

EDUC 535.15: Specialization II – Secondary Mathematics
Fall, 2023

AB

Section	Instructor	Time	Location	Email
S01	Olive Chapman	12:00 – 3:50 pm	EDC 171	chapman@ucalgary.ca

Class Dates: Wednesday – September 5 to October 27, 2023

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:

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 course will be delivered face-to-face on campus with possible engagement in a D2L environment.

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]

Boaler, J. (2016a). *Mathematical Mindsets* [Chapter 3: Creativity and beauty in mathematics, pp. 21-32]. San Francisco, CA: Jossey-Bass. [on D2L]

<https://ebookcentral-proquest-com.ezproxy.lib.ucalgary.ca/lib/ucalgary-ebooks/detail.action?docID=4444210>

Boaler, J. (2016b). *Mathematical Mindsets*, [Chapter 5: Rich mathematical tasks, pp. 57-91]. Jossey-Bass. [on D2L] <https://ebookcentral-proquest-com.ezproxy.lib.ucalgary.ca/lib/ucalgary-ebooks/detail.action?docID=4444210>

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

Gu, F., Huang, R. & Gu, L. (2017). Theory and development of teaching through variation in mathematics in China. In R. Huang & Y. Li (Eds.) *Teaching and learning mathematics through variation: Confucian heritage meets westerns theories* (pp. 13-41). Rotterdam, Netherlands: Sense Publishers. <https://brill-com.ezproxy.lib.ucalgary.ca/display/book/9789463007825/BP000003.xml>

https://link-springer-com.ezproxy.lib.ucalgary.ca/chapter/10.1007/978-94-6300-782-5_2

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>

- 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]
- SanGiovanni, J., Katt, S., & Dykema, K. (2020). *Productive Math Struggle : A 6-Point Action Plan for Fostering Perseverance* (Chapter 1, pp. 8-28: Value productive struggle (pp. 8-28).. Corwin.
https://ezproxy.lib.ucalgary.ca/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=2524744&site=ehost-live&ebv=EB&ppid=pp_8
- *E-book licence permits only one online user at a time; please download/print ahead of schedule to avoid access issues**
- 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>
- Van de Walle, J.A., Karp, K.S., Bay-Williams, J.M., & McGarvey, L.M. (2022). *Elementary and middle school mathematics: Teaching Developmentally (6th Canadian ed.; Chapter 3: Mathematical inquiry through rich tasks and classroom discourse.)*. Pearson Canada. [pdf on D2L]

ADDITIONAL RESOURCES

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

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/mathteacmidscho>

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>

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	Creating mathematics task for conceptual understanding	Individual	30%	September 22, 2023
LT2	Creating script of inquiry-based discourse in a mathematics class	Group	30%	October 13, 2023
LT3	Designing a unit plan for AB PoS secondary mathematics concepts	Individual	40%	October 27, 2023

WEEKLY COURSE SCHEDULE:

Date	Topic	Readings and Tasks	Due Dates
Week 1 Sept 6	Mathematical tasks and activities for conceptual understanding and mathematical thinking	Discuss LT1 Engage in hands-on activities using concrete materials Engage in activities involving multiple representations Analyze tasks for levels of cognitive demands	

Week 2 Sept 13	Mathematical tasks and activities for conceptual understanding and mathematical thinking	Engage in hands-on activities using concrete materials Engage in activities involving multiple representations Analyze variation tasks Readings: Smith & Stein (1998) Arbaugh & Brown (2004) Boaler (2016b) Kullberg et al. (2017) Gu et al. (2017)	
Week 3 Sept 20	Mathematical tasks and activities for conceptual understanding and mathematical thinking	Discuss LT2 Engage in activities involving multiple representations Analyze tasks for problem solving and modelling Readings : Mason et al. (2010) GAIMME (2016)	LT 1; Sept 22
Week 4 Sept 27	Inquiry-based mathematics pedagogical strategies	Examine contemporary principles of mathematics education Examine: - verbs for doing mathematics in the Alberta mathematics program of study - key words for use in the Alberta diploma exam -mathematical processes Discuss inquiry-based pedagogy Readings: Alberta Education, 2008/2014) Boaler (2016a) NCTM (2000; 2014) Kilpatrick et al. (2001) Schoenfeld et al. (2016)	
Week 5 Oct 4	Inquiry-based mathematics pedagogical strategies	Discuss LT3 Discuss inquiry-based discourse Discuss productive struggle Interpret and assess student mathematical thinking Discuss class development of rubric for LT3 Readings: Stockero et al. (2011) Mason (2010) Van de Walle et al. (2022)	
Week 6 Oct 11	Inquiry-based mathematics pedagogical strategies Unit Plan	Discuss productive struggle and problem solving Develop rubric for LT3 with connection to unit planning Readings: Mason et al. (2010) SanGiovanni & Dykema (2020)	LT2 - Oct 13

Week 7 Oct 18	Unit plan	Examine/discuss components of unit plan design Complete rubric for unit plan Reading: McTighe & Wiggins (2014).	
Week 8 Oct 25	Grading Provincial Math Exams	Examine approaches to grading Explore evaluation of diploma exam questions	LT3, Oct 27

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.

Specific guidelines for each will be discussed in class and posted on D2L when necessary.

1. LEARNING TASK 1: Creating mathematics task for conceptual understanding (Individual – 30%)

DUE: September 22, 2023

You will work individually to create an inquiry-based task for conceptual understanding for a high school mathematics concept based on course discussions, activities, and readings. Your report must include the grade and concept from the Alberta Program of Study, the task, explanation of how/why the task is inquiry-based, and explanation of what conceptual understanding students will develop through the task.

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 work will be assessed on the following criteria:

Quality of task, based on:

- Appropriateness of the task for the high school grade
- Appropriateness of the mathematics concept
- Richness/originality of the task
- Inquiry-based, conceptual understanding potential of the task
- Clarity and sufficiency of description of the task

Quality of report, based on:

- Informative design of report
- Clarity and sufficiency of information provided
- Academic writing style
- Required length [words]
- Use of relevant references
- Correct use of APA7

Quality of learning, based on:

- Depth of understanding of an inquiry-based task for conceptual understanding
- Depth of understanding of students' conceptual understanding
- Skill demonstrated to create meaningful mathematics task

2. LEARNING TASK 2: Creating script of inquiry-based discourse in a mathematics class (Group – 30%)**DUE: October 13, 2023**

Working in groups of 3 or 4 depending on class size, you will compose a script of a mathematics lesson to demonstrate inquiry-based discourse in teaching a junior high school mathematics concept from the Alberta Program of Study. The script will be informed by class discussions, activities, and readings on mathematical discourse to teach and learn mathematics. The length of the script is dependent on the lesson. Guideline for the script will be provided and discussed in class. The script must be uploaded to D2L drop box by 11:59 pm on the due date.

CRITERIA FOR ASSESSMENT OF LEARNING TASK 2

The work will be assessed on the following criteria:

Quality of script, based on:

- Appropriateness of the lesson for the junior high school grade
- Appropriateness of the mathematics concept
- Richness, originality, credible flow of the lesson
- Realistic dialogues/thinking in the lesson
- Accuracy of mathematical suggestions by teacher
- Appropriateness of teacher's handling of students' mathematical thinking
- Clarity and sufficiency of description of the lesson
- Informative design of script
- Academic writing style
- Informed by course-work/readings [list of relevant references with correct use of APA7 attached]

Quality of learning, based on:

- Depth of understanding of inquiry-based discourse
- Depth of understanding of the roles of teacher and students in the discourse
- Depth of understanding of questions and prompts to guide the discourse
- Depth of understanding of use of student thinking in the discourse
- Depth of understanding of the flow of discourse in the lesson
- Skill in imagining an inquiry-based discourse lesson

3. LEARNING TASK 3: Designing a Unit Plan (40%) – DUE: October 27, 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 (G8-12). 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:

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

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 **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

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](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 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.