Faculty of Education
The University of Western Ontario
B.Ed Course Outline

Computational Thinking in Mathematics Education (Primary/Junior) 5468Q

Section 001 - Mon (12:30-2:30PM), 002 – Mon (12:30-4:30),
Room 2036

Instructor: Lisa Floyd
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The best way to contact me is through my Western email account
(I am happy to set-up appointments by request.

Calendar Course Description:

A critical introduction to the role of computer coding and digital making as ways of teaching mathematics concepts and relationships to children. The history, current trends, future possibilities of computational thinking in elementary school mathematics education are situated within the broader context of mathematics, science, and technology education.

Learning Outcomes:

- Review, discuss, and reflect on the history, current trends and future possibilities of computational thinking in Primary and Junior mathematics education;
- Explore and engage in ways of teaching mathematics concepts and relationships to children through computer coding;
- Explore and engage in ways of teaching mathematics concepts and relationships to children through digital making;
- Understand the benefits of working with computer code to enhance mathematical understanding;
- Examine methods of teaching math through computational thinking that promote understanding of big ideas in math;
- Use computational thinking to teach math concepts that encompass multiple entry points as well as connections to real-world applications.
Course Content:

Week 1 (on site)

Algorithms and Computational Thinking
- actions and simple math will be used to promote understanding of Computational Thinking
- introduction into how/why computational thinking can be used to enhance math understanding (not an “add-on”)

Coding in Geometry
- code shapes using online programming software
- use of extensions in math tasks

Preparation for Online Learning
- explore concept mapping software

Week 2 (online) Week of September 12th
Readings/Viewings –

http://researchideas.ca/mc/article-1-title-recent-issue/interview-september/

2) View: How you can be good at math, and other surprising facts about learning- Jo Boaler
https://www.youtube.com/watch?v=3icoSeGqQtY

3) Read: Intergenerational Learning – Where Teacher and Learning Roles are Ageless
http://researchideas.ca/mc/intergenerational-learning-where-teacher-and-learner-roles-are-ageless/


- Respond to prompts/questions based on this week’s readings/viewings and classroom activities
- Complete all online activities

Week 3 (on site) Week of September 19th

Coding in Geometry (continued)
- code shapes using programmable robots (tangibles)
- consider possible extensions of this task in mathematics class

Primary Apps
- Explore primary coding environments to enhance understanding of math ideas
**Week 4 (online) Week of September 26th**

**Readings/Viewings –**


2) *Try these:* Repeating and Growing Pattern Simulations: [http://www.researchideas.ca/wmt/c6.html](http://www.researchideas.ca/wmt/c6.html)


4) Choose one of the following articles to *read:*


- Respond to prompts/questions based on this week’s readings/viewings and classroom activities
- Complete all online activities

**Week 5 (on site) Week of October 3rd**

*Mathematical Patterns*
- code repeated and growing patterns
- explore manipulatives to enhance understanding of mathematical concepts in patterning

*Using Digital Tangibles (electronic stickers) as a Math Performance*
- Use electronic stickers to display knowledge of math ideas

**Week 6 (online) Week of October 17th**

**Readings/Viewings –**


- Respond to prompts/questions based on this week’s readings/viewings and classroom activities
- Complete all online activities

Week 7

**Week of October 24th**

*Probability*
- Binomial Theorem: Coin Toss Activity
- Connect probability to algebra – consider “big ideas” in math
- Use unplugged to support big ideas in Data and Probability, Algebra

*Coordinate Grids*
- Cartesian Plane in programming environments
- Code movement, rotations, translations, symmetry
- Plot points, random pairs by programming
- Move shapes and characters along x,y plane in a programming environment

Week 8

**Week of October 31st**

*Readings/Viewings–*

1) Read/View: Probability and Statistics Interview with Western Statistician [http://www.researchideas.ca/wmt/c6b2.html](http://www.researchideas.ca/wmt/c6b2.html)


- Respond to prompts/questions based on this week’s readings/viewings and classroom activities
- Complete all online activities
- View Computational Thinking in Math Tasks (see Appendix A, Assignment 2) submitted by your classmates
Week 9 (on site)  

Week of November 7th

**Assessment in Mathematics with Computational Thinking Integration**

**Abstraction**
– use of variables in Computational Thinking and in Math – connecting conceptual and procedural understanding

**Measurement and Number Sense**
- explore big ideas in math tasks through a computational thinking lens

**Course Materials:**

**Resources:**
- suggested resources/apps/tangibles will be recommended throughout the course
- all readings will be available online (please ensure that you have access to Western’s online library databases)

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**Assignments and Other Course Requirements:**

**It is possible to adapt assignments 1 and/or 2 to suit specific interests that relate to the course. Please propose such alternate assignments to your instructor for feedback and approval.**

Appendix A – ASSESSMENT

1 – REFLECTION (30 %) – Due Date: Friday, October 7th

Your paper should be submitted as a Word document, not as a pdf. It should be written using Times New Roman 12-font, have 1.5 lined spacing, have “portrait” orientation, and be sized as 8.5 x 11 inches. You are to use APA formatting of references. It is to be a maximum of 500 words excluding the required bibliography.

Select ONE Option from below for the Reflection Assignment:

**OPTION 1 – Video, Screencast with Audio or Podcast**

What did you do in your CT/Math Course today?

Create a video (maximum length – 3 minutes) to share information from options 2, 3 or 4. Include any references in the video or as a separate document when submitted.

**OPTION 2 – Critical analysis article**
Select an article/resource that is not listed in this outline and analyze it for how it supports learning of math ideas for students through the use of Computational Thinking. Identify a theme or feature (100 words) and discuss the teaching and learning connections (400 words).

**OPTION 3 – Critical analysis of your learning**

Select a theme or activity from the first 4 weeks of this course and critically reflect on your experience (brief description of activity + 500 words of reflection).

Reflection prompts: What did you learn? What did you feel? How does this relate to other course activities/experience? What will you do next?

**OPTION 4 – Short article for a math journal**

Write a short paper (500 words) on Math and Computational Thinking topic/theme that could be submitted to a journal such as:

- Ontario Mathematics Gazette;

**2 – COMPUTATIONAL THINKING IN MATH TASK (50 %) – Draft to be posted in Week 8 online, Final Draft due Week 9 in-class**

**NOTE:**
- A draft of this assignment will be shared with class during the last week of the online discussion forum
- The task may become part of an online resource (e.g., www.mathncode.com, with your permission)

**OPTION 1 - Design a computational thinking + math task for a teaching resource e-book**

**Requirements:**

The task should be based on the readings and in-class activities presented in this course and will be shared, with your permission, in an e-book format with all course participants at the end of the course.

*Please...*

✓ Indicate a math strand and/or big idea that will be addressed and the grade levels the task could be extended to
Options for Task Creation:

**Provide a brief Summary/Description of Task**

**Provide a rational for the task choice**

**Provide an outline of how the task could be presented, performed by students**

**List any prior-learning students might require for completing the task**

**Describe how the task can be assessed (but no formal assessment scale/rubric is required)**

**Provide an exemplar of what students might create through the task (e.g., options for this could be a short video clip, screen prints, photos, etc.)**

**The product can be presented in a form of your choice: Word Document, PowerPoint, Prezi, blog, etc.**

**Provide a list of all resources used in the creation of this task (use APA formatting)**

**The task should be the equivalent of two (1.5 line spacing, 1 inch margins), including images, excluding the resource list**

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**OPTION 2 - Teach and reflect on a computational thinking + math task**

Select/design/teach a math task (plugged or unplugged) through Computational Thinking based on the readings and in-class activities presented in this course.

**Requirements:**

- Indicate a math strand and/or big idea that will be addressed and the grade levels (two to three grade levels) the task could be extended to
- Teach the math task to a primary or junior class*
- The task should not take-up more than 45 minutes of class time (there is no minimum time requirement)
- Provide a brief summary/description of the task selected/design (250 words)
- Write a reflection on how it went – include an explanation of how the learning of math was enhanced through the use of Computational Thinking (500 words)
- **Provide a list of all resources used in the creation of this task (use APA formatting)**

*Your instructor will provide you with a list of teachers/schools who are willing to have you present the task to their students, but you are free to find a willing teacher/school on your own.
OPTION 3 – Analyze a Computational Thinking + Math Lesson Plan/Task

Find a CT + math lesson plan (not discussed in the course), analyze it using criteria/themes from our course, suggest revisions for improvement and possible extensions.

✓ Provide a list of all resources used in the creation of this task (use APA formatting)

3 – ONLINE CONTRIBUTION (20 %) See Expectations in OWL.

ONLINE REQUIREMENTS – CRITERIA

Please log on regularly and actively participate throughout the week. As this course contains alternating online and in-class components, your attendance will be monitored online (see Attendance Policy).

Ensure you contribute productively to discussions, by providing constructive feedback to your classmates, suggested extensions and next steps, and using effective critical thinking skills.

IN-CLASS REQUIREMENTS – CRITERIA

Please attend every class, be an active listener and participant in discussions/tasks.

Policy Statements:

Accessibility: The University of Western Ontario is committed to recognizing the dignity and independence of all students and seeks to ensure that persons with disabilities have genuine, open and unhindered access to academic services. Please contact the course instructor if you require course materials in an alternative format or if any other arrangements can make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661-2111 x 82147 for information about requesting academic accommodation, or go to the following website: http://www.edu.uwo.ca/programs/preservice-education/documents/policies/Accessibility_Western.pdf

Attendance: The B.Ed. program is an intense and demanding program of professional preparation in which teacher candidates are expected to demonstrate high levels of both academic and professional integrity. Such integrity is demonstrated in part by commitment to and attendance at all classes, workshops, tutorials, and practicum activities. Read more about the Faculty’s attendance policy at http://www.edu.uwo.ca/Programs/preservice-education/documents/Attendance%20Policy%202016.pdf

EXCUSED ABSENCES: If you are ill, require compassionate leave, or must miss classes for religious observance, your absence is excused; you will not be penalized but you are responsible for work missed.
UNEXCUSED ABSENCES: Any absence that is not a result of illness, bereavement, or religious observance is an unexcused absence. Three unexcused absences will result in you being referred to the Associate Dean and placed on academic probation. Any further unexcused absence will result in failure of the course and withdrawal from the program.

Language Proficiency: In accordance with regulations established by the Senate of the University, all teacher candidates must demonstrate the ability to write clearly and correctly. Work which shows a lack of proficiency in the language of instruction is unacceptable for academic credit, and will either be failed or, at the discretion of the instructor, returned to the teacher candidate for revision to a literate level.

Late Penalties: Normally, the only acceptable reasons for late or missed assignments are illness (for which a doctor’s statement may be required) or extreme compassionate circumstances. Unexcused late assignments will not be accepted after the due date unless prior arrangements have been made with the instructor.

Academic Offences: Scholastic offences are taken particularly seriously in this professional Faculty. Teacher Candidates should read about what constitutes a Scholastic Offence at the following Web site: http://www.edu.uwo.ca/programs/preservice-education/documents/policies/WEB_ScholasticDiscipline.pdf

Plagiarism: Plagiarism means presenting someone else’s words or ideas as one’s own. The concept applies to all assignments, including lesson and unit plans, laboratory reports, diagrams, and computer projects. For further information, teacher candidates may consult their instructors, the Associate Dean’s Office, and current style manuals. Advice about plagiarism and how to avoid it can also be found on the Teacher Education website: http://www.edu.uwo.ca/Programs/preservice-education/documents/policies/WEB_PlagiarismPolicy.pdf

Plagiarism-Checking:
- All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (http://www.turnitin.com).
- Computer-marked multiple-choice tests and/or exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.

Use of Laptops & Notebooks in Class: Mobile devices including smart phones, tablets, ipads are encouraged! Please use them to enhance your learning in this course. Laptops and other electronic devices may be used in a professional manner to facilitate your activities in the course, but out of courtesy to colleagues and the instructor, please engage in personal networking and non-course communication only outside class time – before or after class, or at the break.
SUPPORT SERVICES

A variety of support services are available at Western. If you need advice or assistance, do not hesitate to get in touch with any of these services.

FINANCIAL ASSISTANCE: Registrarial Services (http://www.registrar.uwo.ca)

WRITING SUPPORT: Student Development Centre (http://www.sdc.uwo.ca/)

LEARNING SKILLS SUPPORT: Student Development Centre (http://www.sdc.uwo.ca/)

INTERNATIONAL STUDENTS: Student Development Centre (http://www.sdc.uwo.ca/)

ABORIGINAL STUDENTS: Student Development Centre (http://www.sdc.uwo.ca/)

STUDENTS with DISABILITIES: Student Development Centre (http://www.sdc.uwo.ca/)

SOCIAL & CULTURAL ISSUES: University Students’ Council (http://westernusc.ca/service/the-peer-support-network/).

EMOTIONAL or MENTAL DISTRESS: Students who are in emotional or mental distress should refer to Mental Health @ Western http://www.uwo.ca/uwocom/mentalhealth/ for a complete list of options about how to obtain help.

B.Ed. PROGRAM ISSUES: zuber@uwo.ca, Teacher Education Office, room 1166

NEED HELP but not sure what to do: zuber@uwo.ca, Teacher Education Office, room 1166