

EDUC 535.15: Specialization II – Secondary Mathematics
Fall, 2020

AB

Section	Instructor	Zoom Dates	Zoom Time	Email
S01	Olive Chapman	Sept. 14, 28; Oct. 5, 26	11:00am – 12:30pm	Chapman@ucalgary.ca

Class Dates: September 8 to October 30, 2020

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

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:

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, 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 a design-based and inquiry-focused approach. Student participation is crucial to the knowledge building in this course. Students are expected to participate in synchronous meetings organized as whole-class ZOOM sessions and in asynchronous conversations via the discussion forums in Desire2Learn (D2L). Assessment is both formative and summative based on rubrics for the three Learning Tasks. 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 READINGS:

- 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. [on D2L]
- 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=eh&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>
- 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 http://www.ascd.org/ASCD/pdf/siteASCD/publications/ASCD_UBD_whitepaper.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. [on D2L]
- 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. [available 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. [available online through U of C library] <http://www.jstor.org.ezproxy.lib.ucalgary.ca/stable/20876997>

SUGGESTED RESOURCES

- Galileo Educational Network (2019) *Math*. Available: <https://galileo.org/math-fairs/math-fair-problems/>
- Hamilton, G. (2017) *Math pickle*. Available: <http://mathpickle.com>
- National Council of Teachers of Mathematics: www.nctm.org
- Piggott, J. (2014). *Rich tasks and contexts*. Available at <http://nrich.maths.org/5662>

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://education.alberta.ca/media/3522313/toss2.pdf>
- 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-curriculumreview_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>

LEARNING TASKS OVERVIEW

LEARNING TASK	DESCRIPTION OF LEARNING TASK	GROUP/ INDIVIDUAL	WEIGHT	DUE DATE
LT1	Researching pedagogical content topics to further develop knowledge of effective teaching of secondary school mathematics	Group	40%	September 25, 2020
LT2	Designing a unit and assessment plan for AB PoS secondary mathematics concepts	Individual	40%	October 21, 2020
LT3	Inquiry of mathematics tools to further develop essential mathematics knowledge for teaching	Individual	20%	October 30, 2020

WEEKLY COURSE SCHEDULE:

Date	Topic	Readings and Tasks	Due Dates
Week 1 Sept 8-11	Developing understanding of mathematics and mathematics classroom culture.	Review: What mathematics is about and what mathematicians do; Mathematical thinking classrooms Review readings covered in Spec. I: Kilpatrick et al. (2001); National Council of Teachers of Mathematics [NCTM] (2000); Stockero, et al. (2011)	
Week 2 Sept 14-18	Developing deeper understanding of principles for teaching mathematics.	Zoom 1, September 14 Discuss LT1 Explore teaching mathematics concepts [choose readings from selected readings] NCTM (2014) principles to action	
Week 3 Sept 21-25	Identifying and critiquing key learning perspectives and intentions in Alberta Programs of Study	Compare front matter of AB program of study to NCTM Alberta education (2008, 2014); NCTM (2000, 2014)	Learning task 1, Sept 25
Week 4 Sept 28- Oct 2	Applying the Big Ideas that underpin the overarching learning objectives in mathematics	Zoom 2, September 28 Designing unit and assessment plan Discuss LT2 Rubric for LT2 Big ideas: Mason (2010); Kulberg et al. (2017); Schoenfeld et al. (2016)	

Week 5 Oct 5-9	Applying the Big Ideas that underpin the overarching learning objectives in mathematics	Zoom 3, October 5 Designing unit and assessment plan Inquiry teaching/learning McTighe & Wiggins (2014); Friesen et al. (2015) Discuss LT3	
Week 6 Oct 12-16	Applying the Big Ideas that underpin the overarching learning objectives in mathematics	Designing unit and assessment plan Assessing for understanding Leahy et al. (2005); Fennell et al. (2017)	
Week 7 Oct 19-23	Developing deeper understanding of mathematics tasks and processes.	Analyzing mathematical tasks for levels of cognitive demands and levels of competencies using theoretical guidelines Arbaugh & Brown (2004); Smith & Stein (1998) Explore mathematics problem solving versus mathematics modelling GAIMME (2016) Teaching problem solving Chapman (2018)	Learning task 2, Oct 21
Week 8 Oct 26-30	Developing deeper understanding of mathematics tasks and processes.	Zoom 4, October 26 Explore mathematics problem solving versus mathematics modelling Mason et al. (2010).	Learning task 3, Oct 30

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

There are 3 required Learning Tasks for this course.

1. LEARNING TASK 1: Researching effective pedagogy (40%) - DUE: September 25, 2020

Students will work in groups of 3 to research the teaching of mathematics concepts of their choice to further develop their knowledge of effective planning and teaching of secondary mathematics. Each group will investigate the concepts through research into resources within the discipline and through group discussion of personal experiences and observations. The concepts will be based on students' perceived challenges in teaching them based on past experience with learning/teaching mathematics, class discussion and readings, specialization 1, or field experiences and the teaching approach should be useful to the development of their longer-term unit plan (learning task 2) and future teaching. Elements of the project include:

1. Identifying meaningful mathematics concepts to research.
2. Researching online resources for alternative ways to teach concepts.
3. Preparing a report consisting of the concepts and rationale, key teaching ideas found (in your words), references used (minimum of 5 in addition to the AB program of studies) to be uploaded to D2L by 11:59 pm on the due date.

Note: Further details/clarification of these elements will be provided on D2L as needed.

CRITERIA FOR ASSESSMENT OF LEARNING TASK 1

The learning task will be assessed on the following criteria:

- Quality and meaningfulness of research topic (concepts) and resources used
 - Clarity of presentation of the topic (links to program of study)
 - Fullness of rationale for the topic
 - Meaningfulness to pre-service teachers within the discipline
 - Significance and relevance of resources; correct citation
- Quality and meaningfulness of findings
 - Level of engagement of students
 - Level of student-centeredness (mathematical inquiry-based)
 - Level of effectiveness for conceptual understanding
 - Conceptual differences in teaching approaches
- Overall presentation of findings
 - Organization, clarity, and depth of findings
 - Specificity of references made to resources
 - Effectiveness of writing to convey the brainstorming and key findings of the group
 - Strength of report of findings

Summary of Grading Based on Above Criteria

An A+ to A project will present a significant/excellent research topic with clear rationale and exceptional explication of findings that are organized, well written, and supported by appropriate number of references. The findings will contain approaches that are highly practical/useful and conceptually different and demonstrate high levels of engagement of students, student-centeredness (mathematical inquiry-based), and effectiveness for conceptual understanding.

An A- to B+ project will be guided by a good research topic with supporting rationale and good explication of findings that are organized, generally well written, and supported by some references. The findings will contain approaches that are moderately practical/useful and conceptually different and demonstrate very good levels of engagement of students, student-centeredness (mathematical inquiry-based), and effectiveness for conceptual understanding.

A B to C+ project will present a roughly sketched research topic in need of some refinement, a somewhat developed rationale, and findings that are lacking in some clarity, development, and/or references. The findings will contain approaches with a low level of usefulness and conceptual difference and demonstrate low levels of engagement of students, student-centeredness (mathematical inquiry-based), and effectiveness for conceptual understanding.

2. LEARNING TASK 2: Designing a Unit & Assessment Plan (40%) – DUE: October 21, 2020

For this assignment, students will work individually to design a unit learning plan, illustrative of key aspects of theory introduced in the course. The learning design and the theoretical framework supporting it will be posted online for analysis and “feedforward” suggestions from members of the class.

1. Designing a unit-plan for learning and assessment to sponsor deep understanding of a key disciplinary concept.
2. Including a rationale for the learning plan, as supported by theory and discipline.
3. Discussion of practicalities of enacting this learning and assessment plan: fitting it into a larger context/concept, integration of effective formative assessment strategies for scaffolding and adapting to the needs of diverse learners.

Note: Further details and guidelines for the Unit plan will be provided and discussed in class.

CRITERIA FOR ASSESSMENT OF LEARNING TASK 2

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

	Emergent	Satisfactory	Good	Outstanding
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 (including ELL				

strategies or integration).				
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3. LEARNING TASK 3: Inquiry of mathematical tools – DUE: October 30, 2020

Mathematical tools (tasks and processes such as problem solving and modelling) are central to mathematical thinking and to learning, doing, and applying mathematics. This learning task allows students to demonstrate their conceptual understanding of some of these tools based on the course readings. Students will be provided with a set of secondary school mathematical tools to conduct an inquiry of them. Working individually, students will:

1. Identify, with reason, which tools are high cognitive demand, genuine problem solving, and authentic modelling tasks.
2. Explain how to convert a specified task into a genuine problem solving and a modelling task.
3. Prepare a report to be uploaded to D2L by 11:59 pm on the due date.

Note: Further details/clarification of these elements will be provided on D2L as needed.

CRITERIA FOR ASSESSMENT OF LEARNING TASK 3

The report should:

- Present, clearly, all categories identified for each task
- Articulate clear, insightful and persuasive reasons for choice of categories
- Articulate clear, insightful explanation of conversion of task (item 2 above)
- Draw upon relevant evidence from the readings to support analysis and explanations
- Demonstrate an emerging understanding of these tasks, processes, and theories related to teaching mathematics
- Use an appropriate mode of expression and organization in a way that is clear and accurate.
- Include reference list in APA 6 or 7.

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.

LATE SUBMISSIONS

All late submissions of assignments must be discussed with the instructor **at least two days 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. **A penalty of 25% per day will apply for unexcused late submissions of assignments.**

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>

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 Jonah Secreti, jonah.secreti@ucalgary.ca, esa@ucalgary.ca.

Werklund SU Representative is Naomi Shaw, educrep@su.ucalgary.ca.