

*Erin Spring***EDUC 460.17: Specialization I, Secondary Science
Winter, 2025**

I would like to take this opportunity to acknowledge the traditional territories of the people of the Treaty 7 region in Southern Alberta. The City of Calgary is also home to the Métis Nation of Alberta (Districts 5 and 6).

Start date: January 13, 2025

Last Day of Classes: March 14, 2025

Term Break: February 16-22, 2025

Last Day to Add/Drop/Swap: Due to the non-standard dates associated with this program, please check your Student Centre for the important dates pertaining to your section.

Pre-requisite: Due to the multiple pathways in the Bachelor of Education, please consult Undergraduate Programs in Education for questions related to pre-requisite courses.

Office Hours: Available after class or by appointment.

Email: Students are required to use a University of Calgary (@ucalgary.ca) email address for all correspondence.

COURSE DESCRIPTION:

The intent of the Specialization I Seminar is to introduce students to the concepts, theory, and design planning related to teaching within the specialization of Science. Theory as connected to an understanding of practical classroom experiences will particularly inform the course curriculum and will be explored through course readings, analysis of teaching/learning artifacts, and through the design of discipline-based learning and assessment plans. Topics in teaching and learning will include teaching inclusively and addressing the needs of diverse learners, effective integration of technology, and discipline-based inquiry. Assignments will present the opportunity for students to develop an understanding of short-term instructional designs and to begin to examine curriculum shifts in the province.

LEARNER OUTCOMES: Students will be knowledgeable about:

- 1) Developing a foundational understanding of the nature of discourse in the discipline, as related to teaching and learning, including specialized language, concepts, and terminology.
- 2) Understanding teacher as designer of learning and assessment plans and use of the resources available for designing learning and assessment.
- 3) Exploring and applying introductory theory related to the teaching of the discipline with an emphasis on designing discipline-based tasks and assessment processes and creating an adaptive classroom learning environment to better meet the needs of today's diverse learners.
- 4) Successfully designing short-term learning and assessment plans to deepen understanding of key ideas/concepts within the discipline.

COURSE DESIGN AND DELIVERY:

This course will be delivered face-to-face on campus with a D2L site which contains required readings and other relevant class resources and materials (see d2l.ucalgary.ca). This course is delivered through a problem-based and inquiry-focused approach. Student participation is crucial to the knowledge building in this course. While there are readings, they do not “contain” the knowledge of this course. Your learning will be primarily through applying concepts from the readings while you experience, design, and critique science learning activities. Students are expected to participate in whole-class and small-group discussions conversation and Desire2Learn (D2L) discussion forums that will include postings and responses in small-groups. Assessment is based on rubrics for the three Learning Tasks. For most class activities, you will need a device with reliable internet connectivity to access D2L, the library website, YouTube, etc.

LEARNING TASKS OVERVIEW:

The full assignment descriptions and assessment details will be discussed in class and posted to D2L. The descriptions in this syllabus should be treated as summaries or overviews, not the full and complete assignment requirements.

LEARNING TASK	DESCRIPTION OF LEARNING TASK	PERCENTAGE OF FINAL GRADE	GROUPING FOR TASK	DUE DATE
LT1	Inquiry into the Teaching of Science: Presentation	30%	Pairs	Friday, Jan. 31, 2:00 pm
LT2	Creation of Short-term Learning and Assessment Plan	45%	Individual	Mar. 10 (draft) Mar 14 (final copy)
LT3	Evolving Understanding of the Teaching of Science	25%	Individual	Friday, Mar. 14

Note: A and A+ are both worth 4.0. A+ is given at the instructor’s professional discretion based on work of rare and exemplary quality.

AI-generated text

Students are expected to create their own content for all assignments and writing should be of their own work. AI-generated text is permitted as long as the text is appropriately cited with respect to which program generated the text and how the text was generated (e.g., keyword prompts) with a reference list using APA 7 format and appendix with full transcript.

Reference

OpenAI. (2023). *ChatGPT* (Sept 22 version) [Large language model].
<https://chat.openai.com/chat>

Readings

Reading protocols will be discussed during our first class.

The Leganto lists for these readings can be found in D2L under “My Tools”.

Furthermore, here is the link:

https://ucalgary.alma.exlibrisgroup.com/leganto/public/01UCALG_INST/lists/23955466170004336?auth=SAML

WEEKLY COURSE SCHEDULE:

Dates	Topics/Themes	Readings and Assignments
Week 1	<p>Essential Question (EQ): What are the goals of EDUC 460?</p> <ul style="list-style-type: none"> • EDUC 460 Course Outline review – LT1, LT2, and LT3 • LT1: Partner Selection & Topic selection (D2L) • LT2: Chapter selection (D2L) <p>What does Alberta Education deem as curriculum?</p> <p>Intro to LT1, workshop format, & 5Es.</p> <p>Intro to LT3</p> <p>Intro to LT2 & chapter selection (<i>whole/part/whole</i>)</p> <p>In class time to work on LT1: refine your question.</p>	<p>Review <i>Front Matter</i> of the Science Programs of Study (PoS) <i>that supports your grade of interest either</i> gd. 7 – 8: p.1 – 10 or any of the gd. 10 – 12 courses: p. 1 – 12.</p> <ul style="list-style-type: none"> • Alberta Education, (nd). Programs of Study. https://www.alberta.ca/programs-of-study.aspx <p>Assigned readings for Weeks 2 to 7</p> <p>Reference for LT1: Bybee, et al., (2006). The BSCS 5E Instructional Model: Origins, Effectiveness, and Applications. BSCS, 1–19. https://media.bsces.org/bscesmw/5es/bsces_5e_executive_summary.pdf</p> <p>Assigned Chapter for LT2 see schedule in D2L: Wiggins, G. J. & McTighe, J. (2005). Understanding by design (2nd Edition) https://ebookcentral-proquest-com.ezproxy.lib.ucalgary.ca/lib/ucalgary-ebooks/detail.action?docID=3002118</p>
Week 2	<p>EQ:</p> <ul style="list-style-type: none"> • What are the goals of science teaching; “Learning science, learning about science, and doing science”? • What does it mean to be a teacher of science? • What is your understanding of scientific reasoning and inquiry? <p>LT2: Stage 1. Identify Desired Results (foundational knowledge, attitudes & skills).</p> <p>In class time to work on LT1</p>	<p>Readings for LT3</p> <p>Feynman, R. P. (1969). What is science? The Physics Teacher, 7(6), 313-320. https://aapt-scitation-org.ezproxy.lib.ucalgary.ca/doi/10.1119/1.2351388</p> <p>Rennie, L. (2005). Science awareness and scientific literacy. https://espace.curtin.edu.au/handle/20.500.11937/31481</p> <p>https://ezproxy.lib.ucalgary.ca/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=ehh&AN=18133950&site=ehost-live</p>

Week 3	<p>EQ:</p> <ul style="list-style-type: none"> • What does it mean to facilitate and support a “constructivist classroom”? • Who are the learners? • Design thinking & Big Ideas • The “Instructional Core” • What does it mean to be a “designer” of learning? <p>In class time to work on LT1 & LT2, Stage 1</p> <p>LT#1: Workshops: schedule posted in D2L</p>	<p>Readings for LT3:</p> <p>Aikenhead, G.S., Orpwood, G., & Fensham, P. (2011). Scientific literacy for a knowledge society. In C. Linder, L. Ostman, D.A. Roberts, P-O. Wickman, G. Erickson, & A. MacKinnon (Eds.), Exploring the landscape of scientific literacy (28-44). New York: Routledge, Taylor and Francis Group. **E-book UofC Library</p> <p>https://ebookcentral-proquest-com.ezproxy.lib.ucalgary.ca/lib/ucalgary-ebooks/reader.action?docID=592911&ppg=39</p> <p>https://www-taylorfrancis-com.ezproxy.lib.ucalgary.ca/chapters/edit/10.4324/9780203843284-9/scientific-literacy-knowledge-society-glen-aikenhead-graham-orpwood</p> <p>Driver, et al., (1994). Constructing Scientific Knowledge in the Classroom. <i>Educational Researcher</i> p. 5-12. https://journals-sagepub-com.ezproxy.lib.ucalgary.ca/doi/abs/10.3102/0013189X023007005</p> <p>https://www-jstor-org.ezproxy.lib.ucalgary.ca/stable/1176933</p> <p>Reading for LT2:</p> <p>Harlen, W. (Ed.) (2010). <i>Principles and big ideas of science education</i>. p.21-23</p> <p>https://www.ase.org.uk/bigideas</p> <p>LT#1 Due: Friday, 2:00 pm</p> <p>LT#1: Workshops</p>
Week 4	<p>EQ: What does it mean to be a “designer” of learning?</p> <p>In class time to work on LT2, Stage 1</p>	<p>LT#1: Workshops</p>
Week 5	<p>EQ: What will you accept as evidence that student understanding took place?</p> <p>Stage 2. Determine what constitutes acceptable evidence of competency in the outcomes and results (assessment).</p> <p>In class time to work on LT2, Stage 2</p>	<p>LT#1: Workshops</p> <p>Reading for LT2:</p> <p>Clinchot, M., Ngai, C., Huie, R., Talanquer, V., Lambertz, J., Banks, G., ... & Sevian, H. (2017). Better formative assessment. <i>The Science Teacher</i>, 84(3), 69-75.</p> <p>https://ezproxy.lib.ucalgary.ca/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=sch&AN=121366392&site=ehost-live</p> <p>https://link.gale.com/apps/doc/A494100270/ItoF?u=ucalgary&sid=bookmark-ItoF&xid=d3716fae</p>

		<p>Crumrine, T., & Demers, C. (2007). Formative Assessment: Redirecting the Plan. <i>Science Teacher</i>, 74(6), 28-32. https://ezproxy.lib.ucalgary.ca/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=sch&AN=26377643&site=ehost-live</p> <p>https://link.gale.com/apps/doc/A169164630/AONE?u=ucalgary&sid=bookmark-AONE&xid=4b6ee11c</p> <p>Fowler, K., Windschitl, M., & Richards, J. (2019). Exit Tickets. <i>The Science Teacher</i>, 86(8), 18-26. https://ezproxy.lib.ucalgary.ca/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=sch&AN=135589034&site=ehost-live</p> <p>https://link.gale.com/apps/doc/A581990226/AONE?u=ucalgary&sid=bookmark-AONE&xid=93da2a16</p> <p>Resources for LT2: Alberta Education. (2017). Competencies: Descriptions and indicators. https://education.alberta.ca/competencies/descriptions-indicators/</p>
Week 6	<p>EQ: How do you shift the responsibility of learning from the teacher to the students?</p> <p>Stage 3: Plan the Learning Experience and Instruction</p> <p>In class time to work on LT2, Stage 3</p>	<p>LT#1: Workshops</p> <p>Friesen, S. (2009). What did you do in school today? Teaching Effectiveness: A Framework and Rubric. Canadian Education Association. http://www.galileo.org/cea-2009-wdydist-teaching.pdf</p>
Reading Week		
Week 7	<p>EQ: What does it mean to be a teacher of diversity?</p> <p>Stage 4: Learner differentiation</p> <p>In class time to work on LT2, Stage 4</p>	<p>LT#1: Workshops</p> <p>Readings for LT2: Alberta Education. (2010). <i>Making a difference: Meeting diverse learning needs with differentiated instruction</i>: Chapter 13 (Science) http://education.alberta.ca/media/1234045/makingadifference_2010.pdf</p> <p>Alberta Education. (nd). Benchmarks, strategies and resources for teachers of English language learners. http://www.learnalberta.ca/content/eslapb/</p>
Week 8	<p>EQ: What does it mean to be a reflective practitioner?</p> <p>Peer review of LT2 (Monday)</p>	<p>LT#1: Workshops</p> <p>LT#2:</p> <ul style="list-style-type: none"> • Draft due: Monday, March 3 (final peer review). • Final submission due: Friday, March 7 <p>LT#3: Due Friday, March 7</p>

CHANGES TO SCHEDULE:

Please note that changes to the schedule and readings may occur to meet the emerging needs and dynamics of the participants in the course.

LEARNING TASKS AND ASSESSMENT**LT1: Inquiry into the Teaching of Science Presentation (Group – pairs)**

Due Date: Friday, January 31 @ 2:00 pm

Percentage of the Final Grade: 30%

Length: 45 minutes (30 min interactive workshop, 15 min. Q & A)

“A multitude of countries are interested in improving K-12 science education for the purposes of producing a scientifically literate citizenry and increasing student interest in science-oriented careers” (Witzig & Sickel, 2017, p. 1). EQs: What does it mean to be scientifically literate in today’s world? Why is this important? What is the role of teachers of science in this endeavor?

Intent of LT1: The goal of this assignment is to further familiarize yourself with the Nature of Science (NOS) and to introduce the opportunities and challenges that science teachers face in translating curriculum documents, including the philosophy and rationale of the Programs of Study, into engaging instruction that leads to student understanding and development of related knowledge, skills, and attributes.

The intent of this learning task is for you to foster a professional conversation focused on pedagogical content knowledge within science education. You will develop and present an inquiry topic based on a key question to be explored within the teaching of science. Your questions should connect to class discussions, suggested readings, and the development of your lesson plan (LT 2).

During the course, you will present your work as a 45-minute Professional Development workshop for teachers, framed within the 5 E’s Instructional Model. The 5 E’s Instructional Model is based on the constructivist approach to learning and provides a model for how this strategy can be implemented for authentic, design-based, and inquiry-focused learning experiences. Each of the 5 E's describes a phase of learning: Engage, Explore, Explain, Elaborate, and Evaluate. Please refer to: <https://lesley.edu/article/empowering-students-the-5e-model-explained>

Your presentation should focus on how these “understandings” will influence our science specific pedagogical content practice.

The topics/questions and further explanations will be presented to you in our first class.

Requirements:

- Specifics for presentation format: *consider how to best present your work to your colleagues (new teachers) as a professional learning experience.*
- List of resources/references used in the project. This must be presented in APA 7 citation format.
- A digital folder illustrating the evidence/support for your findings. Any workshop materials (i.e., handouts, slide presentations, etc.) should be included in the digital file. You can create these and/or share existing links or examples (where copyright permits). These must be placed in both *Discussions* and *Assignments* in D2L.
- In-class ‘workshop’ session that includes:
 - The personal and professional significance of the inquiry.

- How the inquiry fits into our collaborative knowledge building related to science teaching and learning.
- How the ideas generated from the inquiry may be achieved in planning, instruction, and student assessment with practical examples.
- The implications for us as new teachers in developing our philosophical stance, professional identity, and practice.

CRITERIA FOR ASSESSMENT OF LEARNING TASK 1

Criteria	A to A+ Meets all and exceeds some requirements	A- to B+ Meets all requirements	B to B- Meets most requirements.
Quality & Meaningfulness of Research Question			
Rationale: What and Why do you want to know "this" with respect to informing pedagogical practice?	Clearly articulates the importance of the topic in informing pedagogical practice. Provides thorough reasoning for why understanding "this" is crucial for teaching the discipline effectively. Demonstrates deep understanding of the connections between the topic and pedagogy.	Provides adequate explanation of the importance of the topic in informing pedagogical practice. Offers some reasoning for why understanding "this" is relevant to teaching the discipline. Shows some understanding of the connections between theory and practice.	Explanation of the importance of the topic in informing pedagogical practice is unclear or lacking. Limited reasoning provided for why understanding "this" is relevant to teaching the discipline. Weak connections between theory and practice are evident.
How will this presentation make a difference to our teaching of science?	The workshop content is highly relevant to participants' professional needs and provides in-depth coverage of the topic. Direct links are made to how new knowledge in this area will support teaching in the service of learning.	The workshop content aligns well with participants' needs and offers a solid level of depth. Links are made to how new knowledge in this area will support teaching in the service of learning.	The workshop content is somewhat relevant to participants' needs and lacks depth in certain areas. Few or no links are made to how this question will support teaching in the service of learning.
Critique & Critical Analysis			
What are the connections between theory and practical situation?	Effectively applies theoretical concepts to real-world teaching scenarios. Demonstrates how theories guide decision-making and instructional practices Cites all academic content obtained from other sources. APA 7 citation style is accurate.	Applies theoretical concepts to practical settings with some effectiveness. Demonstrates an understanding of how theories can inform teaching practices. Cites most content obtained from other sources. APA 7 citation style is accurate.	Application of theoretical concepts in practical settings is limited or ineffective. Fails to demonstrate a clear understanding of how theories translate into actionable strategies for teaching. Citations do not employ APA 7 citation style.
Overall Presentation of Findings			
How effective is the creation and development of conceptual ideas in contributing to our pedagogical content knowledge?	Facilitates the careful and critical development of conceptual ideas, ensuring participants grasp fundamental concepts and their implications for pedagogical practice. Offers clear explanations, examples, and opportunities for discussion to support participants' comprehension and application of pedagogical information, concepts and skills. Effectively integrates the 5Es model in presenting the conceptual idea.	Supports the development of conceptual understanding to some extent. Provides explanations and examples but may lack clarity or coherence in facilitating participants' comprehension and application of pedagogical information. Integrates the 5Es model in presenting the conceptual idea with some effectiveness.	Development of conceptual understanding is limited or ineffective. Explanations and examples are unclear or insufficient, hindering participants' comprehension and application of pedagogical information. Limited or ineffective use of the 5Es model in presenting the conceptual idea.

LT2: Designing an Annotated Discipline-based Learning and Assessment Plan
(Individual submission – work in pairs/triads to develop sequential lessons)

Due Date: Monday, March 10, 2:00 pm (for peer editing), Final submission: Friday, March 14

Percentage of the Final Grade: 45%

Intent of LT2: The intent of LT2 is to design and annotate a short-term learning and assessment plan.

Expectations of LT3:

- You may work collaboratively on a series of sequential lessons (pairs/triads) but must submit individual learning plans. Each student will design a short-term learning and assessment plan. The plan will be comprised of ONE lesson plan for:
 - an 80-minute class for grade 10 -12
 - a 60-minute class for grade 7 – 9
 - a 30 - 40-minute class for K- 6
- The learning plan must follow a clear and comprehensive **design for learning focused template** that promotes deep understandings of a key concept or competency of your discipline. Using the rubric on the next page, as a guide, your plan must include the 10 aspects of McTighe and Wiggins' framework.
- You will record/annotate (making your thinking visible), using **mark-ups** on the lesson design, the reasons for the choices you have made including: (i) how this reflects a design approach (UbD), (ii) how this lesson plan fits into the broader context of a unit, (iii) the intended pedagogical content knowledge choices you have made. **Use the following resources and rubric to guide your annotation.**

Resources:

Alberta Assessment Consortium: <https://aac.ab.ca/> Username: U of C email

Doucette Library – Library guide for lesson planning:
http://libguides.ucalgary.ca/lesson_planning_resources

Wiggins, G. J. & McTighe, J. (2005). Understanding by design (2nd Edition) <https://ebookcentral-proquest-com.ezproxy.lib.ucalgary.ca/lib/ucalgary-ebooks/detail.action?docID=3002118>

CRITERIA FOR ASSESSMENT OF LEARNING TASK 2

Criteria	A+ to A Meets all and exceeds some requirements	A- to B+ Meets all requirements	B to B- Meets most requirements
For each of the criteria below, your annotation will be part of the assessment. You must clearly state why/how this point in the plan reflects the criteria's critical element within the design approach (reference UbD).			
Making your thinking visible: Why are you doing what you are doing?	Annotations display a sophisticated and elegant understanding and analysis of the role of planning in lesson design.	Annotations display a competent understanding, if not analysis, of the role of planning in lesson design.	Annotations display some understanding of the role of planning in lesson design but lacks analysis.
Stage 1 - Lesson Rationale: To what extent does the design focus on building understanding of targeted content based on an Alberta Education Program of Studies?			
Alignment with Big Ideas and Enduring Understandings	The lesson plan demonstrates a clear alignment with the overarching unit's general outcome and the enduring understanding is well-developed and deeply integrated throughout the plan.	The lesson plan shows alignment with the overarching unit's general outcome and the enduring understanding is evident, although some connections may require further development or clarification.	The lesson plan exhibits limited alignment with the overarching unit's general outcome and the enduring understanding is inconsistently integrated, indicating a need for stronger connections and more explicit integration.
Targeted Understanding: Clarity of Learning Goals and Specific Outcomes	Specific learning outcome is clearly stated, aligned with a Program of Study (PoS) and reflects important knowledge, skills and attitudes along with the unit emphasis (NoS, ST, STS, STSE).	Specific learning outcomes is generally clear and aligned with standards but may lack specificity in some areas.	Specific learning outcomes is somewhat unclear or not fully aligned with standards, making it difficult to determine what students should know, understand, and be able to do.
Framing of targeted understandings by essential questions	The essential question(s) foster genuine inquiry and critical thinking, deeply aligning with the targeted understanding. The question(s) effectively frame key concepts, encouraging students to explore complex relationships within the content and apply their understanding to new challenges.	Essential question(s) demonstrate alignment with the targeted understanding, yet lack depth or clarity, and while they generally frame key concepts and encourage exploration, they do not consistently promote deep exploration or effectively prompt application to new challenges.	Essential question(s) is somewhat aligned with the targeted understanding but potentially has limited effectiveness in fostering inquiry and critical thinking, providing limited framing of key concepts and fail to effectively encourage exploration or application to new challenges.
Misconceptions	Misconceptions are relevant and targeted within the lesson.	Some misconceptions are identified and somewhat targeted.	Some misconceptions are identified, but not targeted.
Stage 2 - Assessment Evidence: To what extent do the assessments provide fair, valid, reliable, and sufficient measures of the desired results?			
Balanced Assessment	Balanced assessment is integral to the learning and woven into the fabric of teaching and learning. Appropriate criterion-based scoring tools are used to evaluate student products and performances.	Balanced assessment is used on a regular basis and is part of the teaching and learning. Some criterion-based scoring tools are used to evaluate student products and performances.	Assessment is primarily summative with limited or irregular use of formative assessment to improve teaching and learning.

Alignment of Learning Outcome with Assessment Criteria	Criteria align closely with stated learning outcome for the lesson. They reflect the specific knowledge or skills that students are expected to demonstrate as a result of the lesson.	Criteria generally align with learning outcome but may lack some specificity or alignment in certain areas.	Criteria shows limited alignment with learning outcome and hinders their effectiveness in guiding student learning.
Transparency and Student Involvement	Criteria are transparently communicated to students, ensuring they understand how their performance will be assessed and what factors will be considered in evaluation.	Criteria are communicated to students, but transparency or student involvement may vary.	Criteria are poorly communicated to students, leading to confusion or misunderstanding about assessment expectations.
Self and Peer Assessment	Students have numerous and appropriate opportunities to actively engage in both self-assessment and peer-assessment with clear understanding of assessment criteria and opportunity to provide thoughtful feedback.	Students have some opportunities to participate in self-assessment and peer-assessment.	Students' participation in self-assessment and peer-assessment is limited.
Stage 3: To what extent is the learning plan effective and engaging?			
Alignment with 5Es Cognitive Learning Model	The design exhibits a comprehensive alignment with the 5Es model, seamlessly integrating all five phases in a sequential and coherent fashion, ensuring each phase is clearly defined and purposefully integrated to furnish students with a structured and meaningful learning experience conducive to fostering deep understanding.	The design employs the 5Es cognitive learning model, integrating the majority of its five phases cohesively, though with minor inconsistencies or gaps, overall providing students with opportunities for engaging in exploratory activities, cultivating conceptual understanding, and applying their learning meaningfully.	The design partially incorporates the 5Es cognitive learning model, integrating some aspects while lacking coherence or consistency in implementation, potentially leading to notable omissions or deficiencies in certain phases, thus resulting in a fragmented learning experience for students.
Design Is Informed by Pedagogical Content Knowledge	The design demonstrates a sophisticated integration of science content knowledge (including scientific concepts, principles, theories, and models) and pedagogical expertise (such as inquiry-based learning strategies, hands-on activities, and real-world applications), creating meaningful learning experiences.	While there is room for deeper integration of subject matter knowledge and pedagogical practices to enhance the design, lessons demonstrate a good understanding of effective Science teaching, showing potential to facilitate student learning and engagement in the subject.	The design demonstrates minimal content and pedagogical expertise in science, lacking an in-depth understanding of the intricacies of teaching the subject.
Work Fosters Deep Understanding	Lesson consistently facilitates deep understanding of the content by encouraging students to make connections, analyze information critically, and apply concepts in diverse contexts.	Lesson generally prioritizes deep understanding over surface-level knowledge acquisition.	Lesson predominantly focuses on surface-level knowledge acquisition, with activities that emphasize acquiring information, facts, and formulas.

Authenticity of Tasks	The learning tasks closely resemble real-world scientific practices, requiring students to apply scientific knowledge and skills in a meaningful context, aligning with authentic scientific inquiry, problem-solving, critical thinking, and scientific reasoning.	The learning tasks reflect elements of real-world scientific practices, providing students with opportunities to apply scientific knowledge and skills in a relevant context, with limited opportunity to engage in inquiry, problem-solving, critical thinking and scientific reasoning.	The learning tasks lack authenticity, failing to resemble real-world scientific practices or provide meaningful context for students' learning, relying too heavily on rote memorization or procedural tasks, limiting students' opportunities for meaningful engagement with scientific inquiry.
Differentiated Instruction	The design incorporates a diverse range of tasks and activities that cater to multiple learning styles, interests, and readiness levels. Tasks are appropriately scaffolded to support learners at different skill levels, ensuring that all students are appropriately challenged and supported.	The design includes differentiated tasks and activities that address different learning styles, interests, and readiness levels to a satisfactory extent.	Differentiation of tasks and activities is limited or lacking in the design. There is little evidence of intentional efforts to address diverse learner needs, and instruction may primarily follow a one-size-fits-all approach.
Stage 4: Alignment			
Alignment with UbD Principles	Learning experiences are aligned with UbD principles, emphasizing essential questions, inquiry-based learning, and authentic tasks that promote deep understanding.	Learning experiences mostly align with UbD principles but may lack coherence or consistency in their implementation.	Learning experiences have some alignment with UbD principles, but fail to consistently incorporate essential questions, inquiry, or authentic tasks.

LT3: Evolving Understanding of the Teaching of Science (Individual)

Due Date: Friday, March 14

Percentage of the Final Grade: 25%

Format: For this assignment you will respond to the questions below as way of reflecting thoughtfully on the contexts and challenges within science education today. Your response may take several forms. It could be a conventional academic essay, an imagined Socratic dialogue between a teacher and student, an illustrated story, an animation, a short video or a podcast. Length: 700 words, 5 minutes.

Intent of LT3: The purpose of the assignment is to provide a response to the following question: *How is your conceptualization of teaching Science changing, being modified, or reinforced throughout the course?* Your response will be in the form of a self-reflection, writing from a personal perspective that allows you to connect directly with course material, other course and personal experience in learning science.

CRITERIA FOR ASSESSMENT OF LEARNING TASK 3

Criteria	A to A+ Meets all and exceeds some requirements	B+ to A- Meets all requirements	B- to B Meets most requirements
Clarity and Insightfulness	The response articulates a clear, insightful and coherent understanding of teaching science. Insights are communicated with precision and clarity, offering a clear perspectives and thoughtful analysis. The response effectively addresses the complexities and challenges associated with teaching science.	The response demonstrates a solid understanding of teaching science with insights that are generally clear, insightful, and coherent. Occasional lapses in clarity or depth of analysis.	The response offers a limited understanding of teaching science with insights that lack clarity or coherence and inconsistencies in the explanation, resulting in a somewhat fragmented understanding of the topic.
Uses of specific, concrete examples to explain and illustrate insights (evidence)	The response effectively uses specific, concrete examples to explain and illustrate insights, providing relevant and compelling evidence to support key points.	The response incorporates some specific examples to support insights, offering evidence to strengthen key points.	The response includes limited examples to support insights, with evidence that may lack relevance or insufficiently developed.
Organization and Structure	The response is well-organized, with a clear and logical structure for communicating insights. Ideas are presented in a coherent and systematic manner. The response flows smoothly from one point to the next, enhancing the readability/viewing.	The response demonstrates adequate organization and structure for communicating insights. While there may be some minor disruptions in flow or organization, overall, the response presents ideas in a reasonably clear and coherent manner, allowing readers/viewers to follow the argument effectively.	The response lacks organization or structure, making it difficult for readers/viewers to follow the flow of ideas. There may be inconsistencies or abrupt transitions between points, hindering the overall coherence and effectiveness of the response.

THE EXPECTATION OF EXCELLENCE IN PROFESSIONAL WORK

Please review the Academic Calendar carefully. It describes the program and provides detailed schedules and important dates. It contains information on expectations for student work and professional conduct. In addition, procedures are described regarding concern about student performance in the program. Please pay especially careful attention to details and descriptions in the following topic areas:

- *The Importance of Attendance and Participation in Every Class*

As this is a professional program, experiences are designed with the expectation that all members will be fully involved in all classes and in all coursework experiences. As you are a member of a learning community your contribution is vital and highly valued, just as it will be when you take on the professional responsibilities of being a teacher. We expect that you will not be absent from class with the exception of documented instances of personal or family illness or for religious requirements.

- *Engagement in Class Discussion and Inquiry*

Another reason for the importance of attendance and participation in every class is that the course involves working with fellow students to share ideas and thinking. For example, each class you will work with a small group to engage fellow students in discussions on work being considered in class. You will also help other groups by providing ideas for scholarly inquiry in assignments. If you find that you are experiencing difficulties as a group collaborating, please inform the instructor.

EXPECTATIONS FOR WRITING

All written assignments (including, to a lesser extent, written exam responses) will be assessed at least partly on writing skills. Writing skills include not only surface correctness (grammar, punctuation, sentence structure, etc.) but also general clarity and organization. Sources used in research papers must be properly documented. If you need help with your writing, you may use the writing support services in the Learning Commons. For further information, please refer to the official online University of Calgary Calendar, Academic Regulations, E. Course Information, E.2: Writing Across the Curriculum:
<http://www.ucalgary.ca/pubs/calendar/current/e-2.html>

MISSING OR LATE SUBMISSIONS

All late submissions of assignments must be discussed with the instructor **prior to the due date**. A deferral of up to 30 days may be granted at the discretion of the Associate Dean of Undergraduate Programs prior to the end of the course with accompanying written evidence. Instructors can add penalties for late assignments here. <https://calendar.ucalgary.ca/pages/jyekfh6xwhoHwxcetCil>

ISSUES WITH GROUP TASKS

With respect to group work, if your group is having difficulty collaborating effectively, please contact the instructor immediately. If a group is unable to collaborate effectively or discuss course materials online in a timely manner, the instructor may re-assign members to different groups or assign individual work for completion.

GRADING: <https://calendar.ucalgary.ca/pages/fc4adb8643f84441ab32300237b80df1>

Grade	GPA Value	%	Description per U of C Calendar
A+	4.0	95-100	Outstanding
A	4.0	90-94	Excellent – Superior performance showing comprehensive understanding of the subject matter
A-	3.7	85-89	
B+	3.3	80-84	
B	3.0	75-79	Good - clearly above average performance with knowledge of subject matter generally complete
B-	2.7	70-74	
C+	2.3	65-69	
C	2.0	60-64	Satisfactory - basic understanding of the subject matter
C-	1.7	55-59	
D+	1.3	52-54	Minimal pass - Marginal performance
D	1.0	50-51	
F	0.0	49 and lower	Fail - Unsatisfactory performance

Academic Misconduct

Academic Misconduct refers to student behavior which compromises proper assessment of a student's academic activities and includes cheating; fabrication; falsification; plagiarism; unauthorized assistance; failure to comply with an instructor's expectations regarding conduct required of students completing academic assessments in their courses; and failure to comply with exam regulations applied by the Registrar.

For information on the Student Academic Misconduct Policy and Procedure please visit:

<https://www.ucalgary.ca/legal-services/university-policies-procedures/student-academic-misconduct-policy>

<https://www.ucalgary.ca/legal-services/university-policies-procedures/student-non-academic-misconduct-policy>

Additional information is available on the Academic Integrity Website at: <https://ucalgary.ca/student-services/student-success/learning/academic-integrity>

Academic Accommodation

It is the student's responsibility to request academic accommodations according to the University policies and procedures listed below. The student accommodation policy can be found at: <https://ucalgary.ca/student-services/access/prospective-students/academic-accommodations>.

Students needing an accommodation because of a disability or medical condition should communicate this need to Student Accessibility Services in accordance with the Procedure for Accommodations for Students with Disabilities: <https://www.ucalgary.ca/legal-services/sites/default/files/teams/1/Policies-Accommodation-for-Students-with-Disabilities-Procedure.pdf>

Students needing an accommodation in relation to their coursework or to fulfill requirements for a graduate degree based on a Protected Ground other than Disability, should communicate this need, preferably in writing, to the designated contact person in their faculty. The course outline should clearly list the appropriate Faculty

contact person(s) and their contact details. For further information see E.1 C. Course Policies and Procedures <https://calendar.ucalgary.ca/pages/a89ecfbf758841b5983c4b67746e7846>

Research Ethics

Students are advised that any research with human participants – including any interviewing (even with friends and family), opinion polling, or unobtrusive observation – must have the approval of the Conjoint Faculties Research Ethics Board (<https://research.ucalgary.ca/conduct-research/ethics-compliance/human-research-ethics/conjoint-faculties-research-ethics-board-cfreb>) or the Conjoint Health Research Ethics Board (<https://research.ucalgary.ca/conduct-research/ethics-compliance/human-research-ethics/conjoint-health-research-ethics-board-chreb>)

In completing course requirements, students must not undertake any human subjects research without discussing their plans with the instructor, to determine if ethics approval is required. Some courses will include assignments that involve conducting research with human participants; in these cases, the instructor will have applied for and received ethics approval for the course assignment. The instructor will discuss the ethical requirements for the assignment with the students.

For further information see E.5 Ethics of Human Studies
<https://calendar.ucalgary.ca/pages/627ed88eb4b041b7a2e8155effac350>

Instructor Intellectual Property

Course materials created by instructors (including presentations and posted notes, labs, case studies, assignments and exams) remain the intellectual property of the instructor. These materials may NOT be reproduced, redistributed or copied without the explicit consent of the instructor. The posting of course materials to third party websites such as note-sharing sites without permission is prohibited. Sharing of extracts of these course materials with other students enrolled in the course at the same time may be allowed under fair dealing.

Freedom of Information and Protection of Privacy

Student information will be collected in accordance with typical (or usual) classroom practice. Students' assignments will be accessible only by the authorized course faculty. Private information related to the individual student is treated with the utmost regard by the faculty at the University of Calgary. For more information, please see: <https://www.ucalgary.ca/hr/work-compensation/working-ucalgary/freedom-information-and-privacy-act>

Copyright Legislation

All students are required to read the University of Calgary policy on Acceptable Use of Material Protected by Copyright (<https://www.ucalgary.ca/legal-services/university-policies-procedures/acceptable-use-material-protected-copyright-policy>) and requirements of the copyright act (<https://laws-lois.justice.gc.ca/eng/acts/C-42/index.html>) to ensure they are aware of the consequences of unauthorised sharing of course materials (including instructor notes, electronic versions of textbooks etc.). Students who use material protected by copyright in violation of this policy may be disciplined under the Non-Academic Misconduct Policy <https://www.ucalgary.ca/legal-services/university-policies-procedures/student-non-academic-misconduct-policy>.

Sexual and Gender-Based Violence Policy

The University recognizes that all members of the University Community should be able to learn, work, teach and live in an environment where they are free from harassment, discrimination, and violence. The University of Calgary's sexual violence policy guides us in how we respond to incidents of sexual violence, including supports available to those who have experienced or witnessed sexual violence, or those who are alleged to have committed sexual violence. It provides clear response procedures and timelines, defines complex concepts, and addresses incidents that occur off-campus in certain circumstances. Please see the policy available at <https://www.ucalgary.ca/legal-services/university-policies-procedures/sexual-and-gender-based-violence-policy>

Other Important Information

Please visit the Registrar's website at: <https://www.ucalgary.ca/registrar/registration/course-outlines> for additional important information on the following:

- Wellness and Mental Health Resources
- Student Success
- Student Ombuds Office
- Student Union (SU) Information
- Graduate Students' Association (GSA) Information
- Emergency Evacuation/Assembly Points
- Safewalk

The Freedom of Information Protection of Privacy Act prevents instructors from placing assignments or examinations in a public place for pickup and prevents students from access to exams or assignments other than their own. Therefore, students and instructors may use one of the following options: return/collect assignments during class time or during instructors' office hours, students provide instructors with a self-addressed stamped envelope, or submit/return assignments as electronic files attached to private e-mail messages.

For additional resources including, but not limited to, those aimed at wellness and mental health, student success or to connect with the Student Ombuds Office, please visit
<https://www.ucalgary.ca/registrar/registration/course-outlines>

Education Students Association (ESA) President for the academic year is Claire Gillis,
esa@ucalgary.ca.

Werklund SU Representative is Tracy Dinh, educrep@su.ucalgary.ca.