Erin Spring

EDUC 535.17: Specialization 2 Secondary Science
FALL 2025

The University of Calgary, located in the heart of Southern Alberta, both acknowledges and pays tribute to the traditional territories of the peoples of Treaty 7, which include the Blackfoot Confederacy (comprised of the Siksika, the Piikani, and the Kainai First Nations), the Tsuut'ina First Nation, and the Stoney Nakoda (including Chiniki, Bearspaw, and Goodstoney First Nations). The City of Calgary is also home to the Métis Nation of Alberta Battle River Territory (Districts 5 and 6).

Class Dates: Sept. 3 - Oct. 22

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: I am readily available by appointment and after class. Send me an email to schedule a time to meet.

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

COURSE DESCRIPTION:

The intent of the Specialization Seminar II is to deepen your understanding of the practical aspects of teaching within the specialization and to connect this practice with specific theoretical concepts. While this second specialization course focuses more on practical knowledge, you will also refine your knowledge of discourse and theory within the discipline and develop a deeper understanding of ways to enact this theory in a classroom context. You will additionally become familiar with any relevant Ministry documents associated with the Alberta Curriculum and draw on practical classroom observation from the field experience to participate in meaningful discussion and to connect these observations with a vision for your own teaching. The emphasis of the course is on designing for student learning (subject-specific; assessment to strengthen student learning and improve instruction; and designing for inclusion, differentiation, and inquiry).

LEARNER OUTCOMES:

Over the course of the semester, students will:

1) Further develop a deeper conceptual understanding of the historical, socio-cultural, political contexts of the discipline of Science Education, and relate this to curriculum planning in the specialization area;
2) Identify and critique the key learning perspectives (as outlined in the front matter of the Programs of Study) and intentions (learning objectives) across the units in a grade from the Alberta Programs of Studies;
3) Successfully apply theoretical knowledge to the design of a longer-term unit and assessment plan.

COURSE DESIGN AND DELIVERY: The course will be delivered through a design-based and inquiry-focused approach where learning intent, expectations and assessment processes are made visible and transparent. Participation is crucial to the knowledge building in this course. This course will be delivered face-to-face on campus with supplementary engagement in D2L. Students will require access to a computing device capable of accessing D2L. If you do not own a personal device, there are computers available for student use in the Doucette library and the Taylor Family Digital Library.)

REQUIRED RESOURCES: All required resources can be found in the weekly schedule. Additional class readings and other support resources will be posted on the course shell in D2L prior to class. It is your responsibility to keep up with materials and announcements posted on D2L.

LEARNING TASKS OVERVIEW

LEARNING TASK	DESCRIPTION OF LEARNING TASK	GROUP / INDIVIDUAL	WEIGHT	DUE DATE
LT 1 Sharing Our Learning	- In class, each student will share something they learned about science teaching so far. This will include a short presentation, a written summary, and an artifact (e.g., handout, exemplar)	Individual	30%	Sept. 26
LT 2 Microteaching	- Each student will present a short lesson (8-10 minutes) to the class, review a recording of their lesson and write a reflection.	Individual	30%	Various
LT 3 Unit and Assessment Plan	- Individually or in pairs, students will prepare and share a unit plan based on the program of studies for an Alberta science course gr. 7-12	Individual or Small Group	40%	Oct. 24

Detailed instructions and assessment criteria will be shared in class and on D2L.

Generative AI: Course participants are invited to use artificial intelligence tools, including generative AI, to gather information, review concepts, and/or to help produce assignments. However, (1) it is the student's responsibility to inform the instructor in writing of the intention to use such technology in advance of its use; (2) the student is ultimately accountable for the work they submit; (3) any content generated or supported by an artificial intelligence tool must be cited appropriately; and (4) the instructor reserves the right to deny any uses of generative AI determined to be harmful or against the goals of learning. Misuse of these tools will be considered academic misconduct and will be treated as such.

WEEKLY COURSE SCHEDULE:

Date	Topic	Readings and Tasks	Due Dates
Week 1 Sept 3	Why Science? What is science teaching and what is it for?	The following will be read and watched in class on Sept. 3. There are no readings to prepare in advance. Iwuanyanwu, P. N. (2019). What We Teach in Science, and What Learners Learn: A Gap That Needs Bridging. Pedagogical Research, 4(2). https://www.pedagogicalresearch.com/download/what-we-teach-in-science-and-what-learners-learn-a-gap-that-needs-bridging-5780.pdf Shaha, A. (2009) Why Science? [video] Vimeo. https://vimeo.com/3531977	
Week 2 Sept. 10	Science Teaching Strategies and Conceptual Change	Watson, B., & Kopnicek, R. (1990). Teaching for Conceptual Change: Confronting Children's Experience. *Phi Delta Kappan, 71,* 680-684. http://ezproxy.lib.ucalgary.ca/login?url=https://www.jstor.org/stable/20404253	

		Demir, K., Wade-Jaimes, K., & Qureshi, A. (2017). Reasoning From Models: Using Metacognitive Modeling in the Physics Classroom. *The Science Teacher, 84*(6), 37–42. https://doi-org.ezproxy.lib.ucalgary.ca/10.2505/4/tst17_084_06_37 Kruse, J., & Wilcox, J. (2015). Sinking In: Developing a Model for Understanding Density. *The Science Teacher, 82*(2), 23–27. https://doi-org.ezproxy.lib.ucalgary.ca/10.2505/4/tst15_082_02_23 Fouché, J. (2013). Rethinking Failure: When Getting it Wrong can Increase Students' Chances for Getting it Right. *The Science Teacher, 80*(8), 45–49. https://doi-org.ezproxy.lib.ucalgary.ca/10.2505/4/tst13_080_08_45	
Week 3 Sept. 17	Planning lab activities	Shaha, A., (2013). Are school science practicals a complete waste of time? The Guardian, http://www.theguardian.com/science/blog/2013/jun/07/school-science-practicals-waste-time (including video) Shaha, A. (2011). Are science teachers using experiments as props in lessons? The Guardian. http://www.theguardian.com/science/blog/2011/jun/21/science-teaching-experiments-in-lessons Abrahams, I., & Millar, R. (2008). Does practical work really work? A study of the effectiveness of practical work as a teaching and learning method in school science.	

		International Journal of Science Education, 30(14), 1945-1969. (in class) Millar, R. (2009). Analysing practical activities to assess and improve effectiveness: The Practical Activity Analysis Inventory (PAAI). York: Centre for Innovation and Research in Science Education, University of York. https://www.rsc.org/cpd/teachers/content/filerepository/frg/pdf/ResearchbyMillar.pdf	
Week 4 Sept. 24	Sharing our Learning	This will be mostly a sharing class. Review from Specialization I: Bybee, R. W., Taylor, J. A., Gardner, A., Van Scotter, P., Powell, J. C., Westbrook, A., & Landes, N. (2006). The BSCS 5E instructional model: Origins and effectiveness. Colorado Springs, Co: BSCS. pp. 4-11, 28-31, 33-34 https://bscs.org/wp-content/uploads/2022/01/bscs_5e_full_report-1.pdf BSCS (2022) Anchored Inquiry Webinar [Video] YouTube. https://youtu.be/KCezbaJf3O4	Due Date for LT 1
Week 5 Sept. 17	Safety in the Science Classroom	Alberta Education (2019). Health and Safety in the Science Classroom https://open.alberta.ca/dataset/2ade25c2-7dbb-4a1c-a211-600eadb4540d/resource/c1282b6b-203e-4832-b0d8-a405872e4cad/download/health-and-safety-in-the-science-classroom.pdf Alberta Teachers' Association (2022). Occupational Health and Safety for Teachers. https://teachers.ab.ca/advocacy/help-and-advice-teachers/occupational-health-and-safety-teachers	

		BC Ministry of Education (2019) Science Safety Resource Manual https://curriculum.gov.bc.ca/sites/curriculum.gov.bc.ca/files/pdf/tools/science-safety-manual.pdf	
Week 5 Oct. 1	Unit Planning	Bai, Y., Alexander, T. D., Baird-Wolfe, A., Mace, M., Zielinski, L., Chase, S. R., … Campbell, T. (2025). Probing Lyme Disease Rise and Racial Disparities: A Model-Based Inquiry Unit. *The Science Teacher, 92*(2), 33–45. https://doi-org.ezproxy.lib.ucalgary.ca/10.1080/00368555.2024.2445532 Australian Educational Research Association (2022). Example Unit Plan – Science. https://www.edresearch.edu.au/sites/default/files/2023-02/ochre-aero-unit-plan-science.pdf Science Teachers Association of Ontario (2025). Long Range Plan Gr. 8 Model 1. https://scitechontario.ca/project/grade-8-long-range-plan-model-1/	
Week 6 Oct. 8	Summative Assessment	Bremert, H., Stoff, A., & Boesdorfer, S. B. (2020). Collaborative Assessments. *The Science Teacher, 87*(9), 32–37. https://doi-org.ezproxy.lib.ucalgary.ca/10.1080/00368555.2020.12293541 Lui, K. (2022). Idea Bank: Three Steps to Making Assessment Simpler and More Relevant. *The Science Teacher, 90*(1), 16–18. https://doi-org.ezproxy.lib.ucalgary.ca/10.1080/00368555.2022.12293720 Backus, L. (2023). Inquiry-Based Lab Finals. *The Science Teacher, 90*(5), 32–37.	

		https://doi-org.ezproxy.lib.ucalgary.ca/10.1080/19434871.2023.12290281 Forsythe, M., Jackson, J., & King, J. (2019). Turning Tests Into Tasks. *Science Scope, 42*(7), 67-77. https://research-ebsco-com.ezproxy.lib.ucalgary.ca/linkprocessor/plink?id=d177d2ae-4336-3ad8-bc3f-1fb7de4d1472	
Week 7 Oct. 15	Teaching Science in Complex Classrooms	Supalo, C.A. (2012). My Experiences as a Blind Chemistry Student. Braille Monitor. https://nfb.org/sites/default/files/images/nfb/publications/bm/bm12/bm1207/bm120703.htm Supalo, C. A., Isaacson, M. D., & Lombardi, M. V. (2014). Making hands-on science learning accessible for students who are blind or have low vision. Journal of Chemical Education, 91(2), 195-199. https://pubs-acs-org.ezproxy.lib.ucalgary.ca/doi/full/10.1021/ed3000765 Ok, M. W., Hughes, J. E., & Boklage, A. (2018). Teaching and learning biology with iPads for high school students with disabilities. Journal of Educational Computing Research, 56(6), 911-939. https://journals-sagepub-com.ezproxy.lib.ucalgary.ca/doi/full/10.1177/0735633117713113 Bergman, D. (2013). Blending Language Learning With Science: With Purposeful Planning, Teachers can Reach all Students with the Dual Goals of Language Development and Scientific Inquiry. *The Science Teacher, 80*(4), 46–50. https://doi-org.ezproxy.lib.ucalgary.ca/10.2505/4/tst13_080_04_46 Medina-Jerez, W., & Campbell, T. (2015).	

		Myths About English Language Learning: How to Overcome Misconceptions and Help ELLs Learn Both Science and English. *The Science Teacher, 82*(4), 53–59. https://doi-org.ezproxy.lib.ucalgary.ca/10.2505/4/tst15_082_04_53	
Week 8 Oct. 22		Unit Plan Sharing Hernandez, J., Scherr, R., German, M., & Horowitz, R. (2022). Place-based education in high school science: Situating energy and climate change in students' communities. *Sustainability and Climate Change, 15*(1), 58-67. https://par.nsf.gov/servlets/purl/10330270 Kimmerer, R. (2013). *Braiding sweetgrass: Indigenous wisdom, scientific knowledge and the teaching of plants.* (pp. 216- 240) Milkweed Editions. https://ebookcentral-proquest-com.ezproxy.lib.ucalgary.ca/lib/ucalgary-ebooks/reader.action?docID=1212658&ppg=229 Snively, G., & Williams, L. W. (2016). *Knowing home: Braiding indigenous science with Western science, Book 1*. ePublishing Services, University of Victoria Libraries. https://pressbooks.bccampus.ca/knowinghome/ (Read Chapter 1, 2 and a Chapter of your choice)	LT 3 Unit Plan Due on Friday Oct. 24

CHANGES TO SCHEDULE:

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

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: https://calendar.ucalgary.ca/pages/2c2d1ce47b8c4d008aec9cc3da49876e

Missing or Late Submissions

A 5-day 'Late Bank' will be provided to all learners. Use these days at your own discretion and without explanation during the course. For example, you could submit your LT 3 days late and your LT3 2 days late, or just your LT3 5 days late. The late bank dates only apply to written submissions not to scheduled in-class presentations.

This is designed to provide you with some flexibility regarding personal situations, workload management or other concerns that may arise. You do not need to let the instructor know ahead of time that you are using days in your Late Bank. As you submit your work, simply note in the Dropbox or by email that you are using X number of Late Bank days.

Once your Late Bank days are used up, late assignments will be deducted 5% per day.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.

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/627ed88eb4b041b7a2e8155effac3501

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/legal-services/access-information-privacy

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 Tracy Dinh, esa@ucalgary.ca.

Werklund SU Representative is Siena Yee, educrep@su.ucalgary.ca.