“Envision music schools that train pianists to play with their right hands, hoping the left hands will figure it out all on their own. As unthinkable as this may seem, it is not unlike the way research universities train scientists. Just as piano playing is a two-handed job, so is the mission of higher education: to generate and disseminate knowledge.

Why, then, do we take preparation for one part of this endeavor so seriously and treat the other so casually?”

-from “Scientific Teaching” by Jo Handelsman, et. al.

“I have repeatedly argued that the future of science requires that scientists take their teaching just as seriously as they take their science. This will require that we use scientific evidence to test and improve the effectiveness [of our teaching].”

Bruce Alberts, Editor-in-Chief Science Magazine; Professor of Biochemistry, UCSF; and former President, National Academy of Sciences

**Instructors:**
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**Office Hours:**
Mondays, 10:30 am – 12:00 pm,
Thursdays, 10:30-11:00 am
or by appointment (Hensill Hall 236)

Wednesdays 10:00 am – noon
or by appointment (Hensill Hall 243)

**Course Credit:** 2 units seminar, to be taken concurrently with SCI 751 (2 units, fieldwork component)

**Course Description:** This course is designed to provide an introduction to innovative teaching strategies, science education theory and research, and the approach of scientific teaching to SFSU graduate student scientists who are teaching science in a variety of contexts. Weekly seminars will include both instructor-driven and student-driven discussions, activities, and presentations.

**Course Goals:**
• To introduce scientists to a variety of science teaching strategies that build their knowledge of inquiry, assessment, and equity approaches that can be used in many teaching contexts
• To engage graduate student scientists in reflecting on their own teaching practice and constructing a Statement of Teaching Philosophy
• To support graduate student scientists in developing an iterative and evidence-based approach to science teaching
• To engage graduate student scientists in applying their knowledge of effective science teaching strategies to other professional activities such as research posters, talks, and lab meetings
• To develop scientists who are hybrid professionals with the skills to bridge the communities of university research science and science teaching throughout their careers
Student Learning Objectives:
- Students will learn how to promote active student participation in their teaching
- Students will learn how to use a variety of assessment techniques to reveal student thinking, guide teaching, and gauge learning
- Students will learn how to design science lessons to accommodate diverse learning styles
- Students will learn how to effectively communicate scientific research to non-scientists
- Students will learn to identify dilemmas in their own teaching and strategize possible solutions
- Students will develop professional goals for continually growing as scientist educators

Course Requirements:
- Attend weekly seminar, Mondays 4:00 – 6:00 pm. Absences must be approved by instructors prior to class.
- Prepare for weekly seminar by completing readings, collecting evidence in your teaching context, leading and/or facilitating discussions, and writing reflections.
- Submit a weekly Reflective Journal entry through iLearn.
- Have a Sci 750 colleague visit, observe, and videotape you teaching and do the same for them
- Participate in data collection in your classroom evidence collection project
- Come prepared for class with binder and paper for taking notes and recording observations

iLearn
Assignments, class agendas, and class handouts will be posted iLearn (ilearn.sfsu.edu). In addition, questions and comments can be posted on iLearn, which we hope can serve as a forum for a variety of discussions related to the course.

Course Components/Grading Scheme:
Attendance and class participation is essential.
All absences must be approved by the instructor in advance.

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<thead>
<tr>
<th>COURSE COMPONENT</th>
<th>TOTAL POINTS</th>
<th>% OF GRADE</th>
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<tbody>
<tr>
<td>Reflection</td>
<td></td>
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<tr>
<td>Weekly Reflections (14 @ 10 points each)</td>
<td>140</td>
<td>22%</td>
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<tr>
<td>Participation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weekly Attendance and Participation (14 @ 10 points each)</td>
<td>140</td>
<td>22%</td>
</tr>
<tr>
<td>Teaching Coaching Session (schedule, participate, reflect)</td>
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<td>11%</td>
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<tr>
<td>Class Projects</td>
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<td></td>
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<tr>
<td>Classroom Evidence Collection Project</td>
<td>100</td>
<td>15%</td>
</tr>
<tr>
<td>Statement of Teaching Philosophy</td>
<td>100</td>
<td>15%</td>
</tr>
<tr>
<td>Final Semester Reflection</td>
<td>100</td>
<td>15%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>650</td>
<td>100%</td>
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Course Topic Sequence and Timeline

(This schedule is approximate and absolutely subject to change…)

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Activities</th>
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</table>
| August 31  | REFLECTION                                                          | Who are we? What is good science teaching? What does it mean to learn?  
- A-Mazed: Exploring what it means to learn
- Sci 750: It’s about being a better scientist; It’s not just about teaching. |
| September 7|                                                                       | NO CLASS – LABOR DAY HOLIDAY                                                                                                              |
| September 14| INQUIRY                                                             | What does it mean to be a scientist educator? How do we provide students opportunities to develop habits of mind of scientists?  
- Discussion of readings on Scientific Teaching and the Biological Basis of Learning
- Activity: Making the Learning of Science like the Doing of Science |
| September 21| GOALS & LESSON PLANNING                                               | What is most important for students to know? How do we decide how to teach these things?  
- Understanding by Design: Setting goals for student learning and the science education standards
- The 5-E Model: Approaches to lesson planning |
| September 28| EQUITY                                                               | How do we promote active student participation during science lessons?  
- Defining and thinking about equity in your teaching
- Introduction to collecting participation data with your students |
| October 6  | EQUITY                                                               | How can we design science lessons to accommodate diverse learning styles?  
- Identifying your own learning style
- Teaching for students of different learning styles in one lesson |
| October 12 | ASSESSMENT                                                           | How do we reveal student thinking about complex ideas?  
- Learning practical assessment strategies for the science classroom
- Jigsaw Discussion of readings on assessment
- Delving into Bloom’s Taxonomy and question design |
| October 19 | ASSESSMENT                                                           | How can student ideas guide our teaching?  
- Using conceptions and misconceptions in science teaching
- Learning analysis techniques to understand student assessment data |
| October 26 |                                                                       | NO CLASS – FURLOUGH DAY                                                                                                                  |
| November 2 | LESSON PLANNING & INQUIRY                                             | How can we most effectively communicate research ideas to non-scientists?  
- Translating research ideas for non-scientists
- Check In: Debriefing classroom experiences with colleagues |
| November 9 | REFLECTION                                                           | How can we apply what we are learning to other aspects of our professional lives in science?  
- Using teaching strategies at conferences, in lab settings, and with science colleagues
- Mid-semester grades and evaluations |
| November 16| REFLECTION & EQUITY                                                   | What does collecting evidence in our classroom reveal?  
- Classroom Evidence Collection Project – Presentations, part I
- Giving and receiving feedback on collecting evidence in teachings |
| November 23|                                                                       | NO CLASS - THANKSGIVING HOLIDAY                                                                                                             |
| November 30| REFLECTION & EQUITY                                                   | What does collecting evidence in our classroom reveal?  
- Classroom Evidence Collection Project – Presentations, part II
- Giving and receiving feedback on collecting evidence in teachings |
| December 7 | GOALS & REFLECTION                                                    | What are our new professional goals for continually improving as scientist educators?  
- Debriefing classroom presentations
- Revisiting Statements of Teaching Philosophy |
| December 14| GOALS & REFLECTION                                                    | What have we learned about science teaching? What is most pressing to learn next?  
- Reflecting and looking forward…
- Course evaluations, wrap-up until next semester |
| December 21| GOALS & REFLECTION                                                    | What have we learned?  
- FINAL EXAM – to be held during regular class time |