

San José State University
Science Education Program
SCED 205 Methods of Research, Spring 2020

Course and Contact Information

Instructor:	Dr. Elly Walsh
Office Location:	DH 618A
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Office Hours:	M 10:00AM – 12:00PM and by appointment
Class Days/Time:	M 4:00 -6:45 PM
Classroom:	DH 246

Course Format

Students will need access to a computer with internet in order to complete assignments using the canvas learning management system. All of our out-of-class communication with you will be through this system. Course materials such as greensheet, handouts, notes, assignment instructions, etc. can be found on the canvas website: sjsu.instructure.com. If you are an open university student, see the instructor for access to the site. During class you are expected to participate in activities and discussions. This includes being prepared for class by completing assignments prior to attending as well as contributing to the classroom discourse.

Course Description

Official Description: SCI 205: Methods of Research in Science Education

Introduction to techniques and procedures of scientific research. Each student required to prepare and defend a working outline of a master's thesis or project in his or her area of concentration.

Course Overview

This course is guided by two questions:

1. *What is inquiry in education?*
2. *How can we study and develop materials that address interesting problems of teaching and learning?*

These questions are more complex than they first appear. Answering a simple question can quickly lead to considerations about what counts as knowledge, what knowledge is, knowing as an activity and how we define ourselves as learners. It requires examination of approaches to answering these questions and interrogation of what approaches lead to which kinds of answers and why. There are also practical issues—how does one gain proficiency in the practices of educational design and research and what are the ethical implications of educational inquiry?

Researchers have debated all of these questions throughout the history of educational inquiry and this course does not seek to provide a resolution. Rather, through consideration, examination of and practice with inquiry

techniques we will define a problem that your masters project will address and develop a proposal for how you will address that issue.

Course Goals and Learning Outcomes

Program Learning Outcomes (PLO)

This course can be taken to fulfill some of the credit hours required for a master's degree in Science Education. Therefore, this course (in addition to others) will help students make progress towards the following program learning outcomes:

1 – To enhance student's depth and breadth of understanding of selected topics in science education.

PLO 1.1 Students will be able to synthesize primary literature from science education research and apply how it fits to their project.

PLO 1.2 Students will demonstrate knowledge of at least two areas (e.g. inquiry based instruction, learning theory, assessment) that are related to, or supportive of research for their project.

2 – To enhance communication skills, both written and oral, in science education discourse.

PLO 2.1 Students will present science and science education content in the form of graduate seminars or in the oral defense of their project (also known as the culminating experience).

PLO 2.2 Students will organize and write the results of their project in a manner consistent with standards in professional science education publications.

Course Learning Outcomes (CLO)

This course is meant as a general introduction to research in science education.

Upon successful completion of this course, students will be able to:

CLO 1 Evaluate and communicate the utility of various research questions as they apply to their personal research topic.

CLO 2 Construct measurable research questions motivated by science education literature

CLO 3 Create a plan for project implementation (ex: data collection, curriculum design, program implementation etc.) and analysis/reflection as applicable to their masters project.

CLO 4 Create and identify instruments (surveys, interview protocols)

CLO 5 Write your SJSU Institutional Review Board (IRB) protocol and *submit for approval*.

CLO 6 Synthesize knowledge from SCI 205, SCI 220 and other educational courses into a coherent written proposal.

Required Texts/Readings

Textbook

Readings will be assigned to match the in-class discussions. These readings will be posted on the Canvas website under the sidebar menu titles 'files' and 'readings' and in the 'modules.'

Course Requirements and Assignments

Weekly Assignments

Weekly assignments will usually be comprised of both writing and reading components. Students are required to come prepared to discuss the readings assigned each week. In addition, students will be responsible for presenting and leading a discussion or activity on a research method of choice. The writing assignments will help students make progress towards writing a proposal on a topic of interest in science education. Unless otherwise noted all assignments are due at 11:59AM the morning of class in order to provide time for the instructors to evaluate your work and make any necessary modifications to the scheduled activities.

Many weeks, you will complete a short reflection paper (1-2 pages *max*, double-spaced). The instructor has selected readings on a variety of educational methods and techniques. In these readings, reflect on the *how* of research. What does this methodological technique accomplish? What are its limitations? In these papers, *do not summarize* the technique or the methodology. Rather, write about how you understand or do not understand the methodology. What assumptions or expectations about educational research are *you* bringing to the readings and how do the readings affirm, extend, challenge and/or refute what you think you know about research in education? How does this methodology relate to your topic of interest? How might it be useful or not useful?

Details on each weekly assignments will be posted in the assignments tab on canvas. Make sure you read each assignment carefully, as there will be important details, and some assignments may require two steps (for example, a reflection and a peer review) that are required to be accomplished over multiple days.

IRB (Human Subjects) Application

It is essential that all research be conducted ethically, therefore, in addition to studying the ethics around research, in this class you will also be going through the steps of preparing submission of an IRB (Human Subjects) application. We will work to develop an appropriate plan for your treatment of human subjects and develop the required materials including a narrative, consent forms and data instruments (surveys, interviews, etc). In the rare chance that your project is *already approved* by IRB (or that you do not need IRB approval for some other reason) you will still be required to prepare an IRB, and/or work with a partner to prepare their IRB. We will adjust the assignment accordingly on a case by case basis.

University Course Hour Requirement

“Success in this course is based on the expectation that students will spend, for each unit of credit, a *minimum* of 45 hours over the length of the course (normally 3 hours per unit per week with 1 of the hours used for lecture) for instruction or preparation/studying or course related activities including but not limited to internships, labs, clinical practica. Other course structures will have equivalent workload expectations as described in the syllabus.”

Final Examination or Evaluation

Final presentations (science education faculty and relevant college personnel invited) and the final project proposal serve as the final evaluation for this course.

Proposal (Final)

You will create a proposal that outlines your project plan for the completion of your MA degree. The specifics of that plan will be outlined to you in an assignment, and you will be given a rubric on which you will be assessed to refer to as you write.

Final Presentation

On Monday, May 11th, you will present your project proposal to an audience consisting of your classmates, adviser, and committee members if possible. Details of this proposal will be provided to you in an assignment.

Grading Information

Grading Policy

Students will be graded on the quality of their written assignments, the extent of their participation, and the thoughtfulness, effort and coherence of their final project. Points will be allocated as such:

In Class Work and Discussions:	20%
Weekly Assignments:	30%
Final Proposal:	40%
IRB:	10%

There is no extra credit for this course. This is final and there are no exceptions.

Because of the discussion-based nature of this class, submitting work late is **HIGHLY** discouraged. Late work is not accepted except in cases in which unforeseen or emergency situations necessitate an extended deadline and arrangements are made with the instructor *prior* to the deadline. Note that many assignments have the possibility for revision, so students are **STRONGLY** encouraged to submit all work completed by the deadline even if it is not yet “perfect.” If you find yourself getting behind, please see me so we can come up with a plan for you to be successful in this course.

Classroom Protocol

Attendance is essential in order for your success in this course. Often times the success of a classroom activity will depend on the attendance of the entire class. In addition, your contribution to the classroom discourse assists your learning as well as that of your peers. Your absence impacts the learning of others taking the course. Therefore, it is essential that notify us if you are going to miss class for any reason, as soon as you are able to do so. University excused absences require documentation (ie: doctor’s note). University policy on ‘make-up’ work and participation points will be strictly followed.

University Policies

Per University Policy S16-9, university-wide policy information relevant to all courses, such as academic integrity, accommodations, etc. will be available on Office of Graduate and Undergraduate Programs’ [Syllabus Information web page](http://www.sjsu.edu/gup/syllabusinfo/) at <http://www.sjsu.edu/gup/syllabusinfo/>”

SCED 205 Methods of Research in Science Education

This schedule should be considered a draft and is subject to change with fair notice and changes will be posted on Canvas and announced in class.

Week	Date	Topic	Readings & Assignments Due
1	Jan 27	Introduction, Research Proposal Overview	
2	Feb 3	Research Questions/Introduction to Qualitative Design and Methods Qualitative Method Highlight: Ethnography	C&M Ch 1—The Nature of Enquiry GC&E Ch 16 – Ethnography <i>Due: Reflection 1</i>
3	Feb 10	Qualitative Method Highlight: Case Study Rigor & Validity	GC&E Chapter 6 – Case Study Methods and Chapter 7 – Cross-Case Analysis <i>Due: Reflection 2</i>
4	Feb 17	Mixed Methods Highlight: Design Based Research Non-Experimental Projects	Barab, 2006. Design-Based Research: A Methodological Toolkit for Engineering Change <i>Due: Reflection 3</i>
5	Feb 24	Methods Highlight: Teacher Action Research Non-Experimental Projects 2	C&M Ch 18 Action Research <i>Due: Reflection 4</i>
6	Mar 2	Quantitative Methods Highlight: Experiments and Quasi-Experiments Quantitative Design Design Basics: Pre-post & control	C&M Ch 16—Experiments, quasi-experiments, single-case research and internet-based experiments <i>Due: Reflection 5</i>
7	Mar 9	Survey Studies Causality, Sampling	CM Ch 13: Surveys, longitudinal, cross-sectional and trend studies <i>Due: Reflection 6</i>
8	Mar 16	Focus on Mixed Methodologies	Johnson & Onquegbuzie 2004. Mixed Methods Research: A Research Paradigm whose Time has Come CM&M 21 – Interviews (for next week, but gauge your reading load) <i>Due: Reflection 7</i>
9	Mar 23	Collecting data: Interviewing, field notes, observations	Hatch Ch 3 – Collecting Qualitative Data CM&M 21 -- Interviews

Week	Date	Topic	Readings & Assignments Due
			<i>Due: Proposal Draft of Lit Review, Methods and Data Collection</i>
10	Mar 30	Spring Break – NO CLASS	
11	Apr 6	Re-visiting Research Questions Ethics and IRB	C&M Ch 4 Ethics of educational and social research <i>Due: IRB Draft (cover sheet, narrative and consent forms only), Peer review of proposal draft</i> <i>Observation Assignment</i>
12	Apr 13	Analyzing qualitative data: coding, video and audio analysis	Lofland & Lofland Ch 9 – Developing Analyses Saldana Ch 7 – Codes and Coding <i>Due: Draft of full proposal, including creation or identification of data instruments (e.g. surveys or interview protocols)</i> <i>Interview and Interview Reflection</i>
13	Apr 20	Peer Reviewing	Assignment TBA Due at end of normal class time <i>Due:</i> <i>Peer Review of full proposal draft and IRB draft</i> <i>Coding and Coding Reflection</i>
14	Apr 27	Analyzing quantitative data: Descriptive Statistics, Correlation, Ordinary Least Squares Regression, T-tests	Reading: Ch 7 – Descriptive Statistics <i>Due: Full Proposal Second Draft</i>
15	May 4	IRB Help & Workday	<i>Due: Peer review of proposal second draft, Complete IRB Draft (cover sheet, narrative, all consent forms and protocols)</i>
16	May 11	Presentations	Final Presentation Slides due by 12:00PM <i>Due: Proposal Final draft</i>
Final Evaluation	Monday May 18th		FINAL IRB SUBMITTED

C&M refers to the volume Cohen & Manion (2011) *Research Methods in Education*; GC&E refers to Green, Camili & Elmore (2006) *Complementary Methods in Research Education*.

Suggested Supplemental Readings

Alghamdi, A. H., & Li, L. Adapting Design-Based Research as a Research Methodology in Educational Settings. *International Journal of Education and Research*, 1(10)

Bell, P., Hoadley, C. M., & Linn, M. C. (2004). Design-based research in education. In M. C. Linn, E. A. Davis, & P. Bell (Eds.), *Internet environments for science education* (pp. 73–84). Mahwah, NJ: Lawrence Erlbaum Associates.

Creswell, J. W. (2013). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage. (Chapter 14 - Ethnographic designs p. 461-500)

Hatch, J. A. (2002). *Doing qualitative research in education settings*. SUNY Press. (Chapter 2 – Designing Qualitative Studies p. 37-70).

Hatch, J. A. (2002). *Doing qualitative research in education settings*. SUNY Press. (Chapter 3 – Collecting Qualitative Data p. 71-146)

Merriam, S. B. (2014). *Qualitative research: A guide to design and implementation*. John Wiley & Sons. (Chapters 1-2 – The design of qualitative research p. 1-38).

Merriam, S. B. (2014). *Qualitative research: A guide to design and implementation*. John Wiley & Sons. (Part 2 – Collecting Qualitative Data p. 85-164).

Merriam, S. B. (2014). *Qualitative research: A guide to design and implementation*. John Wiley & Sons. (Chapter 8 – Qualitative Data Analysis p. 169-207).

Green, J. L., Camilli, G., & Elmore, P. B. (Eds.). (2012). *Handbook of complementary methods in education research*. Routledge. (Chapter 33 – Randomized Experiments in Educational Research p 551-565)

Green, J. L., Camilli, G., & Elmore, P. B. (Eds.). (2012). *Handbook of complementary methods in education research*. Routledge. (Chapter 21 – Interviewing in educational research p. 357-370)

Green, J. L., Camilli, G., & Elmore, P. B. (Eds.). (2012). *Handbook of complementary methods in education research*. Routledge. (Chapter 27 – Multiple Methodologies in Education Research p. 457-476)

Mertens, D. M. (2014). *Research and evaluation in education and psychology*. Sage. (Chapter 8 – Qualitative Methods p. 225-265)