

**EDUC 460.22: Specialization I K-12 Mathematics  
Summer, 2024**

Class Dates: Monday through Friday, July 8, 2024-July 19, 2024

Office Hours: By appointment only

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.

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 course is to introduce students to the concepts, theory and design planning related to teaching within the specialization of 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:**

Over the course 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.

**REQUIRED RESOURCES:**

Alberta Education (2022). *Program of Study: Mathematics Kindergarten to Grade 6 Curriculum*. Edmonton: Government of Alberta. <https://curriculum.learnalberta.ca/curriculum/en/s/mat>

Alberta Education (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](https://education.alberta.ca/media/3115252/2016_k_to_9_math_pos.pdf)

- Alberta Education (2008). *Program of Study: Mathematics Grade 10-12*. Edmonton: Government of Alberta.  
<https://education.alberta.ca/media/564028/math10to12.pdf>
- Boaler, J. (2016). *Mathematical Mindsets* [Chapter 3, 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>
- Kilpatrick, J., Swafford, J., & Bradford, F. (2001a). The stands of mathematical proficiency. In *Adding it up: Helping children learn mathematics* (pp. 115-155). National Academy Press.  
<https://www.nap.edu/catalog/9822/adding-it-up-helping-children-learn-mathematics>  
*Also available in LCR*  
<https://ebookcentral-proquest-com.ezproxy.lib.ucalgary.ca/lib/ucalgary-ebooks/reader.action?docID=3375421&ppg=136>
- Gilbert, J. M. & Coomes, J. (February 2010). What Mathematics Do High School Teachers Need to Know? *The Mathematics Teacher*, 103(6), 418-423. [UC library] [What Mathematics Do High School Teachers Need to Know? on JSTOR \(ucalgary.ca\)](#)
- 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>  
*Also available in LCR:*  
<https://ezproxy.lib.ucalgary.ca/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=ehh&AN=10191133&site=ehost-live>
- Ontario. (2014). *Paying attention to spatial reasoning*. Government of Ontario. <http://thegamesmethod.com/wp-content/uploads/2015/04/LNSPayingAttention.pdf>
- Van de Walle, J.A., Karp, K.S., Bay-Williams, J.M., & McGarvey, L.M. (2022). Chapter 1: Teaching and learning mathematics in the twenty-first century. *Elementary and middle school mathematics: Teaching Developmentally (6<sup>th</sup> Canadian ed.)*. Pearson Canada. Pp. 1-13  
[https://ucalgary.alma.exlibrisgroup.com/leganto/public/01UCALG\\_INST/citation/22799733150004336?auth=SAML](https://ucalgary.alma.exlibrisgroup.com/leganto/public/01UCALG_INST/citation/22799733150004336?auth=SAML)
- Van de Walle, J.A., Karp, K.S., Bay-Williams, J.M., & McGarvey, L.M. (2022). Chapter 3: Mathematical inquiry through rich tasks and classroom discourse. *Elementary and middle school mathematics: Teaching Developmentally (6<sup>th</sup> Canadian ed.)*. Pearson Canada. Pp. 35-55  
[https://ucalgary.alma.exlibrisgroup.com/leganto/public/01UCALG\\_INST/citation/22799733220004336?auth=SAML](https://ucalgary.alma.exlibrisgroup.com/leganto/public/01UCALG_INST/citation/22799733220004336?auth=SAML)
- Van de Walle, J.A., Karp, K.S., Bay-Williams, J.M., & McGarvey, L.M. (2022). Chapter 4: Preparing to teach and planning for mathematics learning. *Elementary and middle school mathematics: Teaching Developmentally (6<sup>th</sup> Canadian ed.)*. Pearson Canada. pp. 57-76  
[https://ucalgary.alma.exlibrisgroup.com/leganto/public/01UCALG\\_INST/citation/22799733290004336?auth=SAML](https://ucalgary.alma.exlibrisgroup.com/leganto/public/01UCALG_INST/citation/22799733290004336?auth=SAML)

#### ADDITIONAL RESOURCES:

- Aikenhead, G. (2017). Educational contexts. In *School mathematics for reconciliation: From a 19th to a 21st century curriculum* (pp.14-26). Aboriginal Education Research Center.  
<https://education.usask.ca/documents/profiles/aikenhead/School-Mathematics-for-Reconciliation-vB11.pdf>
- Alberta Education (2008). Assessment in mathematics. Available online at:  
<http://www.learnalberta.ca/content/mewa/html/assessment/index.html>
- Alberta Education (2010). *Making a difference: Meeting diverse learning needs with differentiated instruction*.  
<https://open.alberta.ca/publications/9780778586012>

- Boaler, J. (2016). *Mathematical Mindsets* [Chapter 3, 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>
- Kilpatrick, J., Swafford, J., & Bradford, F. (2001b). Teaching for mathematical proficiency. In *Adding it up: Helping children learn mathematics* (pp. 313-368). National Academy Press.  
<https://www.nap.edu/catalog/9822/adding-it-up-helping-children-learn-mathematics>  
*Also available in LCR:*  
<https://ebookcentral-proquest-com.ezproxy.lib.ucalgary.ca/lib/ucalgary-ebooks/reader.action?docID=3375421&ppg=334>
- Liljedahl, P. (2021). How we foster student autonomy in a thinking classroom. In *Building thinking classrooms in mathematics, Grades K-12: 14 teaching practices for enhancing learning* (pp. 132-142). Corwin  
[https://ezproxy.lib.ucalgary.ca/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=2637712&site=ehost-live&ebv=EB&ppid=pp\\_132](https://ezproxy.lib.ucalgary.ca/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=2637712&site=ehost-live&ebv=EB&ppid=pp_132)  
*\*E-book licence permits only one online user at a time; please download/print chapter ahead of schedule to avoid access issues.*
- Liljedahl, P. (2021). How we use formative assessment in a thinking classroom. In *Building thinking classrooms in mathematics, Grades K-12: 14 teaching practices for enhancing learning* (pp. 230-251). Corwin.  
[https://ezproxy.lib.ucalgary.ca/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=2637712&site=ehost-live&ebv=EB&ppid=pp\\_230](https://ezproxy.lib.ucalgary.ca/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=2637712&site=ehost-live&ebv=EB&ppid=pp_230)  
*\*E-book licence permits only one online user at a time; please download/print chapter ahead of schedule to avoid access issues*
- Liljedahl, P. (2021). How we use hints and extensions in a thinking classroom. In *Building thinking classrooms in mathematics, Grades K-12: 14 teaching practices for enhancing learning* (pp. 144-169). Corwin  
[https://ezproxy.lib.ucalgary.ca/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=2637712&site=ehost-live&ebv=EB&ppid=pp\\_144](https://ezproxy.lib.ucalgary.ca/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=2637712&site=ehost-live&ebv=EB&ppid=pp_144)  
*\*E-book licence permits only one online user at a time; per day, a user may print to PDF up to 100 pages*
- Mathigon. (2020). *Polypad*. UCL Institute of Education in London. <https://mathigon.org/polypad> [virtual math manipulatives]
- Mc Tighe, J. & Wiggins, G. (2014). *Improve curriculum, assessment, and instruction using the understanding by design framework*. ASCD White Paper. <https://www.jaymctighe.com/wp-content/uploads/2011/04/UbD-White-Paper-June-20141.pdf>
- SFUSD Math (2016). Visual Model Progressions. <http://www.sfusdmath.org/visual-model-progressions.html>
- The Common Curriculum Framework for K-9 Mathematics  
<https://open.alberta.ca/publications/3949146>
- Van de Walle, J.A., Karp, K.S., Bay-Williams, J.M., & McGarvey, L.M. (2022). *Elementary and middle school mathematics: Teaching Developmentally (6<sup>th</sup> Canadian ed.)*. Pearson Canada.  
*\*Note: Electronic version of this text includes multiple classroom videos and downloadable teacher resources – cost \$49.00 [Teacher Education \(pearson.com\)](https://www.pearson.com/store/p/van-de-walle---elementary-and-middle-school-mathematics-sixth-canadian-edition/P100003049904/9780137435135) Hard copy of older versions available in Doucette Library.  
<https://www.pearson.com/store/p/van-de-walle---elementary-and-middle-school-mathematics-sixth-canadian-edition/P100003049904/9780137435135>*

**LEARNING TASKS OVERVIEW**

LEARNING TASK	DESCRIPTION OF LEARNING TASK	GROUPING	WEIGHT	DUE DATE
1	Analysis of a Learning Design and Assessment Plan	Individual	20%	Friday, July 12
2	Developing Conceptual Understandings of Math Concepts (Mathematics Knowledge for Teaching)	Groups	40%	July 15 <sup>th</sup> -19 <sup>th</sup> (sign-up for date)
3	Creation of Short-term Learning and Assessment Plan	Individual	40%	Wednesday, July 24th

**WEEKLY COURSE SCHEDULE:**

Date	Topics	Readings	Due Dates
Day 1 Mon., July 8	Introduction: Mathematics Teaching and Learning  Essential Question: <i>What is mathematics, and why does it matter?</i>	Van de Walle, J.A., Karp, K.S., Bay-Williams, J.M., & McGarvey, L.M. (2022). Chapter 1: Teaching and learning mathematics in the twenty-first century. <i>Elementary and middle school mathematics: Teaching Developmentally (6<sup>th</sup> Canadian ed.)</i> . Pearson Canada. <a href="https://ucalgary.alma.exlibrisgroup.com/leganto/public/01UCALG_INST/citation/22799733150004336?auth=SAML">https://ucalgary.alma.exlibrisgroup.com/leganto/public/01UCALG_INST/citation/22799733150004336?auth=SAML</a>  Boaler, J. (2016). <i>Mathematical Mindsets</i> [Chapter 3, pp. 21-32]. San Francisco, CA: Jossey-Bass. [on D2L] <a href="https://ebookcentral-proquest-com.ezproxy.lib.ucalgary.ca/lib/ucalgary-ebooks/detail.action?docID=4444210">https://ebookcentral-proquest-com.ezproxy.lib.ucalgary.ca/lib/ucalgary-ebooks/detail.action?docID=4444210</a>	
Day 2 Tues., July 9	Mathematical Proficiency and Curriculum Introduction  Essential Question: <i>What constitutes the learning of mathematics?</i>	Kilpatrick, J., Swafford, J., & Bradford, F. (2001a). The strands of mathematical proficiency. In <i>Adding it up: Helping children learn mathematics</i> (pp. 115-155). National Academy Press. <a href="https://www.nap.edu/catalog/9822/adding-it-up-helping-children-learn-mathematics">https://www.nap.edu/catalog/9822/adding-it-up-helping-children-learn-mathematics</a>  Alberta Education (2016). <i>Program of Study: Mathematics Kindergarten to Grade 9</i> . Edmonton: Government of Alberta. <a href="https://education.alberta.ca/media/3115252/2016_k_to_9_math_pos.pdf">https://education.alberta.ca/media/3115252/2016_k_to_9_math_pos.pdf</a>  Alberta Education (2008). <i>Program of Study: Mathematics Grade 10-12</i> . Edmonton: Government of Alberta. <a href="https://education.alberta.ca/media/564028/math10to12.pdf">https://education.alberta.ca/media/564028/math10to12.pdf</a>	
Day 3 Wed., July 10	Mathematical Inquiry, Rich Math Tasks, and Mathematical Discourse  Essential Question: <i>What constitutes the teaching of mathematics?</i>	Van de Walle, J.A., Karp, K.S., Bay-Williams, J.M., & McGarvey, L.M. (2022). Chapter 3: Mathematical inquiry through rich tasks and classroom discourse. <i>Elementary and middle school mathematics: Teaching Developmentally (6<sup>th</sup> Canadian ed.)</i> . Pearson Canada. <a href="https://ucalgary.alma.exlibrisgroup.com/leganto/public/01UCALG_INST/citation/22799733220004336?auth=SAML">https://ucalgary.alma.exlibrisgroup.com/leganto/public/01UCALG_INST/citation/22799733220004336?auth=SAML</a>	

		<p>Jaworski, B. (2015). Teaching for mathematical thinking: Inquiry in mathematics learning and teaching. <i>Mathematics Teaching</i>, 248, 28-34.  <a href="https://www.atm.org.uk/write/MediaUploads/Journals/MT248/MT248-15-11.pdf">https://www.atm.org.uk/write/MediaUploads/Journals/MT248/MT248-15-11.pdf</a></p> <p><i>Also available in LCR:</i>  <a href="https://ezproxy.lib.ucalgary.ca/login?url=https://search.ebscohost.com/login.aspx?direct=true&amp;db=ehh&amp;AN=110191133&amp;site=ehost-live">https://ezproxy.lib.ucalgary.ca/login?url=https://search.ebscohost.com/login.aspx?direct=true&amp;db=ehh&amp;AN=110191133&amp;site=ehost-live</a></p>	
Day 4 Thur., July 11	<p>Mathematical Thinking and Spatial Reasoning</p> <p>Essential Question: <i>How can spatial reasoning be promoted in the mathematics classroom?</i></p>	<p>Ontario. (2014). <i>Paying attention to spatial reasoning</i>. Government of Ontario.  <a href="http://thegamesmethod.com/wp-content/uploads/2015/04/LNSPayingAttention.pdf">http://thegamesmethod.com/wp-content/uploads/2015/04/LNSPayingAttention.pdf</a></p>	
Day 5 Fri., July 12	<p>Mathematics Knowledge for Teaching</p> <p>Essential Question: <i>How can learning be designed with concreteness fading in mind?</i></p>	<p>Optional: Liljedahl, P. (2021). How we use hints and extensions in a thinking classroom. In <i>Building thinking classrooms in mathematics, Grades K-12: 14 teaching practices for enhancing learning</i> (pp. 144-169). Corwin  <a href="https://ezproxy.lib.ucalgary.ca/login?url=https://search.ebscohost.com/login.aspx?direct=true&amp;db=nlbk&amp;AN=2637712&amp;site=ehost-live&amp;ebv=EB&amp;ppid=pp_144">https://ezproxy.lib.ucalgary.ca/login?url=https://search.ebscohost.com/login.aspx?direct=true&amp;db=nlbk&amp;AN=2637712&amp;site=ehost-live&amp;ebv=EB&amp;ppid=pp_144</a></p> <p><i>*E-book licence permits only one online user at a time; per day, a user may print to PDF up to 100 pages</i></p>	LT1 Due Fri., July 12 <sup>th</sup>
Day 6 Mon., July 15	<p>Lesson Design</p> <p>Essential Question: <i>How can key components of Understanding by Design be applied to create learning and assessment plans?</i></p>	<p>Van de Walle, J.A., Karp, K.S., Bay-Williams, J.M., &amp; McGarvey, L.M. (2022). Chapter 4: Preparing to teach and planning for mathematics learning. <i>Elementary and middle school mathematics: Teaching Developmentally (6<sup>th</sup> Canadian ed.)</i>. Pearson Canada.  <a href="https://ucalgary.alma.exlibrisgroup.com/leganto/public/01UCALG_INST/citation/22799733290004336?auth=SAML">https://ucalgary.alma.exlibrisgroup.com/leganto/public/01UCALG_INST/citation/22799733290004336?auth=SAML</a></p> <p>Additional: Mc Tighe, J. &amp; Wiggins, G. (2014). <i>Improve curriculum, assessment, and instruction using the understanding by design framework</i>. ASCD White Paper.  <a href="https://files.ascd.org/staticfiles/ascd/pdf/siteASCD/publications/ASCD_UBD_whitepaper.pdf">https://files.ascd.org/staticfiles/ascd/pdf/siteASCD/publications/ASCD_UBD_whitepaper.pdf</a></p>	LT2 Due July 15 <sup>th</sup> - July 19 <sup>th</sup> (sign up for date of presentation)
Day 7 Tues., July 16	<p>Lesson Design</p> <p>Essential Question: <i>How can key components of Understanding by Design be applied to</i></p>	<p>Alberta Education (2016). <i>Program of Study: Mathematics Kindergarten to Grade 9</i>. Edmonton: Government of Alberta.  <a href="https://education.alberta.ca/media/3115252/2016_k_to_9_math_pos.pdf">https://education.alberta.ca/media/3115252/2016_k_to_9_math_pos.pdf</a></p>	



	<i>create learning and assessment plans?</i>	Alberta Education (2008). <i>Program of Study: Mathematics Grade 10-12</i> . Edmonton: Government of Alberta. <a href="https://education.alberta.ca/media/564028/math10to12.pdf">https://education.alberta.ca/media/564028/math10to12.pdf</a>	
Day 8 Wed., July 17	Inquiry-based student-centered teaching/learning of mathematics  Essential Question: <i>What does it mean to be a teacher of diversity?</i>	Optional: Kilpatrick, J., Swafford, J., & Bradford, F. (2001b). Teaching for mathematical proficiency. In <i>Adding it up: Helping children learn mathematics</i> (pp. 313-368). National Academy Press. <a href="https://www.nap.edu/catalog/9822/adding-it-up-helping-children-learn-mathematics">https://www.nap.edu/catalog/9822/adding-it-up-helping-children-learn-mathematics</a> <i>Also available in LCR:</i> <a href="https://ebookcentral-proquest-com.ezproxy.lib.ucalgary.ca/lib/ucalgary-ebooks/reader.action?docID=3375421&amp;ppg=334">https://ebookcentral-proquest-com.ezproxy.lib.ucalgary.ca/lib/ucalgary-ebooks/reader.action?docID=3375421&amp;ppg=334</a>	
Day 9 Thur., July 18	Mathematics Knowledge for Teaching Essential Question: <i>How can the responsibility for learning be shifted from the teacher to the students?</i>	Liljedahl, P. (2021). How we foster student autonomy in a thinking classroom. In <i>Building thinking classrooms in mathematics, Grades K-12: 14 teaching practices for enhancing learning</i> (pp. 132-142). Corwin <a href="https://ezproxy.lib.ucalgary.ca/login?url=https://search.ebscohost.com/login.aspx?direct=true&amp;db=nlbk&amp;AN=2637712&amp;site=ehost-live&amp;ebv=EB&amp;ppid=pp_144">https://ezproxy.lib.ucalgary.ca/login?url=https://search.ebscohost.com/login.aspx?direct=true&amp;db=nlbk&amp;AN=2637712&amp;site=ehost-live&amp;ebv=EB&amp;ppid=pp_144</a> <i>*E-book licence permits only one online user at a time; per day, a user may print to PDF up to 100 pages</i>	
Day 10 Fri., July 19	Incorporating Indigenous Ways of Knowing  Essential Question: <i>How can mathematics be taught in relationship with Indigenous Ways of Knowing?</i>	Additional: Aikenhead, G. (2017). Educational contexts. In <i>School mathematics for reconciliation: From a 19th to a 21st century curriculum</i> (pp. 14-26). Aboriginal Education Research Center. <a href="https://education.usask.ca/documents/profiles/aikenhead/School-Mathematics-for-Reconciliation-vB11.pdf">https://education.usask.ca/documents/profiles/aikenhead/School-Mathematics-for-Reconciliation-vB11.pdf</a>	LT 3 Due Wednesday July 24 <sup>th</sup>

**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: Analysis of a Learning Design and Assessment Plan-DUE: Friday, July 12<sup>th</sup>**

For this assignment, independently, you will analyze a learning design and assessment plan (lesson plan) that you have found online. The purposes will be to foster professional learning conversations and build knowledge about the features of well-designed, discipline-based learning and assessment plans. You will provide a three-to-five-page (double-spaced, 12-point font) critical review of the chosen learning design and assessment plan.

**CRITERIA FOR ASSESSMENT OF LEARNING TASK 1**

Criteria	A to A+ Meets all and exceeds some requirements	B+ to A- Meets all requirements	B- to B Meets most requirements	Does not meet requirements
<b>Assessment of Learning Plan</b> -addresses the elements of a learning plan as listed in the assignment description	All elements of a learning plan are addressed in a thorough, detailed, and well-supported assessment.	Some elements of a learning plan are addressed in a thorough, detailed, and well-supported assessment. Others require strengthening.	Some elements of a learning plan are addressed, however the assessment is vague and examples are inappropriate, unspecific, or few.	Some of the elements of a learning plan are not addressed at all or are addressed in a cursory manner.
<b>Grounding in Theory</b> -makes connections to theories of learning and Programs of Study. Explains these connections.	Makes multiple connections to the literature, including the Program of Study. Theoretical positioning is highly effective, and well-explained.	Makes some connections to the literature, sometimes including the Program of Study. Theoretical positioning is usually effective, and well-explained. Some connections require strengthening.	Makes few connections to the literature, or Program of Study. Theoretical positioning is sometimes inappropriate and under explained.	Connections to theory and/or Program of Study are missing, incomplete, or made in a cursory manner.
<b>Presentation of ideas</b> -3-5 pages, double-spaced -academic writing style -APA in-text citations and reference list -attention to form (grammar, spelling, etc.)	-Paper is 3-5 pages. -Writing style is academic. In-text citations and reference list use correct APA 7 <sup>th</sup> edition style. Paper demonstrates superior attention to form.	-Paper is 3-5 pages. -Writing style is primarily academic. Most in-text citations and reference list use correct APA 7 <sup>th</sup> edition style. Paper mostly demonstrates attention to form.	-Paper is 3-5 pages. -Writing style is sometimes academic, sometimes informal. Some in-text citations and reference list use correct APA 7 <sup>th</sup> edition style. Paper requires attention to form.	-Paper is exceeds 5 pages or is less than 3. -Writing style is informal. In-text citations and reference list are missing or not in APA style. Paper requires extensive editing in order to attend to form.

**Resources:**

Alberta Assessment Consortium (Username: teachers Password: master)

Doucette Library – Library guide for lesson planning: [https://library.ucalgary.ca/guides/lesson\\_planning\\_resources](https://library.ucalgary.ca/guides/lesson_planning_resources)

**2. LEARNING TASK 2: *Developing Conceptual Understanding of Math Concepts (Mathematics Knowledge for Teaching)* – Due: July 15<sup>th</sup> through July 19<sup>th</sup> (sign-up for presentation dates.)**

The intent of this group learning task is for you to foster a professional conversation and learning experience focused on pedagogical content knowledge within math education. You will select one mathematical concept, for example, solving equations in grade 7, and delve into how the concept should be taught using the concreteness fading approach. Concreteness fading involves starting with concrete materials (manipulatives), moving to pictorial representation, and

then representing the mathematics symbolically. Your presentation should focus on how this approach can be used to effectively teach the chosen mathematical concept to students.

You will present your work as a 45-minute Professional Development workshop for teachers.

**-Presentation length:** 45 minutes (30 min interactive workshop, 15 min. Q & A)

**-Audience:** The target audience for the workshop should be math teachers

**-Concreteness Fading Approach:** The presentation should explain how concreteness fading can be used effectively to teach the chosen mathematical concept and will include a series of math problems/tasks (not lesson plans) that would support each stage of understanding. Participant use of mathematics manipulatives must be included in the concrete tasks.

**-Presentation format:** Specifics will be at the discretion of the presenters.

**-Written component:** A brief written component (i.e., speaking notes, PowerPoint presentation, or some other record of the ideas presented) along with references (APA 7th ed.) must be submitted to D2L-Dropbox by 12pm the day of your presentation.

### CRITERIA FOR ASSESSMENT OF LEARNING TASK 2

Criteria	A to A+ Meets all and exceeds some requirements	A- to B+ Meets all requirements	B to B- Meets most requirements.	Does not meet requirements
<b>Concreteness Fading Approach</b>				
<b>-selects tasks and manipulatives that support the conceptual understanding of the topic</b>	The presentation effectively demonstrates how concreteness fading can be used to teach the chosen mathematical concept, with a clear flow between each stage (concrete, pictorial, symbolic). The math problems/tasks presented effectively support each stage of understanding and include participant use of mathematics manipulatives.	The presentation generally demonstrates how concreteness fading can be used to teach the chosen mathematical concept, with a basic explanation of each stage (concrete, pictorial, symbolic). The math problems/tasks presented somewhat support each stage of understanding and include some participant use of mathematics manipulatives.	The presentation somewhat demonstrates how concreteness fading can be used to teach the chosen mathematical concept, with an incomplete explanation of each stage (concrete, pictorial, symbolic). The math problems/tasks presented somewhat support each stage of understanding and include limited participant use of mathematics manipulatives.	The presentation does not effectively demonstrate how concreteness fading can be used to teach the chosen mathematical concept, with little or no explanation of each stage (concrete, pictorial, symbolic). The math problems/tasks presented do not effectively support each stage of understanding and do not include participant use of mathematics manipulatives.
<b>Grounding in Theory</b>				
<b>-makes strong connections amongst the tasks, theories of learning, and Program of Study</b>	Makes multiple connections to the literature, including the Program of Study. Relation of theory to practice is highly evident, and well-explained.	Makes some connections to the literature, sometimes including the Program of Study. Relation of theory to practice is somewhat evident, and well-explained. Some connections require strengthening.	Makes few connections to the literature, or Program of Study. Relation of theory to practice is sometimes inappropriate and under explained.	Connections to theory and/or Program of Study are missing, incomplete, or made in a cursory manner.



Effectiveness of Presentation				
<p><b>-engages participants in the doing of mathematics, and helps them develop their mathematical knowledge for teaching (MKT)</b></p>	<p>Presentation is creative, highly engaging, and effective.</p> <p>Presentation flows between tasks and ideas with logical progression.</p> <p>Audience is provided with an effective summary of essential understandings.</p>	<p>Overall presentation is appealing and supports the basic development of conceptual ideas.</p> <p>Presentation generally flows between tasks and ideas with logical progression.</p> <p>Audience is provided with a basic summary of essential understandings.</p>	<p>Presentation is adequate but somewhat limited in the development of conceptual ideas.</p> <p>Presentation is somewhat disjointed and does not adequately assist participant understanding.</p> <p>Summary does not effectively support participants in essential understandings.</p>	<p>The presentation does not have coherent development of conceptual ideas.</p> <p>Presentation requires greater organization and clarity.</p> <p>Audience is not provided with a summary.</p>

### 3. LEARNING TASK 3: Creation of Short-term Learning and Assessment Plan – DUE: Wednesday, July 24<sup>th</sup>

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 mathematics concept (from your choice of learning outcomes Kindergarten to Grade 12).

Working individually, you will select a mathematics concept from the Alberta Mathematics Program of Studies (K-12) and design ONE lesson plan for an 80-minute class (for Secondary) or TWO lessons of 35-40 minutes (For Elementary or Junior High). You must plan for learning and assessment that promote mathematical thinking and deep understanding of the concept. Your learning and assessment plan will be submitted using a lesson plan template adapted from Wiggins and McTighe (1998). The template will be provided. In addition to the lesson plan, you will provide rationale for your thinking and decision-making processes relevant to developing the lesson plan. Rationale could include references to the course readings, class discussions, and other sources.

#### CRITERIA FOR ASSESSMENT OF LEARNING TASK 3

Criteria	A to A+ Meets all and exceeds some requirements	B+ to A- Meets all requirements	B- to B Meets most requirements	Does not meet requirements
<b>DESIGN</b> <b>Curricular Outcomes</b>  <b>-links to Program of Study (PoS)</b>	Appropriate links to PoS for chosen level; clear understanding of curricular outcomes as expressed in POS	Some links to PoS for chosen level are clear and appropriate; some PoS curricular outcomes are represented in lesson plan	Links to PoS for chosen level not clear or appropriate; curricular outcomes present but not clearly articulated	Few if any links provided between PoS and lesson elements; curricular outcomes not present
<b>INSTRUCTIONAL DELIVERY</b>  <b>-plan demonstrates disciplinary knowledge, engagement, student-centeredness, organization, integration across lesson sections</b>	Lesson Plan is well informed by disciplinary knowledge; lesson highly engaging; lesson is clearly student-centered; lesson clear and well-ordered; easy to envision how lesson will unfold; all important elements included; high degree of integration sections and excellent links	Good evidence of carryover of disciplinary knowledge to lesson plan; lesson is somewhat engaging mostly student-centered; good attempt to integrate parts of the lesson; lesson plan mostly clear and logical flow; most important elements included	Some evidence that disciplinary knowledge informed creation of lesson plan; lesson is somewhat student-centered but needs to be strengthened; lesson plan flow is neither clear nor logical and is hard to follow; several important elements of good lesson plan are missing	Little evidence that disciplinary knowledge informed creation of plan; lesson is teacher-centered; lesson plan is missing important elements and does not flow well (hard for reader to imagine how the lesson would unfold)
<b>DEEP UNDERSTANDING</b>  <b>-learning opportunities for deep understanding of</b>	Lesson design (inquiry tasks) is highly effective for supporting deep/ conceptual understanding of content objectives by students	Lesson design (tasks) provides good opportunities to encourage deep/ conceptual understanding by students	Lesson design (tasks) shows awareness of importance of encouraging deep understanding by students but not effective in achieving that understanding	Absence of evidence of attempt to encourage deep understanding by students

<b>curriculum objectives</b>				
<b>ASSESSMENT</b>  -integrated formative assessments -statement of how assessment will improve practice	Appropriate assessments are clearly integrated into lesson; clearly communicates to students how individual tasks fit in. Uses a variety of effective formative assessments to inform instructional decisions and to improve practice; strong statement of how assessment will improve practice	Good effort to integrate appropriate and effective assessments; Shows some variety in choices for formative assessment – most are effective; clear statement of how assessments will improve practice	Some attempt to include appropriate assessment opportunities; shows lack of understanding of what constitutes effective assessment; no communication to students of how to situate their work. Formative assessment options are limited and not effective; does not address how assessment will lead to improved practice	Assessment lacking; no understanding shown of importance of appropriate and effective assessment; clear lack of direction for students. Unclear vision of how to include assessment; discussion of importance of assessment or how it can be used to improve practice needs to be strengthened/ revised
<b>RATIONALE</b>  -depth of analysis/ understanding	Rationale displays an excellent understanding of the relationships of theory to practice.	Rationale displays a good understanding of the relationships of theory to practice.	Rationale displays a partial understanding of the relationships of theory to practice.	Rationale displays little understanding of the relationships of theory to practice.
<b>WRITING QUALITY</b>	The lesson plan and rationale are clearly written and stand as a superior example free of errors.	The lesson plan and rationale are relatively clearly written and contains few errors.	The lesson plan and rationale are somewhat unclearly written and contains errors that impede understanding.	The lesson plan and rationale are unclearly written and contains many errors that impede understanding.
<b>REFERENCES</b>	Clearly stated; Accurately APA7 referenced	Stated; APA 7 referenced with minor errors	Unclear; referenced but not to APA 7 guidelines	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>

*\*Please note that all assignments are expected to be the original work of the student and students are not to employ text generation software (for example, ChatGPT).*

### 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**

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/](http://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 Claire Gillis, [esa@ucalgary.ca](mailto:esa@ucalgary.ca).

**Werklund SU Representative** is TBA, [educrep@su.ucalgary.ca](mailto:educrep@su.ucalgary.ca).