

# CHEM 781: Scientific Approaches to Teaching and Learning (13761) Spring 2023

## COURSE INFORMATION

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<b>Class Meetings:</b> Thursdays 4-6:40pm	<b>Instructor:</b> Dr. Regis Komperda (she/her)
<b>Class Location:</b> Adams Humanities 2134	<b>Email (preferred):</b> rkomperda@sdsu.edu
<b>Mode:</b> Synchronous lecture/discussion	<b>Office location:</b> GMCS 203
	<b>Office hours:</b> by arrangement

## DIVERSITY AND INCLUSION

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In this course, I am committed to creating a safe space for people of all views and backgrounds. We may cover difficult topics in this course regarding social issues that you may encounter while teaching or at some other point in your teaching career. It is our intent to present materials and activities that are respectful of diversity: gender identity, sexual orientation, disability, age, socioeconomic status, ethnicity, race, culture, perspective, and other background characteristics. Suggestions about how to improve the value of diversity and inclusion in this course are encouraged and appreciated.

## LAND ACKNOWLEDGMENT

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For millennia, the Kumeyaay people have been a part of this land. This land has nourished, healed, protected and embraced them for many generations in a relationship of balance and harmony. As members of the San Diego State University community, we acknowledge this legacy. We promote this balance and harmony. We find inspiration from this land, the land of the Kumeyaay.

## COURSE MATERIALS

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**Required Materials:** All required course readings will be from reports that are freely available online or journal articles available through the SDSU library and made available via Canvas. The abbreviation after each document indicates how it is referenced in the course schedule.

- National Research Council. 2012. *Discipline-Based Education Research: Understanding and Improving Learning in Undergraduate Science and Engineering*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/13362>. [DBER]
- National Research Council. 2000. *How People Learn: Brain, Mind, Experience, and School: Expanded Edition*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/9853>. [HPL1]
- National Academies of Sciences, Engineering, and Medicine. 2018. *How People Learn II: Learners, Contexts, and Cultures*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/24783>. [HPL2]
- National Research Council. 2001. *Knowing What Students Know: The Science and Design of Educational Assessment*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/10019>. [KWSK]

## STUDENT LEARNING OUTCOMES

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This course is intended for graduate students in STEM disciplines who are interested in pursuing careers with teaching components or who want to know more about the research literature in STEM education to improve their own teaching. Students completing this course will:

1. Compare and contrast approaches to research in traditional laboratory science and science education fields
2. Synthesize the evidence for or against the effectiveness of common instructional practices utilizing an understanding of educational theory and the research methods used to evaluate their effectiveness
3. Articulate how the findings from science education research publications can be applied in the classroom, particularly those aligned with your own discipline
4. Develop a personal teaching philosophy that includes self-reflection and is supported by science education research and best practices in teaching and assessment with support for diversity, equity, and inclusion in the classroom

## COURSE DESIGN: MAJOR ASSIGNMENTS AND ASSESSMENTS

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The course is divided into four modules, each addressing one of the learning outcomes. Each module will be comprised of various activities and assessments, as outlined in the course schedule. The two major writing assignments for the course, the instructional practice essay and the teaching statement, will serve as the midterm and final for the course. Other smaller assignments will be due on a weekly basis along with any in-class activities.

- **In-class activities** include participating in class discussions, completing informal quizzes, or other small assignments designed to engage students with course material.
- **Weekly reading reflections** will provide an opportunity for you to read STEM education literature. You will submit a brief (< 1 page) summary of your reading on Canvas. At the start of the semester the specific articles and focus of your reflection will be provided, as the semester progresses you will have the opportunity to select articles relevant to your own area and interests.
- Your **instructional practice essay** will be an opportunity for you to focus on a specific instructional practice identified in your readings and synthesize the evidence for or against the practice utilizing an understanding of the educational theory underlying the practice (or lack thereof) and the methods used to evaluate its effectiveness (or lack thereof).
- You will create an **evidence-based teaching plan** focused on teaching a specific topic or class session that integrates evidence-based teaching practices
- You will practice **assessment development** by designing an assessment aligned with best practices for understanding and testing human cognition
- The **teaching reflection** will provide you an opportunity to consider how your knowledge of best practices in teaching is reflected in your classroom and develop your skills at self-evaluation
- You will conduct a **teaching observation** of a peer or faculty member and reflect on similarities and differences to your own teaching practices
- Your **teaching statement** will be developed and refined throughout the semester, and turned in as your final assignment as a way to connect the topics we have studied all semester and prepare you for future teaching opportunities

## GRADING POLICIES

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Your mastery of course learning outcomes will be assessed using a combination of in-class activities and writing assignments. Details for submission and grading of specific assignments will be provided in class. Grades will be determined by the percentage of course points earned.

### Grading Scale:

	A = $\geq 92.5\%$	A- = 89.5-92.4%
B+ = 87.5-89.4%	B = 82.5-87.4%	B- = 79.5-82.4%
C+ = 77.5-79.4%	C = 72.5-77.4%	C- = 69.5-72.4%
D+ = 67.5-69.4%	D = 62.5-67.4%	D- = 59.5-62.4%
	F < 59.4%	

Assignments	Points
In-class activities	50
Weekly article reflections	100
Instructional practice essay	100
Evidence-based teaching plan	50
Assessment development	50
Teaching reflection	25
Teaching observation	25
Teaching statement	100
Total	500

## ACADEMIC HONESTY

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The University adheres to a strict policy prohibiting cheating and plagiarism, including

- Copying, in part or in whole, from another's test or other examination.
- Using sources verbatim or paraphrasing without giving proper attribution (this can include phrases, sentences, paragraphs and/or pages of work).
- Copying and pasting work from an online or offline source directly and calling it one's own.
- Using information found from an online or offline source without giving the author credit.
- Replacing words or phrases from another source and inserting one's own words or phrases.

Under CSU policy, instructors must report instances of academic misconduct to the Center for Student Rights and Responsibilities for disciplinary review by the University, which may lead to probation, suspension, or expulsion. Instructors may also, at their discretion, penalize student grades on any assignment or assessment discovered to have been produced in an academically dishonest manner.

## ESSENTIAL STUDENT INFORMATION

For essential information about student academic success, please see the [SDSU Student Academic Success Handbook](#).

- SDSU provides disability-related accommodations via the Student Ability Success Center (sascinfo@sdsu.edu | [sdsu.edu/sasc](https://sdsu.edu/sasc)). Please allow 10-14 business days for this process.
- Class rosters are provided to the instructor with the student's legal name. Please let me know if you would prefer an alternate name and/or gender pronoun.
- A complete list of all academic support services--including the [Writing Center](#) -is available on the Student Affairs' [Academic Success](#) website

## SCHEDULE

**Tentative Schedule (check Canvas for any updates):** *Unless otherwise told by the instructor, all assignments are due in Canvas at 12pm on the day of class.*

Class #	Date	Pre-Readings & Course Topic(s)	Assignment(s) Due BEFORE Class	Learning Outcome
1	1/19	<ul style="list-style-type: none"> <li>• Reading: DBER p. 1-4</li> <li>• Course overview and goal setting</li> <li>• Introduction to DBER</li> </ul>	<ul style="list-style-type: none"> <li>• Post introduction to Canvas discussion</li> </ul>	LO1
2	1/26	<ul style="list-style-type: none"> <li>• Reading: DBER p. 7-14, Box 1-1, your field on p. 19-31, and p. 45-55</li> <li>• Overview of DBER methods</li> </ul>	<ul style="list-style-type: none"> <li>• Article reflection</li> </ul>	LO1
3	2/2	<ul style="list-style-type: none"> <li>• Reading: DBER p. 119-139</li> <li>• Statistics review</li> </ul>	<ul style="list-style-type: none"> <li>• Article reflection</li> </ul>	LO1
4	2/9	<ul style="list-style-type: none"> <li>• Reading: DBER p. 165-185</li> <li>• Research article diagramming</li> </ul>	<ul style="list-style-type: none"> <li>• Article reflection</li> </ul>	LO1
5	2/16	<ul style="list-style-type: none"> <li>• Reading: HPL1 p. 3-27</li> <li>• Overview of educational theories used in DBER</li> </ul>	<ul style="list-style-type: none"> <li>• Article reflection</li> </ul>	LO2
6	2/23	<ul style="list-style-type: none"> <li>• Reading: HPL1 p. 51-78</li> <li>• Identification of evidence-based instructional practices (EBIPs)</li> </ul>	<ul style="list-style-type: none"> <li>• Article reflection</li> </ul>	LO2
7	3/2	<ul style="list-style-type: none"> <li>• Reading: HPL1 p. 131-154</li> <li>• Evaluating evidence for EBIPs</li> </ul>	<ul style="list-style-type: none"> <li>• Article reflection</li> </ul>	LO2
8	3/9	<ul style="list-style-type: none"> <li>• Reading: HPL1 p. 171-189, skip</li> <li>• Limitations of implementing EBIPs</li> </ul>	<ul style="list-style-type: none"> <li>• Instructional practice essay</li> </ul>	LO2
9	3/16	<ul style="list-style-type: none"> <li>• Reading: HPL2 p. 69 -83 and 96-106</li> <li>• Alignment of teaching with models of cognition</li> </ul>	<ul style="list-style-type: none"> <li>• Article reflection</li> </ul>	LO3

<b>Class #</b>	<b>Date</b>	<b>Pre-Readings &amp; Course Topic(s)</b>	<b>Assignment(s) Due BEFORE Class</b>	<b>Learning Outcome</b>
<b>10</b>	3/23	<ul style="list-style-type: none"> <li>• Reading HPL2 p. 109-133</li> <li>• Affective components of learning</li> </ul>	<ul style="list-style-type: none"> <li>• Article reflection</li> </ul>	LO3
	3/30	<b>No Class – Spring Break</b>		
<b>11</b>	4/6	<ul style="list-style-type: none"> <li>• Reading: HPL2 p. 135-161</li> <li>• Equity and cultural issues in teaching</li> <li>• Qualities of effective teachers</li> </ul>	<ul style="list-style-type: none"> <li>• Evidence-based teaching plan</li> </ul>	LO3
<b>12</b>	4/13	<ul style="list-style-type: none"> <li>• Reading: KWSK p. 37-56</li> <li>• The role and design of assessments</li> </ul>	<ul style="list-style-type: none"> <li>• Teaching self-reflection</li> </ul>	LO4
<b>13</b>	4/20	<ul style="list-style-type: none"> <li>• Reading: KWSK p. 104-127</li> <li>• Statistical models of assessment</li> </ul>	<ul style="list-style-type: none"> <li>• Design an assessment</li> </ul>	LO4
<b>14</b>	4/27	<ul style="list-style-type: none"> <li>• Reading: KWSK p. 177-185, 194-209</li> <li>• Qualities of effective assessment</li> </ul>	<ul style="list-style-type: none"> <li>• Teaching peer observation</li> </ul>	LO4
<b>15</b>	5/4	<ul style="list-style-type: none"> <li>• Peer review of teaching statements</li> <li>• Reflection on course</li> </ul>	<ul style="list-style-type: none"> <li>• Draft of teaching statement</li> </ul>	LO4
	5/11	<b>No Class – Final Teaching Statement Due</b>		