CHEM 781: Scientific Approaches to Teaching and Learning (20851)
Spring 2022

COURSE INFORMATION

Class Meetings: Thursdays 4-6:40pm	**Instructor**: Dr. Regis Komperda (she/her)
Class Location: Zoom until Feb 7; Adams Humanities 2134	**Email** (preferred): rkomperda@sdsu.edu
Mode: Synchronous lecture/discussion	**Office location**: GMCS 203
Platform: Canvas	**Office hours**: by arrangement

COURSE MATERIALS

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

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

COURSE DESIGN: MAJOR ASSIGNMENTS AND ASSESSMENTS

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 article reflections** will provide an opportunity for you to read primary 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

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 = ≥ 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

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.

DIVERSITY AND INCLUSION

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

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.

ESSENTIAL STUDENT INFORMATION

- Compliance with CSU / SDSU vaccination and facial covering policies is required.
- Your SDSU email address will be used for all course-related communications.
- The Student Conduct Code prohibits conduct disruptive to instruction, including academic dishonesty and the unauthorized recording, dissemination, or publication (including on websites or social media) of lectures or other course materials.
- SDSU provides disability-related accommodations via the Student Ability Success Center (sascinfo@sdsu.edu | sdsu.edu/sasc). Please allow 10-14 business days for this process.
- The Family Educational Rights and Privacy Act (FERPA) mandates the protection of student information, including contact information, grades, and graded assignments. I will not post grades or leave graded assignments in public places. Students will be notified at the time of an assignment if copies of student work will be retained beyond the end of the semester or used as examples for future students or the wider public.
- As an instructor, one of my responsibilities is to help create a safe learning environment on our campus. I am required to share information regarding sexual violence on SDSU's campus with the Title IX coordinator, Gail Mendez (619-594-6464), who will contact you to let you know about support services at SDSU and possibilities for holding accountable the person who harmed you. If you do not want the Title IX Officer notified, you can speak confidentially SDSU's Sexual Violence Victim Advocate (619-594-0210) or Counseling and Psychological Services (619-594-5220, psycserv@sdsu.edu).
- 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.
- For technical or computing assistance, contact the Library Computing Hub.

ABSENCES

- If you plan to be absent for a religious observance or holiday, notify me by the end of the second week of classes.
- If you are absent more than five days due to illness or injury, you may contact Student Health Services for help in communicating your absence.
- If you miss class because you have been diagnosed with or are required to quarantine due to exposure to COVID-19, contact vpsafrontdesk@sdsu.edu to notify the university.

RESOURCES FOR STUDENTS (SEE FULL LIST ON CANVAS)

A complete list of all academic support services--including the Writing Center and Math Learning Center--is available on the Student Affairs' Academic Success website. Counseling and Psychological Services (619-594-5220) offers confidential counseling services by licensed therapists; you can Live Chat with a counselor at http://go.sdsu.edu/student_affairs/cps/therapist-consultation.aspx between 4:00pm and 10:00pm, or call San Diego Access and Crisis 24-hour Hotline at (888) 724-7240.

SCHEDULE

Tentative Schedule (check Canvas for any updates): *Unless otherwise told by the instructor, all assignments are due in Canvas at 3pm on the day of class.*

Class #	Date	Pre-Readings & Course Topic(s)	Assignment(s) Due BEFORE Class	Learning Outcome
1	1/20	• Reading: DBER p. 1-4 • Course overview and goal setting • Introduction to DBER	• Post introduction to Canvas discussion	LO1
2	1/27	• Reading: DBER p. 7-14, Box 1-1, your field on p. 19-31, and p. 45-55 • Overview of DBER methods	• Article reflection	LO1
3	2/3	• Reading: DBER p. 119-139 • Statistics review	• Article reflection	LO1
4	2/10	• Reading: DBER p. 165-185 • Research article diagramming	• Article reflection	LO1
5	2/17	• Reading: HPL1 p. 3-27 • Overview of educational theories used in DBER	• Article reflection	LO2
6	2/24	• Reading: HPL1 p. 51-78 • Identification of evidence-based instructional practices (EBIPs)	• Article reflection	LO2
7	3/3	• Reading: HPL1 p. 131-154 • Evaluating evidence for EBIPs	• Article reflection	LO2
8	3/10	• Reading: HPL1 p. 171-189, skip • Limitations of implementing EBIPs	• Instructional practice essay	LO2
9	3/17	• Reading: HPL2 p. 69 -83 and 96-106 • Alignment of teaching with models of cognition	• Article reflection	LO3
10	3/24	• Reading HPL2 p. 109-133 • Affective components of learning	• Article reflection	LO3
	3/31	**No Class – Spring Break**		
11	4/7	• Reading: HPL2 p. 135-161 • Equity and cultural issues in teaching • Qualities of effective teachers	• Evidence-based teaching plan	LO3
12	4/14	• Reading: KWSK p. 37-56 • The role and design of assessments	• Teaching self-reflection	LO4

Class #	Date	Pre-Readings & Course Topic(s)	Assignment(s) Due BEFORE Class	Learning Outcome
13	4/21	• Reading: KWSK p. 104-127 • Statistical models of assessment	• Design an assessment	LO4
14	4/28	• Reading: KWSK p. 177-185, 194-209 • Qualities of effective assessment	• Teaching peer observation	LO4
15	5/5	• Peer review of teaching statements • Reflection on course	• Draft of teaching statement	LO4
	5/12	**No Class – Final Teaching Statement Due**		