prosecute any offenses vigorously. This includes plagiarism of any work other than your own. Some offenses can result in not passing the course.

B. **Students are expected to attend class regularly.** We will be making announcements in class at 4:00 PM and if you are late or do not attend then it is up to you to get that information from another student. These announcements may involve changes in the syllabus; therefore it is important for you to get that information. Again, no makeup of classes will be scheduled.

C. **University Withdrawal Policy.** Unrestricted class withdrawals are permitted only until the end of the third week. A student must file a Change of Program Form to avoid receiving a U (calculated as an F in determining grade point average). After the third week, requests to drop a class are only accepted on a case-by-case basis and unsatisfactory performance is not a reason to drop a class. During the last three weeks of classes the only acceptable excuse is a medical reason and a student would have to be withdrawing from all their courses.

4. **Common sense rules:**
a. Do not enter the classroom until the previous class has exited.
b. We will be using computers and or tablets during class time for SCI456 NOT FOR PERSONAL USE. If you need to be reached in an emergency you can give the Geology office phone (818-677-3541) number to the person and the office will send someone to get you. **We also do not allow texting during class time** and will take your phone from you if you choose to try to text during class time which means you will lose participation points for class that day. You will have to make arrangements outside of class time to come get your phone from us.
c. We should be respectful to each other and listen when anyone else is asking questions or when a discussion is occurring. Please do not talk or interrupt others.
d. Students should also only be concentrating on LRS456 during class time and should not have other reading material or assignments on their desk during class time.
e. Laboratory rules will be followed when doing a lab.

### TENATIVE SCHEDULE OF TOPICS AND ASSIGNMENTS

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-8/30</td>
<td>Introduction to the Course and Pond</td>
<td></td>
</tr>
<tr>
<td>2-9/6</td>
<td>NGSS Jigsaw and SEP-1 Asking Questions</td>
<td>Make model of pond ecosystem and use it to refine questions.</td>
</tr>
<tr>
<td>3-9/13</td>
<td>SEP-3 Planning and Conducting Investigations.</td>
<td>Discuss how to turn a question into a plan for investigation. Start Rot-It-Right.</td>
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<tr>
<td>4-9/20</td>
<td>SEP-1/SEP-3, Cont’d</td>
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<tr>
<td>5-9/27</td>
<td>SEP-2 Developing and Using Models</td>
<td>Eye project?</td>
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<tr>
<td>6-10/4</td>
<td>Pond Investigation Day</td>
<td></td>
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<tr>
<td>7-10/11</td>
<td>Pond Investigation Day</td>
<td></td>
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<tr>
<td>8-10/18</td>
<td>Pond Investigation Day</td>
<td></td>
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<tr>
<td>9-10/25</td>
<td>Field Trip to Discovery Cube</td>
<td>Turn in write-up of pond research</td>
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<tr>
<td>10-11/1</td>
<td>Research to Teaching: Work on Elementary Lessons</td>
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<tr>
<td>11-11/8</td>
<td>Elementary Lesson Design</td>
<td>Microteaching to class</td>
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<tr>
<td>12-11/15</td>
<td>Teach at Elementary School</td>
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<td></td>
<td>Thanksgiving</td>
<td></td>
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<tr>
<td>13-11/29</td>
<td>Rot it Right</td>
<td>Lesson write-ups due.</td>
</tr>
<tr>
<td>14-12/6</td>
<td>Assessments: Formative v. Summative</td>
<td>Design part of your final</td>
</tr>
<tr>
<td>EXAM:12/13</td>
<td>Final Exam</td>
<td></td>
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