EDUC 535.15: Specialization II – Secondary Mathematics
Fall, 2021

Section	Instructor	Time	Location	Email
S01	Olive Chapman	11am – 12:20 pm	Virtual - Zoom	chapman@ucalgary.ca

Class Dates: Monday, Wednesday, and Friday – September 7 to October 29, 2021

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 Seminar II is to deepen students' 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, students will also refine their knowledge of discourse and theory within the discipline and develop a deeper understanding of ways to enact this theory in a classroom context. Students 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 their 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:

Students will:

1) Further develop a deeper conceptual understanding of the historical, socio-cultural, political contexts of the discipline, and relate this to curriculum planning in the specialization areas;

2) Identify and critique the key learning perspectives (as outlined in the front matter of the Program of Studies) and intentions (learning objectives) across the units in a grade from the Alberta Program of Studies;

3) Successfully apply theoretical knowledge to the design of a longer-term unit and assessment plan.

COURSE DESIGN AND DELIVERY: This online course is delivered through Zoom sessions and discussion forums in Desire2Learn (D2L). D2L will be used to post class information and for submitting assignments. You will need a device that supports online audio (and preferably video) communication.

REQUIRED RESOURCES:

Alberta Education (2014). *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

Arbaugh, F. & Brown, C. A. (2004). What makes a mathematical task worthwhile? Designing a learning tool for high school mathematics teachers. In R. Rebenstein (ed.) *Perspectives on teaching and learning of mathematics, 66th yearbook of the National Council of Teachers of Mathematics* [NCTM] (pp. 27-41). Reston, VA: NCTM. [on D2L]

Chapman, O. (2018). Mathematics teachers' ways of supporting students' learning of problem solving. In M. Steen (ed.) *A life's time for mathematics education and problem solving. On the occasion of Andràs Ambrus' 75th Birthday* (pp. 45–69). WTM-Verlag: Münster. [on D2l]

Fennell, F., Kobett, B. M., & Wray, J. A. (2017). *The formative 5: Everyday assessment techniques for every math classroom* (pp. 3-16). Thousand Oaks, CA: Corwin. [on D2L]

Friesen, S., Saar, C., Park, A., Marcotte, C., Hampshire, T., Martin, B., Brown, B., & Martin, J. (2015). *Focus on Inquiry*. [eBook, chapter 2] http://inquiry.galileo.org/

GAIMME (2016). *What is mathematical modeling*? (pp.7-21). Bedford, MA: COMAP and Philadelphia, PA: SIAM. http://www.siam.org/Portals/0/Publications/Reports/gaimme-full_color_for_online_viewing.pdf?ver=2018-03-19-115454-057

Kilpatrick, J., Swafford, J., & Findell, B. (Eds.) (2001). *Adding it up: Helping children learn mathematics*. Washington, DC: National Academy Press. [Chapter 4, pp. 115 – 133] http://www.nap.edu/catalog.php?record_id=9822

https://ebookcentral-proquest-com.ezproxy.lib.ucalgary.ca/lib/ucalgary-ebooks/reader.action?ppg=136&docID=3375421&tm=1512076004993

Kullberg, A., Runesson Kempe, U., & Marton, F. (2017). What is made possible to learn when using the variation theory of learning in teaching mathematics? *ZDM: The International Journal on Mathematics Education*, 49(4), 559-569. [available online through U of C library] https://link-springer-com.ezproxy.lib.ucalgary.ca/article/10.1007/s11858-017-0858-4

Leahy, S., Lyon, C., Thompson, M., & Wiliam, D. (2005). Classroom Assessment: Minute by Minute, Day by Day. *Educational Leadership*, 63(3), 18-24. [available online through U of C library] http://ezproxy.lib.ucalgary.ca/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=ehh&AN=18772694&site=ehost-live

Mason, J. (2010). *Effective questioning and responding in the mathematics classroom*. http://mcs.open.ac.uk/jhm3/Selected%20Publications/Effective%20Questioning%20&%20Responding.pdf
**2020 edition available in LCR*
https://www-taylorfrancis-com.ezproxy.lib.ucalgary.ca/chapters/edit/10.4324/9780429021015-11/effective-questioning-responding-mathematics-classroom-1-john-mason

Mason, J., Burton, L., & Stacy, K. (2010). *Thinking Mathematically* (2nd Edition, chapter 1). New York: Prentice Hall.
https://www.pearsonhighered.com/assets/samplechapter/m/a/s/o/Mason%20-%20Chapter%201.pdf

McTighe, J. & Wiggins, G. (2014). *Improve curriculum, assessment, and instruction using the understanding by design framework*. ASCD White Paper

https://jaymctighe.com/wp-content/uploads/2018/06/UbD-White-Paper.pdf

National Council of Teachers of Mathematics *Principles to Action: Executive summary*. https://www.nctm.org/uploadedFiles/Standards_and_Positions/PtAExecutiveSummary.pdf

National Council of Teachers of Mathematics (2014). *Principles to Actions: Ensuring mathematics success for all* (pp. 7-12). Author, Reston, VA. https://ebookcentral-proquest-com.ezproxy.lib.ucalgary.ca/lib/ucalgary-ebooks/reader.action?docID=6478900&ppg=18

National Council of Teachers of Mathematics (2000). *Principles and Standards for School Mathematics* (pp. 52 – 71). Reston, VA: Author. [on D2L]

Schoenfeld, A. H., & the Teaching for Robust Understanding Project. (2016). *An Introduction to the Teaching for Robust Understanding (TRU) Framework.* Berkeley, CA: Graduate School of Education. Retrieved from http://map.mathshell.org/trumath.php or http://tru.berkeley.edu

Smith, M. S. & Stein, M. K. (February 1998). Selecting and creating mathematical tasks: From research to practice. *Mathematics Teaching in the Middle School,* 3, 344-350. [online through U of C library] https://www-jstor-org.ezproxy.lib.ucalgary.ca/stable/41180423

Stockero, S. L., Van Zoest, L. R., Kinzel, M. & Cavey, L. (May, 2011). Making student thinking public. *Mathematics Teacher*, 104, 9, 704-709. [online through U of C library] http://www.jstor.org.ezproxy.lib.ucalgary.ca/stable/20876997

SUGGESTED RESOURCES

Galileo Educational Network (2019) *Math*. https://galileo.org/math-fairs/math-fair-problems/

Hamilton, G. (2017) *Math pickle*. http://mathpickle.com

National Council of Teachers of Mathematics: www.nctm.org

Piggott, J. (2014). *Rich tasks and contexts*. http://nrich.maths.org/5662

The Mathematics Teacher: https://www-jstor-org.ezproxy.lib.ucalgary.ca/journal/mathteacher

Mathematics Teaching in the Middle School: https://www-jstor-org.ezproxy.lib.ucalgary.ca/journal/mathteacmiddscho

SUGGESTED READINGS:

The readings and resources below are recommended for continued professional learning and development and will be useful in research projects, but they are not required for the course.

Alberta Education (2015). *Telling our school stories 2.0: Moving forward with high school redesign [an interim report for 2014/2015]*. Edmonton: Alberta Government. Available at: https://open.alberta.ca/publications/telling-our-school-stories-2-0-moving-forward-with-high-school-redesign

Alberta Education (2016). Streamlined expression of competencies – descriptions, indicators and examples. https://education.alberta.ca/media/3272998/competency-indicators-september-30-2016.pdf

Galileo Educational Network (2008b). *Guide to Assessing Critical Thinking*. http://www.galileo.org/tips/rubrics/ct_rubric.pdf

Mathematics Working Group, Alberta Education (2016). *Mathematics review: Report to Premier and Minister*. *Alberta Education*. https://education.alberta.ca/media/3402136/final_mathematics-curriculum-review_05dec16pdf.pdf

Marton, F. (2014). *Necessary conditions of learning*. New York: Taylor & Francis. https://ebookcentral-proquest-com.ezproxy.lib.ucalgary.ca/lib/ucalgary-ebooks/detail.action?docID=1715781

https://www-taylorfrancis-com.ezproxy.lib.ucalgary.ca/books/mono/10.4324/9781315816876/necessary-conditions-learning-ference-marton

LEARNING TASKS OVERVIEW

LEARNING TASK	DESCRIPTION OF LEARNING TASK	GROUP/ INDIVIDUAL	WEIGHT	DUE DATE
LT1	Researching topics on effective mathematics pedagogy for secondary school mathematics	Group	30%	September 24, 2021
LT2	Reflecting on personal growth in pedagogical mathematics knowledge	Individual	30%	Blogs - Wed & Fri (weeks 4, 5, 6: see schedule) Final: October 20, 2021
LT3	Designing a unit and assessment plan for AB PoS secondary mathematics concepts	Individual	40%	October 29, 2021

WEEKLY COURSE SCHEDULE:

Date	Topic	Readings and Tasks	Due Dates
Week 1 Sept 7-10	MKT: Knowledge of content and student	Discuss LT1 Interpret and assess student mathematical thinking Stockero et al. (2011)	
Week 2 Sept 13-17	MKT: Knowledge of content and student Principles for teaching mathematics	Interpret and assess student mathematical thinking Examine contemporary principles of mathematics education NCTM (2014) NCTM (2000) Kilpatrick et al. (2001)	
Week 3 Sept 20-24	Mathematical learning tasks	Discuss LT2 Analyze and evaluate mathematical tasks Arbaugh & Brown (2004); Smith & Stein (1998) Kullberg et al. (2017)	LT 1; Sept 24

Week 4 Sept 27- Oct 1	Pedagogical mathematics knowledge [PMK] Mathematical thinking and application processes	**Workshop 1** on PMK [Sept 27] Explore mathematics problem solving Mason et al. (2010); Kulberg et al. (2017); Schoenfeld et al. (2016) Discuss class development of rubric for LT3	LT2 - Learner blog; Sept 29 LT2 - Instructor blog; Oct 1
Week 5 Oct 4-8	Pedagogical mathematics knowledge [PMK] Mathematical thinking and application processes	**Workshop 2** on PMK [Oct 4] Discuss LT3 Explore mathematics modelling GAIMME (2016) Develop rubric for LT3 with connection to unit planning	LT2 - Learner blog; Oct 6 LT2 - Instructor blog; Oct 8
Week 6 Oct 11-15	Pedagogical mathematics knowledge [PMK] Teaching Problem solving	**Workshop 3** on PMK [Oct 11] Examine approaches to teaching problem solving Chapman (2018) Mason (2010) Develop rubric for LT3 with connection to unit planning	LT2 - Learner blog; Oct 13 LT2 - Instructor blog; Oct 15
Week 7 Oct 18-22	Unit plan	Examine components of unit plan design Learning objectives Alberta Education (2008) and (2014) Inquiry teaching/learning McTighe & Wiggins (2014); Friesen et al. (2015) Assessing for understanding Leahy et al. (2005); Fennell et al. (2017)	LT2, Final blog Oct 20
Week 8 Oct 25-29	Grading Provincial Mathematics Exams	Examine approaches to grading Explore evaluation of diploma exam questions	LT3, Oct 29

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.

LEARNING TASKS AND ASSESSMENT

Following are general description of the 3 required Learning Tasks for this course.
Specific guidelines for each will be discussed in class and posted on D2L when necessary.

1. **LEARNING TASK 1: Researching effective mathematics pedagogy (Group – 30%)**
   DUE: September 24, 2021

   You will work in groups of 4 to select and research a mathematics pedagogy topic to further develop your knowledge of effective planning and teaching of secondary school mathematics. Each group will select a different topic from a list of topics (on D2L) that address contemporary ideas and practices to teach mathematics meaningfully and with deep understanding. The research process will consist of exploring resources that include relevant course readings, journals for mathematics teachers, and online publications on teaching and learning secondary school mathematics.

   The research report could include text, math examples, visuals, media, and other supporting links for this inquiry and must include:

   i. The topic selected and rationale, the key ideas and practices found, connections or uses in the secondary mathematics classroom, questions or concerns that still remain, and references of all resources used in APA7 format.
   ii. A 30-minute instruction plan (professional development workshop) for teaching the topic to the rest of the class in an engaging way. It should be a thoughtful plan of how you will engage the members of your class to learn the topic based on your insights and learning; what you want them to know/learn about topic. You will be required to carry out the plan as part of Learning Task 2.

The report must be uploaded to D2L drop box by 11:59 pm on the due date.

CRITERIA FOR ASSESSMENT OF LEARNING TASK 1

The research report will be assessed on the following criteria:

• Quality of report, based on:
  informative design and design elements of report
  sufficiency of information provided
  significance and relevance of resources
  clarity of discussion/information
  coherent explanation to reflect collaboration and not isolated pieces of information
  correct use of APA7

• Quality of learning, based on:
  depth of understanding of ideas and practices and influence on your pedagogical practices based on substantive evidence
  Well-developed depth of understanding of the topic shown through credible and respected referenced connections between theory and practice
  Depth of insight, based on the quality, defensibility, and incisiveness of ideas and practices
  Appropriateness and meaningfulness of ideas and practices for secondary school mathematics
  Depth of engagement with resources based on level of substantive, high-quality evidence included

• Quality of instructional plan, based on:
  Constructive and thoughtful activities to engage the class
  Effectiveness of plan to engage class in learning key findings
  Clarity and sufficiency of information provided

LEARNING TASK 2: Reflecting on growth in pedagogical mathematics knowledge

Learner Blogs Due: Wednesday **September 29, October 6, and October 13** (midnight, D2L discussion forum)
Instructor Blogs Due: Friday **October 1, 8, and 15** (midnight, discussion forum)
Final Blog DUE: Wednesday **October 20, 2021** (midnight, D2L drop box)

The purpose of this learning task is for you to reflect on, and/or demonstrate, growth in your pedagogical mathematics knowledge that will or should inform your future practice. The two sub-purposes are:
First, given the importance of reflection in the role of a professional teacher, this task allows you to engage in such reflection in a community context with your peers to address your learning through the following activities;

Each group from LT1 will engage the class in learning selected ideas and/or practices they found in their research using the instruction plan they developed. The 30-minute workshop will occur on Sept 27, Oct 4, and Oct 11, with 2 groups per each date [depending on class size]. Following the workshop you will individually write reflective blogs based on the workshop experience in the roles of instructor and learner.

As learner, your blog addresses the following: What did you learn from your engagement in the workshop about the topic researched by the group that could enhance your knowledge for teaching and learning mathematics? How will it make a difference to your teaching? Pose at least 1 question or issue to the group to gain further knowledge or clarification about the topic.

These blogs are due on Sept 29, Oct 6, and Oct 13.
As instructor, your blog addresses the following: Provide a response to 2 different questions from 2 different blogs of 2 different learners. These blogs are due Oct 1, 8, and 15.

The blogs should be written from a personal perspective that allows you to connect directly with your readers, support knowledge building, and use relevant and varied evidence from the workshop experience. Blogs will be 250 - 300 words each.

Second, given the importance of students' thinking and mathematical tools (tasks and processes such as problem solving and modelling) to support mathematical thinking and learning, doing, and applying mathematics, this LT also allows you to demonstrate your conceptual understanding of some of these tools based on the course readings and in-class work. Working individually, you will reflect on a sample of student thinking and mathematics tasks and explain your thinking from a pedagogical perspective in the final blog.

The **final blog** is due on Oct 20. It must be submitted to **D2L drop box** by 11:59 pm on the due date. There are 2 parts to this entry:

i. Response to: What did you learn from carrying out the instructional plan and the blogs from peers about their learning from your group that could help you in your teaching? [200 words]
ii. Response to pedagogical task posted on D2L

CRITERIA FOR ASSESSMENT OF LEARNING TASK 2

The work will be assessed on the following criteria:

- Clear organization and explanation with appropriate length.
- Substantive, high-quality blogs that indicate original thinking and a willingness to reflect deeply.
- Insightful, thoughtful, meaningful explanation of what you learned about the topic of

mathematics pedagogy and anything you still want to know to enhance your pedagogical knowledge of the topic.
- Thoughtful, meaningful questions related to mathematics pedagogy.
- Constructive and thoughtful responses to questions posed to your LT1 group, supported by evidence from resources (appropriate APA 7).
- Relevant evidence from the workshop to support claims made and personal engagement in it.
- Appropriate consideration of participants as legitimate contributors to the shared goals of the knowledge building community.
- Appropriate interpretation and understanding of student thinking and mathematics tasks.

2. LEARNING TASK 3: Designing a Unit & Assessment Plan (40%) – DUE: October 29, 2021

For this assignment, you will work individually to design a unit-plan for supporting secondary school mathematics students' development and assessment of deep/conceptual understanding of a key mathematics concept from the Alberta mathematics program of study (G7-12). Further details and guidelines for designing the unit plan will be provided on D2L and discussed in class.

CRITERIA FOR ASSESSMENT OF LEARNING TASK 3

In collaboration with your peers and instructor, you will develop the assessment criteria and performance levels based on five key themes:

Build and deepen understanding Help develop strong learning tasks that focus students on issues, questions and problems central to the discipline.
Informed by disciplinary knowledge/ Programs of Study Makings meaningful connections to ways of thinking about the discipline, and in alignment with the Programs of Study in your disciplinary area.
Authentic and engaged learning Learning is meaningful and relevant to students and to the broader community, and that are of real concern and central to the discipline.
Balanced assessment Assessment of learning provides a comprehensive and holistic picture of student learning and competencies
Differentiated learning Addresses the diversity and range of students' needs

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 **at least one day prior to blog and response entries and two days prior to the final due date for each learning task.** 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. **Late assignments not approved by instructor will not be accepted.**

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
Students seeking an accommodation based on disability or medical concerns should contact Student Accessibility Services; SAS will process the request and issue letters of accommodation to instructors. For additional information on support services and accommodations for students with disabilities, visit www.ucalgary.ca/access/. Students who require an accommodation in relation to their coursework based on a protected ground other than disability should communicate this need in writing to their Instructor. The full policy on Student Accommodations is available at http://www.ucalgary.ca/policies/files/policies/student-accommodation-policy.pdf.

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 Kyle Corry, esa@ucalgary.ca.

Werklund SU Representative is Dwani Joshi, educrep@su.ucalgary.ca.