Course Syllabus: Science Curriculum & Instruction
EDUC 267a

COURSE INFORMATION
267 (A) Summer C & I June 30, July 1,2,3,7,8,9,10,11, **Daily:** 3:00pm - 6:00 pm PST Course Website: https://canvas.stanford.edu **Room 308**

INSTRUCTOR INFORMATION	
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COURSE PURPOSE AND OVERVIEW

Only a small part of teaching is visible to a student or an observer; most people underestimate the amount of knowledge and skill that good teaching requires. Furthermore, being a good student does not always translate into being a good teacher. Most people think that teaching is largely about knowing the science and telling it in such an engaging way that the students will actually listen. They suppose that if the students listen well, they will learn and understand. Such conversations often revolve around one's "teaching style." Positioning teaching as an individualized pursuit implies that a new teacher's job is to develop a personal style of delivery. However, learning is far more complex than simply listening and teaching is far more complex than simply talking.

While we do think that there is a place for individuality in teaching, we also think that is important to develop a shared understanding of the foundations of effective teaching that is grounded in educational research. In this course -- and your other STEP courses throughout the year -- you will study the complexities of teaching and learning, and you will learn how to plan and implement lessons using research-based practices which take these complexities into account.

The summer session of curriculum and instruction (ED 267A) is a brief course that provides an overview of ideas that we will revisit over the course of the academic year. The course provides an opportunity for participants to develop a fundamental understanding of the first stages of instructional planning. This does not mean learning to lesson plan; rather, this short course focuses on helping you understand the science content more deeply in order to present it in a way that will resonate with students. Specifically, you will:

1. Decide what to teach and articulate goals that are worthwhile and appropriate for students;
2. Gather data about your students' strengths, backgrounds, and interests to support their learning;
3. Create mechanisms so students can demonstrate they have learned what you have planned for them to learn;
4. Design instructional tasks to engage students in learning.

Working with and learning about students
Most years you would also be actively working in schools through your field experiences, you will have opportunities to work with a wide range of students, many of whom will be different from the student that you were. You will use techniques to find out who your students are and how to use this knowledge to plan for their learning. You will learn how to diagnose what your students seem to understand (i.e. "where they are at") relative to the learning goals planned for them. You will continually assess what they understand vis-à-vis what you intend for them to learn in all of your interactions. In this way you will know better what they should do next to build the intended understandings and skills. You will be using assessment **FOR** learning much more often than assessment **OF** learning. Although you will not do this immediate, keep this in mind for your upcoming classroom placement.

Working with and learning more about the subject matter…the science
Knowing science content is not enough. Effective teachers must understand science to a depth that allows them to make effective decisions regarding the best ways to introduce students to scientific ideas and to help them construct deep understandings. We will consider what students should learn and why they should learn it. We will explore what is likely to be difficult for our students to understand and why it is challenging. This knowledge will be used to determine effective ways to scaffold our students' understanding. We will examine the nature of science as a subject, including its key conceptions and its language patterns. We will be interested in not only WHAT science says, but also in WHY we are persuaded that it is useful and reliable knowledge. Through this process, you may well find yourself reorganizing your own understanding of what science is and particular conceptions in order to make this knowledge more useful for you as a teacher.

Working with and knowing more about the process of learning
One of the most important ideas that fuels the decisions teachers make is our current understanding of how people learn and remember. As a simple example, if someone believes that people learn best by listening, that person will probably construct plans for teaching that involve the teacher giving information and student paying attention and listening. We will examine various aspects of learning theory from the field of cognitive science and explore the evidence for this theory that has been built over the last thirty-plus years. We will examine the implications for teachers and teaching, which have particular relevance for science learning.

YOUR IN-SCHOOL EXPERIENCES

Teaching does not always mean being "at the front of the room." Similarly, learning to teach does not always mean being "at the front of the room" -- in fact, this summer you may not do much "student teaching" in the traditional sense, yet you will learn a great deal about effective teaching. With several of you in the same classroom, you will practice working alongside students in a way that allows the students to tell you what they know and understand themselves. We want you to find out what they know about the topic at hand, so you can make sound decisions about helping them to build upon their current understandings. We want you to use every opportunity to speak with individual students to discover what prior understanding, experiences, interests, dreams, fears, and social issues they are bringing with them to science class. You will be encouraged to seek their strengths, as well as what they need to gain from science class. In short, we want you to discover who they are as individuals.

Overall, this C & I course seeks to provide you an introduction to the intellectual practice of teaching and these exercises will help you begin this process.

COURSE EXPECTATIONS

In STEP, you are no longer only a student, you are a teacher as well (except this year). This means many things. Among them is the fact that you are now a member of several professional communities--for example, your EDUC

267 community and the community of the school where you will be placed for your fieldwork. As a member of these communities, you take on responsibility not merely for yourself but for your students, their families and community, your mentor(s) and colleagues in your placement, and your STEP colleagues (both your peers and your instructors). The professional responsibility of being a teacher is different from the responsibility of being a student, and we expect you reflect on this responsibility often, letting it shape *(and be shaped by)* your work in your classroom and our classroom and your evolving understanding of what it means to be a teacher.

With these responsibilities come several expectations. We expect you to complete all the coursework in EDUC 267 on time and to the best of your ability. We expect you to make mistakes, and we expect you to work hard to learn from these mistakes. If you have questions or feel confused--perfectly normal experiences for any student--we expect you to contact any of the instructional staff to ask for clarifications or advice. If you find yourself feeling lonely, discouraged, or stressed—again, perfectly normal experiences for a graduate student and for a preservice teacher--we expect you to schedule an appointment with Vaden Health Services to talk to one of the excellent counselors on staff there, as many of us frequently do. Finally, if you have a disability, we expect you to inform us as soon as possible so that we can discuss accommodations with you (and can, if you like, assist you in requesting accommodations for this and future courses through Stanford's Office of Accessible Education).

ASSIGNMENTS

The assignments for this course are designed to bring you closer toward achieving the key understandings and goals outlined above. Indeed, they are the evidence we will use to determine when you have achieved these understandings--in other words, they are an example of the same planning processes we will be teaching and which we want you to use in your own teaching.

One ongoing assignment (which has no assignment number) will be to complete course readings and prepare to teach the big ideas to your peer (see "Ongoing Assignment: Instruct and Analyze" below).

Three of the assignments (#2, 3, and 5) are designed to help you learn the first step of effective planning for instruction: articulating the desired understandings, including not only *what* you want students to understand but *how* that content relates to students themselves, as well as *where* (or in what contexts) that content is situated. You will receive feedback on each of these assignments and will ultimately revise them and incorporate them into the final product for the course. This final product (Assignment #6) is a series of planning documents which will collectively demonstrate your ability to engage in the first *two* steps of effective planning: first, articulating the desired understandings, and second, identifying acceptable evidence to know when students have achieved these understandings. This product will be focused on teaching the concept "osmosis." We believe in the value of collaborative work, take the time to work with peers throughout your planning to share ideas.

The remaining three assignments (#1, 4, and 5) are focused on important aspects of teaching which do not build directly toward the final product but which begin to lay the groundwork for your future coursework in STEP. Assignment #1 will familiarize you with the philosophy and goals of the Science C&I course you will take this summer and during the coming Autumn and Winter. Assignment #4 will be your first foray into reading instruction and classroom group interactions, aspects of teaching which will be central to your Summer *Literacies* course and to your Autumn and Winter *Designing Equitable Groupwork* courses. Assignment #6 is an opportunity to consider not only *what to teach* but *who ought to decide what gets taught*, a consideration which is likely to resurface in STEP courses from the Summer *Equity in Schooling* all the way to your Spring electives.

ASSIGNMENTS

#	ASSIGNMENTS	DUE DATE	ASSESSMENT	% OF GRADE
1	**Response to The Syllabus**	**T. 7/1/25 2:30 PM**	CREDIT/NO CREDIT	**10 %**
2	**20-Second Story***	**WED. 7/2/25 2:30 PM**	CREDIT/NO CREDIT	**15 %**
3	***** Pre-Assessment: Design & Share**	**T. 7/8/25 2:30 PM**	CREDIT/NO CREDIT	**15%**
4	**How do I Know They Know?**	**TH. 7/10/25 2:30 PM**	CREDIT/NO CREDIT	**15%**
5	**How Do They Know They Know?**	**FRI. 7/11/25 2:30 PM**	CREDIT/NO CREDIT	**15 %**
6	**Final Planning Product**	**SAT. 7/12/25 3:00PM**	RUBRIC	**30%**

*** These assignments build towards your final product, Assignment #6.**
***** These assignments will be conducted in your teaching placement with your co-teachers.**

COURSE READING

Students are expected complete *all* of the readings for each course session as indicated in the calendar below. In addition, students are expected to lead an instructional segment on the day's readings once during the summer course for their peers (see description below).

Date	Readings	Assigned Leaders	Leaders Submit Analysis by 2:30 pm on
Wednesday July 3, 2025	Brown, B. A. (2006). "It isn't no slang that can be said about this stuff": Language, identity, and appropriating science discourse. *Journal of Research in Science Teaching*, *43*(1), 96–126. Rincke, K. (2011) It's Rather like learning a Language: Development of talk and conceptual understanding in mechanics lessons. International Journal of Science Education, 33, 2, 229-258.	Bryan + Liz	**Monday** July 7, 2025
Monday July 8, 2025	Wiggin & McTighe (2005) [**Chp. 1**]Understanding by Design. Saddle River, NY: Pearson Press. Bunch, G. C., Shaw, J. M., & Geaney, E. R. (2010). Documenting the language demands of mainstream content-area assessment for English learners: Participant structures, communicative modes and genre in science performance assessments. *Language and Education*, *24*(3), 185–214.	Enasia + Sophie	**Tuesday** July 8, 2025

Tuesday July 9, 2025	Wiggin & McTighe (2005) [**Chp. 2**]Understanding by Design. Saddle River Quinn, H.; Lee, O.; & Valdez (2012) Language Demands and Opportunities in Relation to Next Generation Science Standards for English Language Learners: What Teachers Need to Know (p. 32-44). In Hakuta & Santos (Eds.)Commissioned Papers on Language and Literacy Issues in Common Core State Standards and Next Generation Science Standards. Palo Alto, CA: Stanford University Press	Trish + Sam	**Wednesday** July 9, 2025
Wednesday July 10, 2025	Wiggin & McTighe (2005) [**Chp. 4**]Understanding by Design. Saddle River Osborne, J., Sedlacek, Q. C., Friend, M., & Lemmi, C. (2016). Learning to Read Science. Science Scope, 40(3), 36-42.	Razi + Eric	**Thursday** July 10, 2024
Thursday July 11, 2025	Wiggin & McTighe (2005) [**Chp. 5**]Understanding by Design. Saddle River Bransford, J. (2000) How People Learn (Chp 2.) L Washington, DC: National Academies Press	My	**Thursday** July 10, 2024
Friday July 12, 2025	Wiggin & McTighe (2005) [**Chp. 6 & Chp 7.**] Understanding by Design. Saddle River Wellington, J. & Osborne, J. (2001) Writing for Learning in Science. In *Language and Literacy in Science Education* (pp. 63-81). London, UK: Open University Press.	Nikkie + Cassie	**Friday** July 11, 2024

ONGOING ASSIGNMENT: INSTRUCT AND ANALYZE (NOT- GRADED)

The goal of this activity is for you to gain experience determining a learning goal, designing and leading a learning activity involving discussion, and reflecting on the outcomes of the activity. You will create a 2-4 minute video of you explaining the key ideas the article you read for your classmates.

Instruct
Some of you will work in pairs, some will work individually to design and lead a 2 to 4-minute presentation of the key ideas from your assigned readings. In preparing for instruction, each group should:

- Determine one or more key ideas from each of your assigned readings. What is important to know?
- Determine a goal for understanding for the activity. Given that the segment is short, it will be important to pick a specific and achievable goal that is focused on the key ideas from the reading.
- Design a video that will allow your peers to deepen their understanding of the readings and retain the information.

ASSIGNMENT #1: A WRITTEN RESPONSE TO THE EDUC 267A SYLLABUS

The goal of this assignment is for you to familiarize yourself with the objectives, activities and assignments of this course and to provide feedback to your instructors about anything that might need clarification or modification.

Your assignment is to write a paper of 1 to 2-pages (double-spaced) that responds to the course syllabus and canvas site. You can address *any* of the following questions as well as include other thoughts.

- How does the course compare to what you had expected to do in your first science education course?
- What is your reaction to the course themes? What are you excited about? Is there anything you wish were given more attention?
- Do any expectations need clarification? (Include any practical or logistical questions you might have.)
- Do you have any concerns you would like to express?

ASSIGNMENT #2: A 20-SECOND STORY

The goal of a 20-second story is for you to synthesize the big ideas of a science concept into a one-paragraph narrative that is situated in a context that is of interest to your students.

A 20-second story...

- Presents a science concept in a context that is relevant and important to students.
- Summarizes the science concept in everyday language.
- Includes *some* science terms, but *only* those that you consider most important.
- Ideally, is less than 250 words. By limiting the length, you are forced to decide what is most important for students to know.

Your assignment has three parts:

- Write the text of your 20-second story.
- Create a video of the story and upload it to a video share site *(e.g. YouTube, Vimeo).*
- Invite people (classmates or others) to watch your story and comment on it. Collect at least 10 comments *(Note: the comments do not need to be included in the submission, but they will be used later in class.)*

To submit the assignment, create a document that contains both the text of the story and a link to the video and upload it to Canvas.

ASSIGNMENT # 3: PRE-ASSESSMENT

The goal of conducting a pre-assessment is to garner valuable information about 1) your students as

individuals and 2) what your students already know and the context(s) of this knowledge. Both of these types of information can help you to support your students' learning.

Design
You write a series of question to garner information about:

- Student Background: Who your students are outside of school (including their interests, hopes and accomplishments)
- Content Knowledge: what information your students already know related to the science topic you have chosen for your final assignment (Note: start from the premise that every single child *does, in fact,* have relevant knowledge, and try to phrase questions that can *elicit what knowledge students do have* rather than merely demonstrating what knowledge they do *not* have. Consider local contexts in which students' knowledge may be situated.)

ASSIGNMENT #4: HOW DO I KNOW THEY KNOW?

Create a short formative assessment task. This is an exercise and will not be administered in your classroom. In this task, you will create an opportunity for your students to share what they know in a small group setting. This task will place students in small groups of 3, where all students will be required to share their original understanding of the concept, assess what their partners know, and have an opportunity to change their answer. Each student will share the answer with you as the teacher. Make this lesson as fun as it is informative. Create the directions for the task in a 1 slide Google doc/ PowerPoint and create a handout for the task. Both the directions and the handout will be submitted using canvas.

ASSIGNMENT #5: HOW DO THEY KNOW THEY KNOW?

Create a short summative assessment task that students will use to identify if they know what they are learning. The task cannot take more than 15 minutes. As you design the task ensure that every student explains (written/oral) what they know and what they are not clear about. Create an opportunity for other students to support each other. Try to make this task as fun and as efficient as possible. Create a Create the directions for the task in a 1 slide Google doc/ PowerPoint and create a handout for the task. Both the directions and the handout will be submitted using canvas.

ASSIGNMENT #6 FINAL PRODUCT OF THE COURSE:

The goal of this assignment is for you to complete the first two parts of a backward design process as described in *Understanding by Design*--first, articulating the desired results (key understandings, big ideas, etc.), and second, deciding what constitutes appropriate evidence of those desired results.

You may complete this backward design process related to any concept that you choose, although we request that you identify a concept that both you and at least one your classmates expect to teach in the future (multiple perspectives will lead to a more nuanced understanding of such topics and will better prepare you for your future teaching). In the past, we have had the entire class use "osmosis," "mitosis," or both as topics for the final product. Osmosis, in particular, is connected to all three of the

major secondary sciences: biology, chemistry, and physics.

We will be using the principles of "Backward Planning" as described in *Understanding by Design*, the course text. This final product, then, is the start of a template you will use to develop lesson plans and unit plans in the future.

You will work on drafts of the pieces of this assignment in class, with many opportunities for one-on-one assistance and support from the course instructors**.** The pieces of the plan that you make will grow and develop into a final version as you act on feedback from us and incorporate your own evolving understanding(s) of the topic.

Note: We expect and intend you to come and talk to us about the assignment, and we also expect that you will need to REVISE your work from feedback that you receive from us as the course goes along. We hold both these expectations if you are to push and promote your own progress in becoming a teacher. These expectations, then, are to support you in that progress.

PART 1: ARTICULATING THE DESIRED RESULTS (I.E., WHAT YOU WANT YOUR STUDENTS TO COME TO UNDERSTAND)

To structure what you want the students to come to understand about your topic, you will create 5 texts, 3 of which should be revised versions of documents you created for assignments #2, 3, and 5 earlier in the course:

1. An analysis of the **results** from your use **of a pre-assessment probe (Assignment #3).** *Even if the results are not about content, you can use information about their interests and background to plan a better lesson.*

2. The **Rationales** for teaching this topic and why high school students might want to learn it.

3. A written **"20 second story"** about the concept you selected **(Assignment #2).**

4. A written **Science Statement.**

5. Your **Goals for Understanding** written in both scientific vocabulary and ordinary, everyday language. These goals will be a set of small paragraphs that represent an unfolding of understanding about your topic. These paragraphs should discuss the results of the pre-assessment are addressed, and include some arguments from evidence that support why we trust the scientific explanation(s) for some real-world phenomenon.

Details about each of these components of the plan are provided in the final product rubric, available on Canvas.

PART 2: DECIDING WHAT CONSTITUTES APPROPRIATE EVIDENCE (I.E. HOW STUDENTS WOULD DEMONSTRATE THEIR UNDERSTANDING)

To decide what students will do to demonstrate and articulate that they have, in fact, built the understanding(s) you intended, you will create two more documents:

6. A **summative assessment task** that students would do, in class, to demonstrate and articulate their understandings of what you intended for them. (Note: You do not actually have to *use* this assessment task during the summer, merely *create* it.)

7. A **rubric** for assessing the evidence of understanding provided by the completion of that summative assessment task.

GRADE: This project earns 30% of the quarter's grade. A 7-item rubric is provided on Canvas, with the expectation and intention that you will reach levels 2 or 3 on each item. 30% means that your work reached that level of achievement.

Course Calendar

JUNE/ JULY

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
30 **C& I Session 1**	1 **C& I Session 2**	2 **C& I Session3**	3 **No Class Holiday**	4 **No Class Holiday**
7 **C& I Session 4**	8 **C& I Session 5**	9 **C& I Session 6**	10 **C& I Session 7**	11 **C& I Session 8**

Course Readings:

Wiggin & McTighe (2005) Understanding by Design. New York, NY: Saddle River Press

Bunch, G. C., Shaw, J. M., & Geaney, E. R. (2010). Documenting the language demands of mainstream content-area assessment for English learners: Participant structures, communicative modes and genre in science performance assessments. *Language and Education*, *24*(3), 185–214.

Bransford, J. (2000) How People Learn (Chp 2.) L Washington, DC: National Academies Press

Brown, B. A. (2006). "It isn't no slang that can be said about this stuff": Language, identity, and appropriating science discourse. *Journal of Research in Science Teaching*, *43*(1), 96–126.

Osborne, J., Sedlacek, Q. C., Friend, M., & Lemmi, C. (2016). Learning to Read Science. Science Scope, 40(3), 36-42.

Quinn, H.; Lee, O.; & Valdez (2012) Language Demands and Opportunities in Relation to Next Generation Science Standards for English Language Learners: What Teachers Need to Know (p. 32-44). In Hakuta & Santos (Eds.)Commissioned Papers on Language and Literacy Issues in Common Core State Standards and Next Generation Science Standards. Palo Alto, CA: Stanford University Press

Rincke, K. (2011) It's Rather like learning a Language: Development of talk and conceptual understanding in mechanics lessons. International Journal of Science Education, 33, 2, 229-258.

Wellington, J. & Osborne, J. (2001) Writing for Learning in Science. In *Language and Literacy in Science Education* (pp. 63-81). London, UK: Open University Press.