Western Education

Transforming Education. Transforming Lives.

EDUC 5485

Designing Aesthetic Experiences For Young Mathematicians

Instructors:

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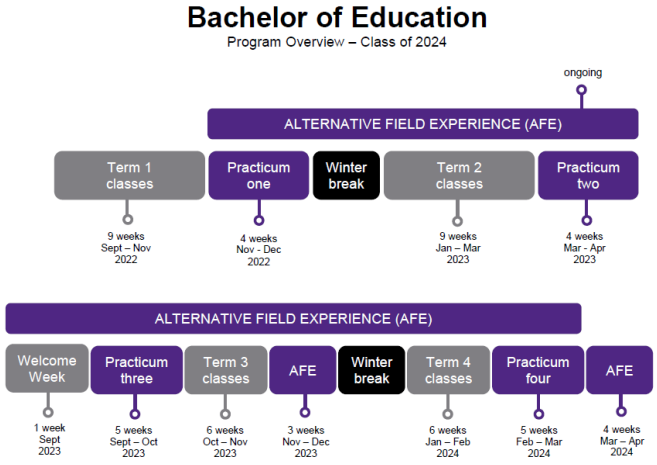
Schedule:

Section 001: Thursday, 4:30-6:30 PM
Room: 2046

Program Context:

This is a **Specialty Course** taken by Teacher Candidates in **Mathematics Specialty** during **Year 1 and Full Term** of the Bachelor of Education.



BEd Course (EDU 5485)

Teacher candidates will engage in arts informed design of mathematics learning experiences, based on personal interests and needs, and perceived mathematics learning needs of Primary/Junior students. Teacher candidates will develop a capacity for addressing the "artistic puzzle" of making mathematics learning experience a "story" worthy of human attention. 2 hours per week, full year, .5 credit.

The teacher candidates in this course will begin to learn how to design aesthetic mathematical experiences for primary and junior students that include the following:

- a beautiful mathematical idea
- an engaging story about a mathematics concept
- a surprise or wonder at the way a problem could be solved in many ways
- excitement for learning math concepts
- solving problems in novel and creative ways
- working cooperatively to develop understanding
- investigating mathematics links to the world around them

Number of Weeks: 18

Week 1: Introduction to Course, Assignments & Each Other

• Introductions

- What's Changed in Mathematics
- How has the pandemic changed education
- Teaching Strategies
- Amazing Race
- Bitmoji Classroom
- Who is a Mathematician? What is Math Aesthetics? What are myths or misconceptions of mathematics?
- Which one doesn't belong? (WODB)

Learning Activities

Type	Name	Description
Reading	Week 1 Viewing	Briscoe, L., & Van Kesteren, J. (2018). The Art of Math. Retrieved from https://www.youtube.com/watch?v=CoM1K_k9ZlY; Biniarz, L. (2018). Can Math + Art co-exist. The Drive. Retrieved from https://www.thedrivemagazine.com/posts/can-math-art-co-exist; Broadie, I (2018). Why the Arts & Mathematics? Retrieved from https://mathiest.wordpress.com/

Week 2: Curriculum and Pedagogy in Mathematics

- How do you feel about teaching math? How is it beautiful?
- PMI: Positive Minus Interesting
- Which one doesn't belong (WODB) and estimation jars
- New math curriculum: coding

Learning Activities

Type	Name	Description
Reading	Week 2 Reading & Materials	Phillips. S (2015). CRA. Retrieved from: http://youtu.be/PuTUGs9NUS8

Assessment Activities

Type	Name	Description
Formative Assessment	Week 2 Online response	

Post Mini CRA Model to Padlet

Week 3: Curriculum and Pedagogy in Mathematics

- Assessment
- Let's create our own mathematical clothesline
- CRA Model
- Choice boards
- 3 Act Math

Assessment Activities

Type	Name	Description
Formative Assessment	Week 3 Online Response	

Please comment on Clothesline or 3 Act Math, What did you like/dislike. How can you see this being used in your own classroom.

Week 4: Designing an Aesthetic Experience

• What is a rich task?

- PRIME diagnostic
- Fractals
- Measurement
- Mini Lesson
- Review Assignment

Learning Activities

Type	Name	Description
Reading	Week 4 Reading	Stager, G. (2018). The Lost Art of Teaching (podcast).

Assessment Activities

Type	Name	Description
Formative Assessment	Share Experience	Share completed aesthetic experiences component

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Week 5: In Class Assignment and Planning

- Assignments overview and due
- Long term planning
- Rubrics
- Google Classroom

Assessment Activities

Type	Name	Description
Formative Assessment	Post Image of Poster	Please post video of your interactive poster on OWL Resources Tab

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Week 6: Math circles & Thinking Classroom

- Tactile items
- Circles
- Building thinking classrooms - Peter Liljedhal. VPNS

Learning Activities

Type	Name	Description
Reading	Week 6 Reading & Viewings	Gadanidis, G. (2015). Coding as a Trojan Horse for Mathematics

	Education Reform. Journal of Computers in Mathematics and Science Teaching, 34(2), 155-173; Harlow, A. (2015). Kinesthetic learners. TedX. Retrieved from https://www.youtube.com/watch?v=diMJhM8Y1N4; Liljedahl, P, (2016). Building thinking classrooms: Conditions for problem solving. In P. Felmer, J. Kilpatrick, & E. Pekhonen (eds.)., Posing and Solving Mathematical Problems: Advances and New Perspectives. (pp. 127-144). New York, NY: Springer. Liljedahl, P. (2014). The affordances of using visibly random groups in mathematics classroom.

Week 7: Early Number Sense & Math Games

- Why Math Games?
- Subitizing
- Verbal Counting
- Number identification and counting.
- Object counting and cardality

Learning Activities

Type	Name	Description
Reading	Week 7 Reading	Maich, K., Keith, E. (2018). Makey Makey as an Assistive Resource. EdCan Network: Education Canada; ONgov (2015). Student Voice in Ontario Schools. Retrieved from https://www.youtube.com/watch?v=0GQz1ka_cHg; Groundwater-Smith, S (2016). Why Student Voice Matters. EdCan Network. Retrieved from https://www.edcan.ca/articles/why-student-voice-matters/

Week 8: Rich Math Tasks & Assignment 3

- Students will explore a variety of rich mathematical tasks and create a task analysis.
- They will gather in groups and select an idea to attempt throughout their practicum.
- In the new year, students will share one task they attempted and outline curriculum expectations along with other themes touched on through the course.

Learning Activities

Type	Name	Description
Reading	Week 8 Reading & Materials	Appleton, E., Farina, S., Holzer, T., Kotelawala, U., & Trushkowsky, M. (2017). Problem posing and problem solving in a math teachers circle. Journal of Research and Practice for Adult Literacy, Secondary, and Basic Education, 6(1), 33-39. Gadanidis, G., Cendros, R., Floyd, L. & Namukasa, I. (2017). Computational Thinking in Mathematics Teacher Education. Retrieved from https://www.citejournal.org/volume-17/issue-4-17/mathematics/computational-thinking-in-mathematics-teacher-education/; Meyer, D. (2013). Math class needs a makeover. TedEd. Retrieved from http://www.youtube.come/watch?v=qocAoN4jNwc

Assessment Activities

Type	Name	Description
Formative Assessment	Week 8 Assignment	Students work in groups to plan a task analysis. Teacher candidates will share at least one idea next week and share it to OWL.

Week 9: Task Analysis & Growing Patterns

• If you asked teachers what they found beautiful in mathematics, would they be able to:

- Describe a beautiful mathematical idea?
- Tell an engaging story about a mathematics concept?
- Relay a surprise or wonder at the way a problem could be solved in many ways?
- How they solve problems in novel and creative ways?
- How mathematics is linked and related to so many things around them?

Learning Activities

Type	Name	Description
Reading	Week 9 Reading	Sinclair, N. (2008). Notes on the aesthetic dimension of mathematics education. (pp. 1–6). Paper Presented at the ICMI Conference, Rome, Italy; Whitcombe, A. (1988). Mathematics Creativity, Imagination, Beauty. Mathematics in School, 17, 13–15.

		Gadanidis, G. Windows into elementary mathematics. Retrieved from http://www.fields.utoronto.ca/mathwindows/

Week 10: Task Analysis Presentations Assignment 3 Presentation

- Students to present one task analysis to the class
- Teacher candidates are highly encouraged to utilize creative measures to present material
- All task analyses are to be posted to OWL
- More to come in class

Week 11: Math Centres

- •How to foster centres?
- Guest presenter

Learning Activities

Type	Name	Description
Reading	Week 11 Reading	Robelen, E. (2011). STEAM: Experts Make Case for Adding Arts to STEM. Retrieved From: https://www.edweek.org/ew/articles/2011/12/01/13steam_ep.h31.html BBHCSD Media; BBHCSD Media, (2014). STEM Education Overview. https://www.youtube.com/watch?v=5GWhwUN9iaY

Week 12: Math Escape Rooms

- Math in nature
- Fibonacci sequence
- Rich learning experience
- Escape room

Learning Activities

Type	Name	Description
Reading	Week 12 Readings & Materials	Dougherty, D. (2013). The Maker Mindset. Retrieved from http://llk.media.mit.edu/courses/readings/maker-mindset.pdf;

		Stager, G. (2015). A Broader Perspective on Maker Education - Interview Gary Stager. Academica Business College. https://www.youtube.com/watch?v=kFolerX_RiQ; Stager, G. (2014). Progressive Education and the Maker Movement. Constructing Modern Knowledge. Retrieved from http://stager.tv/blog/wp-content/uploads/2016/05/FabLearn-2014-paper-for-web.pdf

Week 13: Coding & Computational Thinking in K-10

- Unplugged grids and loops
- Micro:bit. Write the code to create a thermometer
- Scratch coding
- Assessment
- Knowledgehook

Assessment Activities

Type	Name	Description
Assignment	Post to OWL	Teacher candidates will choose one of the suggested activities that were organized using Gardiners multiple intelligences. Activities to be posted on OWL.

Week 14: Geometry & Patterning & Algebra

- Explore math circles and their relevance
- Math Tools & their affordances
- Desmos

Learning Activities

Type	Name	Description
		Lockhart, P. A Mathematician's Lament. Retrieved from https://www.maa.org/external_archive/devlin/LockhartsLament.pdf;
Reading	Week 14 Reading	Gadanidis, G. (2012). Trigonometry in Grade 3?. Student Achievement Division. Retrieved from http://www.edu.gov.on.ca/eng/literacynumeracy/inspire/research/WW_trigonometryGr3.pdf

Week 15: Computational Thinking & Coding

- What is computational thinking?
- Why is this relevant in 21st century classrooms?
- Explore micro:bit (interactive microcontroller)
- How does this work in K-12?

Learning Activities

Type	Name	Description
Reading	Week 15 Reading	Grover, S., Pea, R., (2013). Computational Thinking in K-12: A Review of the State of the Field. Educational Research 42(1), 38-43 Wing, J. M. (2006). Computational thinking. Communications of the ACM, 49(3), 33-35;

Week 16: Patterning, Algebra & Graphing

- Patterning rules
- Outdoor applications
- Placemats
- Decimals

Week 17: Long Term Planning in a Mathematical program

- Guided math
- Long term planning
- Gap closing
- Resource sharing

Week 18: Conclusions & Presentations

- Course wrap-up
- Teacher candidates presentations

Assessment Activities

Type	Name	Description
Assignment	Due Wk 18 Assignment 4	Details(Specifics in OWL) Final Presentations

ASSIGNMENTS

Assessment Activities

Type	Name	Description
Assignment #1	Due Wk 5 Assignment 1 Resource Sharing	Teacher candidates will bring in a resource (idea, community connection for field trip, experiment, lesson, etc.) which your group will share with the class. You will be responsible for providing ideas pertaining to curriculum, along with a detailed sequence of events (how, when, why). These will be uploaded onto OWL. Please focus on creative solutions. Both slides and documents are adequate but consider additional mediums including video, audio, web applications, etc. Materials to be shared and posted to OWL.
Assignment #2	Due Wk 7 Assignment 2 In Class Poster	Students will create an interactive poster which can be created in a variety of ways. Work to be completed in class. Students will create an interactive poster which can be created in a variety of ways. Work to be completed in class. Students evaluated based on application of ideas, creativity, and pedagogical outcomes.
Assignment #3	Due Wk 12: Assignment 3 Task Analysis	Teacher candidates are responsible f includes, a detailed overview, lesson, experience. Students will explore a variety of rich task analysis. They will gather in grou and select an idea to attempt through year, students will share one task the attempted and outline curriculum exp touched on throughout the course. Teacher candidates are responsible f includes, a detailed overview, lesson,

		and reflection based on in class expe posted to OWL.
Assignment #4	Due Week 17-18 Assignment #4 Choice Board	Complete one of these activities payi Write a brief description of what you c learned. Include pictures or some wa words). Reflect on how the aesthetic dimensio learning of mathematics.
Formative Assessment	Ongoing Professionalism & Participation	
Consistently demonstrates respect, integrity, and embodying the traits of a professional educator.		

This course meets the following Competencies:

Mathematical Idea: A beautiful mathematical idea.

Engaging Story: An engaging story about a mathematics concept.

Surprise or Wonder: A surprise or wonder at the way a problem could be solved in many ways.

Learning Math Concepts: Excitement for learning math concepts.

Solving Problems in Creative Ways: Solving problems in novel and creative ways.

Work Cooperatively: Working cooperatively to develop understanding.

Investigating Mathematics Links: Investigating mathematics links to the world around them.

How to Protect Your Professional Integrity:

The Bachelor of Education is an intense and demanding program of professional preparation. Teacher Candidates are expected to demonstrate high levels of academic commitment and professional integrity that align with both Western University's Academic Rights and Responsibilities and the Professional Standards and Ethical Standards set by the Ontario College of Teachers. These expectations govern your time in class, in your Practicum, in your Alternative Field Experiences, and include the appropriate use of technology and social media.

The Teacher Education Office will only recommend teacher candidates for Ontario College of Teachers certification when candidates have demonstrated the knowledge of, and adherence to, the faculty polices throughout the two-year program.

To review the policies and practices that govern the Teacher Education program, including attendance, plagiarism, progression requirements, safe campus and more, visit: edu.uwo.ca/CSW/my-program/BEd/policies.html

Faculty of Education Pass/Fail Policy:

All courses and assignments in the Bachelor of Education are assessed as Pass/Fail.

Instructors will make the Success Criteria of the assignments clear, and refinements of the criteria may take place in class as a means of co-constructing details of the assignments in the first two weeks of a course. This will allow for differentiation of process, product and timeline depending upon student needs.

Success Criteria will

- Articulate what needs to occur to demonstrate learning outcomes for a course/assignment;
- Inform the instructional process so that teaching can be adapted to ensure students continue to remain on track to meet the criteria as needed and appropriate.
- Align with the assignments created to provide opportunities for students to demonstrate the knowledge, skills and abilities they are working toward;
- Establish clear descriptive language that allows Teacher Candidates to identify, clarify and apply the criteria to their work and to their engagement in peer feedback;
- Focus the feedback on progress toward meeting the overall and specific tasks/assignment goals for the course.

Participation

Participation is essential to success in the Teacher Education program. As a professional school, you need to treat coming to class as showing up for work in the profession. If you are not in class, you cannot participate. Actively participating in discussions, peer reviews/feedback, group work and activities is integral to the development of your own learning and to the learning within your classroom community.

Given the varied experiences of Teacher Candidates in the program, you may engage with ideas/concepts or skills that are familiar or unfamiliar to you.

A Professional Teacher Candidate is one who:

- Arrives in class (virtual or on-site) on time, and prepared. This includes completing any readings, viewing assignments or tasks in advance of class as requested.
- Listens to others and contributes thoughtfully to discussions;
- Models respectful dialogue and openness to learn, monitors, self-assesses and reformulates one's prior beliefs and understandings in light of new information;
- Monitors and addresses their wellness, practices self-care, and seeks appropriate support when necessary.

Ontario Curriculum & Supplementary Resources:

Curriculum & Resources
dcp.edu.gov.on.ca/en

Campus Services & Resources:

Health and Wellness
uwo.ca/health

Peer Support
westernusc.ca

Learning Skills
uwo.ca/sdc/learning

Indigenous Services
Indigenous.uwo.ca

Student Accessibility Services
sdc/uwo.ca/ssd

Writing Support
writing.uwo.ca

Financial Assistance
registrar.uwo.ca

Not sure who to ask?
Contact the Teacher Education Office at eduwo@uwo.ca