San José State University
College of Science – Science Education Program
Course Number 40354, Secondary School Science, Section-01, Fall 2021

COURSE CONTACTS & INFORMATION

Instructor:	Dr. Tammie Visintainer
Office Location:	Zoom (or Sweeney Hall 338)
Email:	tammie.visintainer@sjsu.edu (please use this email, not Canvas messaging)
Office Hours:	By appointment
Class Days/Time:	Tuesday 4:00PM – 10:00PM (8:00PM end while virtual)
Classroom:	Zoom/virtual
Prerequisites:	CSET 215, one specialized area, secondary science education adviser approval

COURSE OVERVIEW

Course Description

This course centers equity, justice, and inclusion in science education. During the course, teacher candidates will engage with the methods, learning theories, and practices of teaching science in secondary schools that focus equally on science as a discipline and teaching students from racial/ethnic, linguistic, and socioeconomic backgrounds of great diversity. To do this, teachers will explore inquiry-based approaches to science teaching and how to engage students in the Next Generation Science Standards (NGSS). In addition, teacher candidates will learn how to design learning environments that leverage students' diverse sense making practices as instructional resources and cultivate inclusive, learner-centered experiences. **Teachers will leave the course with the tools to become justice-centered educators, prepared to teach science for equity and inclusion.**

Course Goals and Vision

The goal of this course is to prepare teachers as reflective and responsive***, designer and equity advocates*** who support students, especially those historically/currently marginalized in society, school, and science, as learners and doers of science, and change agents in their communities.

Guiding questions for the course are as follows:

- What are contemporary issues of equity in science education?
- What types of instructional/pedagogical approaches promote teaching science for equity and inclusion?
- What is science inquiry and how does it relate to NGSS science practices?
- How do we support students as learners and doers of science through our instruction and pedagogy?
- How do we leverage students' diverse experiences/sense making practices as instructional resources?

Course Learning Outcomes

Through course readings, class discussions and activities, and teaching practice you will:

- Create a teaching philosophy that reflects your commitments to science as a discipline and your vision for teaching students from racially, ethnically, and socioeconomically diverse populations.
- Explore how to teach science that is justice-centered and reflects current theories of learning.
- Learn how to engage students in authentic science practices and contemporary science phenomena.
- Design a unit and lesson plan that address California State/Next Generation Science Standards.
- Differentiate instruction and support students' diverse ways of knowing, learning, and sense making.
- Create design principles that serve as actionable guidelines for your future instructional design.

Opportunities & Challenges of This Course

Becoming a science teacher is an exciting and noble endeavor! First and foremost, we are ALL science learners. Science is EVERYWHERE in our lives. Many of us learned science in schools in static, prescribed ways that made us think we were bad and science, lost us out of boredom, and/or didn't peak our curiosity. Every day we wonder about things, ask questions, make observations – THIS is science ☺. This course engages in what it means to teach in ways that address contemporary goals and issues in science education. You will develop a vision for teaching science and explore why teaching for equity is central to student learning and empowerment.

As exciting as this is, this course is also challenging. You will explore and teach science in ways you likely did not experienced in your own schooling. In addition, you will be asked to look inward and reflect on your own views and biases. While this may seem daunting, we will experience and practice strategies together in a critical caring community and support each other while engaging in science practices in authentic ways.

Creating a Critically Caring Learning Community

As educators, we are first and foremost learners (professors included!). Teaching is a journey and there will always be ways to grow and improve. It is important to create a safe and comfortable learning environment where we can explore, make mistakes, learn, and grow as professionals together. I have 2 main requests:

- Be open to new instructional and pedagogical approaches and ways of ***engaging with/doing science***.
- Develop new ways of ***seeing students*** as young people, innovators, knowledge producers & learners.

Primary Teacher Performance Expectations (TPE's) addressed in SCED 273

- TPE 1: Engaging and Supporting All Students in Learning (1.1, 1.3, 1.5)
- TPE 2: Creating and Maintaining Effective Environments for Student Learning (2.2, 2.5)
- TPE 3: Understanding and Organizing Subject Matter for Student Learning (3.1, 3.2, 3.7)
- TPE 4: Planning Instruction and Designing Learning Experiences for All Students (4.4, 4.8)
- TPE 5: Assessing Student Learning (5.1, 5.3)
- TPE 6: Developing as a Professional Educator (6.1, 6.2, 6.3)

Helpful Readings & Resources

- A Framework for K-12 Science Education *(download free pdf):* https://www.nap.edu/catalog/13165/a-framework-for-k-12-science-education-practices-crosscutting-concepts
- STEM Teaching Tools: Free resources – University of Washington: STEMTeachingTools.org
- National Science Teacher Association (NSTA): TONS of resources, free, even more with membership

- Next Generation Science Standards, California Department of Education
  http://www.cde.ca.gov/pd/ca/sc/ngssintrod.asp
- Next Generation Science Standards Webinars
  https://learningcenter.nsta.org/products/symposia_seminars/NGSS/webseminar.aspx

Connection to Lurie College of Education

COURSE EXPECTATIONS

Class Meetings & Participation
Classes will consist of discussions, activities, visits from expert teachers (pending), and teaching practice. Please complete assignments on time and attend class prepared to engage in our learning community.

- **Participation:** The course is designed as a practicum, thus, active participation is essential (even virtually) to learning/growing as an educator and your success in the course. Students are graded on the quality of participation in class and on-line.
- **Attendance:** Class attendance is required and students are expected to attend every class, on time, and stay for the entire period to receive full credit.
- **Missing class:** Attending weekly class sessions is required and expected. If you must miss a class, please discuss this with the instructor well in advance

Readings
To expand the breadth and depth of your thinking and professional growth you are responsible for completing weekly required readings. All readings will be accessible on Canvas (***intended to be completed prior to class***. Attend class prepared to engage in discussions of the assigned readings.

Course Projects & Assignments
Course projects and assignments are discussed in detail below. Expectations, grading, and deadlines for all assignments will be clearly communicated in advance.

- Late work is subject to penalty depending on the severity of the lateness
- Due Dates: Written assignments are **DUE on Tuesday BEFORE the start of class.**

Technology Use
Please refrain from phone/computer/technology use during class sessions unless you are taking notes and/or using your computer for other class activities.

DETERMINATION OF GRADES

- **Participation & Class Assignments = 60% of Final Grade**
  - Demonstration of teaching practices – 15
  - Course participation – 15
  - Course assignments – 30

- **Final Project: Teaching Portfolio = 40% of Final Grade**
  - Lesson plans (2 total) – 10
  - Unit Plan – 10
  - Teaching Statement & Philosophy of Equity (Final Version) – 10
  - Design Principles for Equity (Final Version) - 10

Additional Grading Information: *The lesson and unit plans for this course will be evaluated in accordance to rubrics (included separately). Additional rubrics will be used for grading teaching practice, participation, and assignments. More guidelines on grading and attendance can be found in these university policies:*

- *University Syllabus Policy S16-9 (http://www.sjsu.edu/senate/docs/S16-9.pdf)*
- *University policy F15-12 (http://www.sjsu.edu/senate/docs/F15-12.pdf)* A letter grade will be determined according to the percentage of available points that each student has earned. There are no extra credit options for this course.

% of Points Earned	Grade	Reported Student Achievement
97-100%	A+	
94-96%	A	Exceeds *Teaching Performance Expectations (TPE)*
90-93%	A-	
87-89%	B+	
84-86%	B	Meets *Teaching Performance Expectations*
70-83%	C-	Minimally meets Teaching Performance Expectations
67-69%	D+	
64-66%	D	Provides little evidence for meeting (TPE)
60-63%	D-	
Below 60%	F	Does not meet *(TPE)*

****Important Note ****

- In order to qualify for Supervised Student Teaching (SCED184Y and/or Z), **a grade of B or higher (B- not accepted) must be earned in SCED 273**.

Grading Policy for Written Assignments: All work submitted is expected to meet high standards of professional quality in content, style, and use of standard English. Written assignments and presentations will be graded based on criteria according to rubrics distributed in advance of the due date. **All assignments are to be submitted on or before their due dates/times to be eligible for full credit.**

Teaching practice: Student lesson components and practice are to be performed as scheduled. In cases of serious illness or in an emergency situation the instructor will allow a one-time deadline extension on any written assignment other than the final unit plan. The new deadline will be final.

COURSE ASSIGNMENTS OVERVIEW

Educational Autobiography: You will prepare a short (~2 pages) statement about who you are – as a person, SJSU student, science person, and prospective science teacher – with particular emphasis on science experiences in/outside of K-12 schooling that have been formative for you. The details you choose to include are entirely up to you. The purpose is for me to get to know you and for you to get to know each other. *NOTE: The instructor will read autobiographies and you will share them in class.*

Teaching Statement & Philosophy of Equity: At the beginning of the course, you will write a draft of your vision and commitments for teaching science – how you envision teaching science, your core values, what you hope your students will *do* with science based on their experiences in your classroom, and what teaching science for equity and inclusion means to you. Throughout the semester you will experience new readings, science teaching practices, and theories of learning. At the end of the semester you will revise your draft to reflect your current commitments and core values based on your experiences in the course. The final version of your Teaching Statement & Philosophy of Equity will be part of your final project for the course.

Reading Discussion Forum: To expand the breadth and depth of your thinking, understanding, and professional growth you are responsible for completing weekly required readings.

- **Canvas On-Line Reading Discussion Forum:** Each week there will be guiding questions posted under Canvas "Discussions." You are required to participate in the discussion by responding to the prompts.
- Responses to the on-line discussion are DUE on MONDAY NIGHT by 10PM

Science Self-Documentation Project: An exciting and challenging aspect of teaching science is engaging students meaningfully in science and in ways that have purpose and are relevant to their lives and interests. To help foster creativity in your instructional design, we will ask you to notice and document science phenomena and the relevancy of science across the many contexts of your life. The goal is to notice, reflect on, and think about science in new and expansive ways.

Design Principles for Teaching Science for Equity & Inclusion: Based on course readings and experiences, you will create an annotated list of principles that serve as guidelines for the design of equitable science learning environments. The design principles provide an opportunity for you to synthesize readings and experiences from the course into actionable guidelines. The goal is to put big ideas and theories into practice.

Lesson Plans: A key element of this course is for you to learn how to design lesson plans involving science phenomena that engage students in NGSS/inquiry. You will ***use the lesson plan template for the course*** to guide your design. Details and components of the lesson plan will be described during review of the lesson plan template. We will build and practice components of the lesson plan throughout the summer course.

Unit Plan: As part of your final project you will be asked to create a unit plan overview and outlines that includes your detailed lesson plan. You will ***use the unit plan template provided*** that includes a description of the goals of the unit including how you plan to incorporate inquiry and equity throughout the unit.

Science Journal (optional): A central aspect of growing as an educator is inquiring into your own practice and cultivating networks and resources that support your endeavors. Throughout the course you are encouraged to keep a science journal as a way to create a collection of teaching resources such as class notes, podcasts, videos, and websites. In addition, it can be a place to write questions, reflections, and inquiries into your practice. Engaging in this practice serves as a model that you may choose to use with your own students.

Dropping and Adding

Students are responsible for understanding the policies and procedures about add/drop, grade forgiveness, etc. Refer to the current semester's Catalog Policies section at http://info.sjsu.edu/static/catalog/policies.html. Add/drop deadlines can be found on the current academic calendar web page: http://www.sjsu.edu/provost/Academic_Calendars/

The Late Drop Policy is available at http://www.sjsu.edu/aars/policies/latedrops/policy/. Students should be aware of the current deadlines and penalties for dropping classes. Information about the latest changes and news is available at the Advising Hub at http://www.sjsu.edu/advising/

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 at http://www.sjsu.edu/gup/syllabusinfo/

COURSE OUTLINE

The following is an outline of when topics are anticipated to be covered. Please note, this syllabus is a living document – modifications will be made as we progress through the semester. **The syllabus will be regularly updated/posted on Canvas to reflect the current topics.** *Note: All readings are available through Canvas.*

Week	Date	THEMES & GOALS
1	Aug 24	**Introduction to Science Teaching & Learning** **Goal**: We will begin to form a learning community by starting to grapple with the guiding questions of the course, engaging in inquiry together, and reflecting on our varied experiences with science.
2	Aug 31	**Issues of Equity in Science Education: Challenges & Opportunities** **Goal:** We will engage in and think critically about big broad issues in education generally, and science education specifically, and explore the current goals for science teaching and learning. In addition, we will explore what how you, as teachers, can become agents of social change. **Assigned Readings to Be Completed <u>Before</u> this Class:** • Chap 1: The Flat World, Educational Inequality, and America's Future, In Darling-Hammond, L. (2010). *The Flatworld & Education*, p.1-26 • Position Statement NSTA: The Next Generation Science Standards (2016). *National Science Teachers Association,* p.1-6. **Optional Reading**: • Chap 2. The Anatomy of Inequality: How the Opportunity Gap is Constructed. *The Flatworld & Education*. ***Assignment Due: Educational Autobiography***

3	Sept 7	**Developing a Vision: Empowering Students as Learners & Doers of Science** **Goal:** We will explore connections between an instructor's vision the design of instructional/pedagogical resources, and shifts that occurred for youth through while they engaged in community-based scientific research. **Assigned Readings to Be Completed <u>Before</u> this Class:** • Visintainer, T. (2017). "Scientists Do What We Do": Empowering Youth of Color as Learners and Doers of Community-Based Scientific Research. In D. Stroupe (Ed.), *Reframing Science Teaching and Learning: Students and Educators Co-Developing Science Practices In and Out of School.* Routledge. • Chapter 2: Guiding Assumptions & Organization of the Framework (p. 23-34)**,** *Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas* (see link under "required texts") • Early Gender Gaps in Mathematics and Teachers' Perceptions. National Science Board. Science & Engineering Indicators Report 2018
4	Sept 14	**Theories of Learning: Science, Culture & Inquiry** **Goal**: We will explore how students learn and understand science. In addition, we will engage an inquiry activity with varying levels of scaffolding in order to experience different instructional approaches to inquiry as leaners. **Assigned Readings to Be Completed <u>Before</u> this Class:** • Nasir, N.S., Rosebery, A., Warren, B., & Lee, C.D. (2006). Learning as a Cultural Process: Achieving Equity Through Diversity. In R.K. Sawyer (Ed.), *The Cambridge Handbook of the Learning Sciences* (pp. 489-504). Cambridge, UK: Cambridge University Press. • Bang, M. Learning & Culture. *Institute for Science,Math Innovation*, p.1-3. • Wilcox, Kruse, & Clough (Sept, 2015). Teaching Science Through Inquiry: Seven Common Myths About This Time-Honored Approach. *The Science Teacher,* p.62-67. **Optional Reading:** • Chap 1: Learning, From Speculation to Science. In Bransford, J.D., Brown, A.L., Cocking, R.R. (2000). *How People Learn*. National Academies Press, Washington D.C.; p. 3-27 ***Assignment Due: Draft of Teaching Statement and Philosophy***
5	Sept 21	**Overview: Next Generation Science Standards** **Goal:** We will begin to dig into the standards and you will explore the Disciplinary Core Ideas and Performance Expectations for your discipline. Finally, we will explore how to build on our own experience documenting science in our lives as we design instruction.

		Assigned Readings to Be Completed <u>Before</u> this Class: • NSTA Transitioning from Scientific Inquiry to 3D Teaching and Learning. • Practice Brief 32: Why Focus on Science and Engineering Practices? (http://stemteachingtools.org/brief/32) • Practice Brief 2: Why Should Students Investigate Contemporary Science Topics/Not Just "Settled" Science? (http://stemteachingtools.org/brief/2) • Practice Brief 31: How to Launch STEM Investigations That Build on Student/Community Expertise (http://stemteachingtools.org/brief/31) • Science Self-Documentation Classroom Example (http://stemteachingtools.org/sp/self-doc) ***Assignment Due: Science-Self Documentation Project***
6	Sept 28	**NGSS Part 2: Science & Engineering Practices** **Goal**: We will explore the NGSS science and engineering practices, and practice designing an elicit and engage activity for an opening to an NGSS lesson. **Assigned Readings to Be Completed <u>Before</u> this Class:** • Bang, M., Brown, B., Calabrese Barton, A., Rosebery, A., & Warren, B. (2017). Chapter 3: Toward More Equitable Learning in Science: Expanding Relationships Among Students, Teachers, and Science Practices. In: *Helping Students Make Sense of the World Using Next Generation Science and Engineering Practices* • Chapter 3: Scientific & Engineering Practices in a *Framework for K-12 Science Education:* (p.41-82) ***Assignment Due: NGSS DCI & PE Table for your discipline***
7	Oct 5	**Teaching Science for Equity Part 1:** **Race, Identity, Learning & Scientific Literacy** **Goal:** We will explore how we "see" our students and discuss how to get to know them as individuals, learners, and dreamers. To do this, we will: 1) Reflect on our assumptions about race, class, culture, community, 2) Discuss ways to create a supportive and inclusive classroom culture, and 3) Examine intersections of identity, learning, and teaching approaches that support students' diverse interests and sense making practices. **Assigned Readings to Be Completed <u>Before</u> this Class:** • Nasir, N.S. (2012): Chap 3. Wrestling with Stereotypes, In: *Racialized Identities, Race and Achievement Among African American Youth*. Stanford University Press, Stanford, CA. • Nasir, N.S. Race, Identity & Equity in Education. *The180 Podcast* (https://www.podbean.com/ew/pb-mqcee-ce6a63) (LISTEN) • Teach Lab Podcast: w/ Beverly Daniel Tatum (LISTEN)

8	Oct 12	**Teaching Science for Equity Part 2:** **Equitable Approaches to Science Instruction** **Goal:** We will explore intersections of culture and science, what it means to teach science in culturally relevant ways, and other equitable/inclusive approaches to science teaching. **Assigned Readings to Be Completed <u>Before</u> this Class:** • Calabrese Barton, A. (2003). Chapter 2: Learning with Urban Youth. In: *Teaching Science for Social Justice*. Teachers College Press, New York. • Ladson-Billings, G. (1995). But That's Just Good Teaching! The Case for Culturally Relevant Pedagogy. *Theory Into Practice*, 34(3), 159-165. • Boaler, J. (2006). How a Detracked Mathematics Approach Promoted Respect, Responsibility, and High Achievement. *Theory into Practice* 45 (1), 40-46. • NPR Short Wave: Want to Dismantle Racism in Science? Start in the Classroom. https://www.npr.org/2020/09/30/918864226/want-to-dismantle-racism-in-science-start-in-the-classroom
9	Oct 19	**NGSS SEPs, Learning Objectives, & Lesson Design Practice** **Goal:** We will explore the components of effective learning objectives and practice designing learning experiences that promote equity and inclusion by engaging students in science practices • Lesson 6: Writing Objectives: https://www.itma.vt.edu/courses/instrdes/lesson6.htm • Chap 4: The Qualities of Useful Objectives (p.43-49). In Mager, R.F. (1997) Preparing Instructional Objectives, Third Edition • NPR Code Switch, A Shot in the Dark (LISTEN) https://www.npr.org/2021/02/16/968359504/a-shot-in-the-dark

10	Oct 26	**Differentiating Instruction for Diverse Learners**
		
		Goal: We will explore how to differentiate instruction for diverse learners and the components of universal design for learning (UDL).
		
		Assigned Readings to Be Completed <u>Before</u> this Class:
		• Rosebery, Warren, Ballenger, C. (2008) In: *Teaching Science to English Language Learners*
		  o Introduction
		  o Chap 1: Creating a Foundation Through Student Conversation.
		• Case Study 4: English Language Learners & NGSS
		• Universal Design for Learning (UDL)
		
		In class presentation: Elicit & Engage
		HW: Scientific literacy: Position statement

11	Nov 2	**Scientific Literacy** **Goal**: We will explore the concept of scientific literacy and its importance for engaging fully and democratically in a information and data-rich society. **Assigned Readings to Be Completed <u>Before</u> this Class:** • Chap 4: The Role of Practices in Scientific Literacy. In: *Helping Students Make Sense of the World Using NGSS* ***Due: Position statement*** ***HW: Research learning technology + body of lesson activity***
12	Nov 9	**Technology in the Science Classroom** We will explore different types of learning technologies that can be used in science teaching (e.g., simulations, real-time data, models etc). You will research and present a technology of your choosing to the class. **Assigned Readings to Be Completed <u>Before</u> this Class:** • Headrick-Taylor, K., et al., (2019). Supporting Public-Facing Education for Youth: Spreading (Not Scaling) Ways to Learn Data Science With Mobile and Geospatial Technologies. *Contemporary Issues in Tech/Teacher Education*, 3(19) ***Due: Present Technology/Body of Lesson*** ***HW: Design principles for teaching science for equity - DRAFT*** ***HW: Unit plan – DRAFT (OPTIONAL)***
13	Nov 16	**Community-Based & Place-Based Science** **Goal:** We will explore tools, resources, and approaches to teaching climate change. In addition, you will engage in teaching practice by designing and presenting a Body of a Lesson activity in class. **Assigned Readings to Be Completed <u>Before</u> this Class:** • Scientific Literacy & Global Climate Change. STEM Teaching Tools #12 http://stemteachingtools.org/brief/12 • Morrison, J. (Sept 19, 2019). Can We Turn Down the Temperature on Urban Heat Islands? *Yale Environment 360* • The Litter Myth, NPR Throughline (LISTEN) https://www.npr.org/2019/09/04/757539617/the-litter-myth • Explore: Learning in Places (Dr. Megan Bang et al) http://learninginplaces.org/ ***Due: Design Principles (DRAFT)*** ***OPTIONAL: Unit plan (DRAFT)***

14	Nov 23	**NO CLASS THANKSGIVING BREAK**
15	Nov 30	**Transformative Science Teaching & Assessment** **Goal:** We will end the semester by exploring inspiring approaches to teaching and ways to cultivate a pedagogical vision and imagination to support your science teaching endeavors. In addition, we will explore different strategies for assessing student learning. **Assigned Readings to Be Completed <u>Before</u> this Class:** • hooks, bell. Teaching to Transgress: Education as the Practice of Freedom 1) Introduction (p.1-12) 2) Chapter 1: Engaged Pedagogy (p.13-22) 3) Chapter 3: Embracing Change (p. 35-44) *[The whole book is great! Chap 2 is also highly recommended (but not required)]* • McKamey, P. (June 17, 2020). What Anti-Racist Teachers Do Differently. *The Atlantic*.
16	Dec 7 or 14	***DUE: Final Portfolio*** ***CLASS Presentations****: Present overview of your final portfolio*