AB

EDUC 460.15 (01): Specialization I (Secondary Mathematics)
Winter, 2024

Class Dates: Monday and Friday, January 8 – March 8, 2024

No class: Term Break, February 18 – 24, 2024

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: By appointment only

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 specializations of Secondary Mathematics. 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 design and to begin to examine curriculum shifts in the province.

LEARNER OUTCOMES

By the end of the semester, students will:

1) Develop a foundational understanding of the nature of discourse in the discipline, as related to teaching and learning, including specialized language, concepts, and terminology.
2) Understand teacher as designer of learning and assessment plans and use of the resources available for designing learning and assessment.
3) Explore and apply 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 design 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 possible engagement in a D2L environment.
It is designed based on a design and inquiry-focused learning approach. Student participation is crucial to the knowledge building in this course.

REQUIRED RESOURCES

Course Text

Hine, G., Anderson, J., Reaburn, R., Cavanaugh, M., Galligan, L., Ngu, B., & White, B. (2021). *Teaching Secondary Mathematics* (2 ed.). Cambridge University Press.

Course Readings

Alberta Education (2007 updated 2016). *Program of Study: Mathematics Kindergarten to Grade 9*. Edmonton: Government of Alberta. https://education.alberta.ca/media/3115252/2016_k_to_9_math_pos.pdf

Alberta Education (2008). *Program of Study: Mathematics Grade 10 to Grade 12*. Edmonton: Government of Alberta. https://education.alberta.ca/media/564028/math10to12.pdf

Beyranevand, M. L. (2014). The different representations of rational numbers. *Mathematics Teaching in the Middle School*, *19*(6), 382-385.

Davis, B. (2015). The mathematics that secondary teachers (need to) know. *Revista Española de Pedagogía*, *73*(261), 321-342.

Jaworski, B. (2015). Teaching for mathematical thinking: inquiry in mathematics learning and teaching. *Mathematics Teaching*, *248*, 28-34. https://www.atm.org.uk/write/MediaUploads/Journals/MT248/MT248-15-11.pdf

Additional Resources

Peat, F. D. (nd). *Blackfoot physics and European minds*. Pari Center. https://paricenter.com/library-new/indigenous-ways-of-knowing/blackfoot-physics-and-european-minds/

Stavros, G. S., & Murphy, M. S. (2019). Identity-making through Cree mathematizing. *Canadian Journal of Education*, *43*(3), 692-714.

LEARNING TASKS OVERVIEW

LEARNING TASK	DESCRIPTION OF LEARNING TASK	GROUP / INDIVIDUAL	WEIGHT	DUE DATE
Title 1	Exploration of Mathematics Processes	Group	30%	January 29, 2024
Title 2	Exploration of Mathematics Knowledge for Teaching Number Concepts (Junior High Grades)	Individual	25%	February 12, 2023
Title 3	Creation of Short-term Learning and Assessment Plan (Senior High Grades)	Individual	45%	March 8, 2024

WEEKLY COURSE SCHEDULE:

Date	Topic	Readings	Due Date
Week 1 Jan 08 - 12	Teaching and Learning Mathematics	Cavanagh (2021) Chapter 1	
Week 2 Jan 15 - 19	Language and mathematics	Galligan (2021) Chapter 2	
Week 3 Jan 22 - 26	Making Mathematical Connections	Hine (2021) Chapter 3 Beyranevand (2014)	
Week 4 Jan 30 - Feb 3	Inquiry-based teaching/learning of mathematics	White (2021) Chapter 4 Davis (2014)	**Learning task 1 [by January 9]**
Week 5 Feb 5 - 9	Using technology in mathematics education	Anderson (2021) Chapter 5 Jaworski (2015)	
Week 6 Feb 13 – 17	Assessing mathematics learning	Hine (2021) Chapter 8	**Learning Task 2 [by February 12]**
Feb 18 – 24		NO CLASSES - Term Break	
Week 7 Feb 27 - Mar 3	Designing inquiry-based lesson plans	Anderson (2021) Chapter 9 (pg. 232-245) Stavros & Martin (2019) Peat (nd)	
Week 8 Mar 6 - 10	Designing inquiry-based lesson plans		**Learning Task 3 [by March 8]**

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.
Readings are as listed in the Reading Tool of the D2L class site.

LEARNING TASKS AND ASSESSMENT

There are 3 required Learning Tasks **[LTs]**for this course. Students must pass each learning task in order to successfully complete the course.

NOTE: Further details of the 3 Learning Tasks and any clarification needed will be provided in class.

LEARNING TASK 1: EXPLORATION OF MATHEMATICS PROCESSES (GROUP, 30%) – DUE JANUARY 31, 2023

The National Council of Teachers of Mathematics [NCTM] and Alberta Mathematics Program of Studies [APoS] highlight several mathematics processes that are central to teaching, learning, and doing mathematics. This learning task is intended for you to develop understanding of these processes, which are also important to learning tasks 2 and 3. Working in groups of 3-4, you will explore a mathematical process assigned to your group and present your findings to engage the class through an activity and explain the meaning of the process. The class will provide constructive feedback on the presentation regarding the extent to which the activity deepened their understanding of the process. Your presentation will include a (1) description of the activity, (2) explanation of how the activity illustrates the

meaning of the process, and (3) a minimum of 2 references, in addition to the APoS, that you used to support your work. You may also want to draw upon group/class-discussions and course readings. Upload the powerpoint to D2L dropbox by midnight on due date.

CRITERIA FOR ASSESSMENT OF LEARNING TASK 1

The following criteria will be used to assess the work:

• Quality of presentation, based on:
- Informative design and design elements of presentation
- Clarity and sufficiency of information provided
- Significance and relevance of references
- Coherent explanation to reflect collaboration and not isolated pieces of information
- Appropriate length [words] where specified
- Significance and relevance of references
- Correct use of APA7

• Quality of activity, based on:
- Appropriateness and meaningfulness of activity to support learning of the *process*
- Level of engagement of the class in the activity
- Peer assessment of effectiveness of the activity to their learning of the *process*
- Clarity and sufficiency of description of the activity
- Appropriate use of required time for the activity and oral explanation of *process*

• Quality of learning, based on:
- Well-developed depth of understanding of the *process* shown through:
  - the content and quality of the activity and accuracy of the explanation of the *process*
  - meaningful and relevant connections to theory and practice

LEARNING TASK 2: EXPLORATION OF MATHEMATICS FOR TEACHING NUMBER CONCEPTS (JUNIOR HIGH SCHOOL) (INDIVIDUAL, 25%) – DUE FEBRUARY 14, 2023

Mathematics for Teaching [M4T] is a special type of knowledge mathematics teachers need to plan and teach mathematics to engage students meaningfully to learn and develop conceptual understanding of mathematics. This assignment allows you to explore and develop M4T for rational numbers in Junior High School [G 7 to 9] and develop an understanding of what to consider in planning meaningful mathematics lessons for any grade to foster deep understanding of mathematics concepts.

Working individually, you will investigate M4T for rational numbers with a focus on fractions. You are expected to draw on in-class work on M4T for numbers, course readings, and your own research of related resources.

Your report should include all aspects of the guideline for M4T for numbers discussed in class and organized with clear headings and subheadings based on the guideline. It should be typed; diagrams and mathematical expressions/relationships can be done by hand if neat and legible.

CRITERIA FOR ASSESSMENT OF LEARNING TASK 2

The following criteria will be used to assess the work:

• Quality of report, based on:

Well organized, informative design and design elements of report
Clarity and sufficiency of information provided
Neatness and clarity of diagrams/pictures
Legible mathematics symbols/expressions
Appropriate length [words] where specified
Correct use of APA7

• Quality of learning, based on:

Depth of understanding of rational number properties shown through accuracy of the key elements for the 4 operations.

Depth of understanding of meaning of rational numbers [fractions] shown through accuracy of 4 different meanings and multiple representations of them

Depth of understanding of meanings of the 4 operations and procedures of fractions shown through accuracy of meanings of the operations, the procedures, and multiple representations of them

Depth of understanding of application of fractions shown through meaningful and appropriate contextual problems for the 4 operations

Depth of understanding of relevant historical information of fractions shown through situations meaningful to students

Depth of understanding of students' misconceptions of fractions shown through at least 4 possible meaningful examples

LEARNING TASK 3: CREATION OF SHORT-TERM LEARNING AND ASSESSMENT PLAN (SENIOR HIGH SCHOOL GRADES) (INDIVIDUAL, 45%) – DUE DATE: MARCH 10, 2023

Lesson plans are central to imagine and facilitate meaningful classroom experiences to support students' learning and doing of mathematics and development of mathematical thinking, procedural fluency, and conceptual understanding of mathematics. This assignment allows you to learn how to create such lesson plans by applying your understanding of inquiry-based teaching/learning and MKT for a senior high school concept (G 10 - 12).

Working individually, you will select a secondary level mathematics concept from the Alberta Mathematics Program of Studies (G 10 – 12) and design a lesson plan for an 80-minute class. Your plan should follow a clear and comprehensive template and include a plan for learning and assessment that promotes mathematical thinking and deep understanding of the concept.

In the lesson plan, you will also add annotations that provide explanations behind your thinking, choices, and MKT relevant to developing the lesson plan based on the guideline discussed in class. Simply put, you will record on the lesson plan the reasons for the choices that you have made, how this lesson plan fits into the broader context of a unit as described in the Program of Studies, and the intended results of creating the lesson in the manner in which you have done. You should justify the pedagogical choices you make with references to the course readings, class discussions, and other sources.

CRITERIA FOR ASSESSMENT OF LEARNING TASK 3

The following rubric will be used to assess the work:

Category	A+ / A	A-/ B+	B / B-	C+ / lower
Design Curricular Outcomes -links to Program of Studies (PoS)	- All links to PoS are clear and appropriate – All relevant PoS curricular outcomes for a mathematics concept and mathematical processes are correctly represented	- Many links to PoS are clear and appropriate - Many relevant PoS curricular out-comes for a math concept and mathematical processes correctly represented	- Few links to PoS are clear and appropriate - Few relevant PoS curricular outcomes for a math concept and mathematical processes are correctly represented	- Links to the PoS are unclear and/or inappropriate - No relevant curricular outcomes for a math concept and mathematical processes are correctly represented
Instructional Delivery -plan demonstrates disciplinary knowledge, engagement, student-centeredness, organization, integration across lesson sections	- Plan demonstrates excellent level of disciplinary knowledge - Lesson highly and meaningfully engaging and clearly student-centered - Lesson extremely clear and well-ordered, high degree of integration among lesson sections (exceptionally easy to envision how it will unfold) - All important elements of plan included	- Plan demonstrates very good level of disciplinary knowledge - lesson moderately engaging meaning-fully and partly student-centered - Lesson mostly clear and well-ordered, very good level of integration among lesson sections (easy to envision how most of it will unfold) - Most important elements of plan included	-Plan demonstrates good level of disciplinary knowledge; - Lesson moderately engaging and not student-centered - Lesson moderately clear and well-ordered, good level of integration among lesson sections (easy to envision how some of it will unfold) - Many important elements of plan missing	- Plan demonstrates low/unsatisfactory level of disciplinary knowledge; - Lesson is teacher-centered and does not engage students meaningfully - Lesson unclear and not well ordered, does not flow well; low level of integration among lesson sections (hard to envision how it would unfold) - Most important elements missing
Deep Understanding -learning opportunities for deep understanding of curriculum objectives	- Learning tasks are highly effective for supporting mathematical thinking and processes and students' conceptual understanding of content objectives. - Tasks are clearly inquiry-based, learner-centered, and support initial learning of a new concept	- Learning tasks are moderately effective for supporting mathe-matical thinking and processes and students' concept-tual understanding of content objective - Tasks are partly inquiry-based, learner-centered, and support initial learning of a new concept	- Learning tasks have a low level of effectiveness in supporting mathema-tical thinking and processes and students' conceptual understanding of content objective - Tasks are partly or fully inquiry-based, learner-centered, but do not support initial learning of a new concept	- Learning tasks are not effective for supporting mathematical thinking and processes and students' conceptual understanding of content objective - Tasks are not inquiry-based, learner-centered, and are for practicing the concept
Assessment	A variety of highly effective formative assessments are	Some variety of effective formative assessments are	Formative assessment options are limited and shows little	Formative assessment options lacking and/or shows lack of under-standing of

-integrated formative assessments	clearly integrated into lesson	integrated into lesson	understanding of what constitutes effective assessment	appropriate and effective assessment
Narratives -depth of analysis/under-standing	Narrative explanations have excellent depth and demonstrate clear understanding of all of the guideline items for lesson planning and design	Narrative explanations have excellent depth and demonstrate understanding of many of the guideline items for lesson planning and design	Narrative explanations have very good depth and demonstrate some understanding of some of the guideline items for lesson planning and design	Narrative explanations lack depth and demonstrate little understanding of most of the guideline items for lesson planning and design
Writing quality	The lesson plan and narratives are clearly written and stand as a superior example free of errors.	The lesson plan and narratives are relatively clearly written and contains few errors	The lesson plan and narratives are some-what unclearly written and contains errors that impede understanding.	The lesson plan and narratives are unclearly written and contains many errors that impede understanding.
References	Clearly stated; Accurately APA 7 referenced.	Stated; APA 7 referenced with minor errors.	unclear; Referenced but not APA.	Not stated or unclear; not referenced.

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

LATE SUBMISSIONS

All late submissions of assignments must be discussed with the instructor **prior to the due date.** Students may be required to provide written documentation of extenuating circumstances (e.g. statutory declaration, doctor's note, note from the University of Calgary Wellness Centre, obituary notice). A deferral of up to 30 days may be granted at the discretion of the Associate Dean of Undergraduate Programs 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

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

Students in the B.Ed. program must have an overall GPA of 2.5 in the semester to continue in the program without repeating courses.

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://www.ucalgary.ca/legal-services/sites/default/files/teams/1/Policies-Student-Accommodation-Policy.pdf. 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: 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 based on a Protected Ground other than Disability, should communicate this need, preferably in writing, to their Instructor.

Academic Misconduct
For information on academic misconduct and its consequences, please see the University of Calgary Calendar at http://www.ucalgary.ca/pubs/calendar/current/k.html

Attendance/ Prolonged Absence

Students may be asked to provide supporting documentation for an exemption/special request. This may include, but is not limited to, a prolonged absence from a course where participation is required, a missed course assessment, a deferred examination, or an appeal. Students are encouraged to submit documentation that will support their situation. Supporting documentation may be dependent on the reason noted in their personal statement/explanation provided to explain their situation. This could be medical certificate/documentation, references, police reports, invitation letter, third party letter of support or a statutory declaration etc. The decision to provide supporting documentation that best suits the situation is at the discretion of the student.

Falsification of any supporting documentation will be taken very seriously and may result in disciplinary action through the Academic Discipline regulations or the Student Non-Academic Misconduct policy.

https://www.ucalgary.ca/pubs/calendar/current/n-1.html

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 Elsa Stokes, educrep@su.ucalgary.ca.