Western Education

Transforming Education. Transforming Lives.

EDUC 5178

Curriculum & Pedagogy in Elementary Science & Technology

Instructor:

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Course Coordinator
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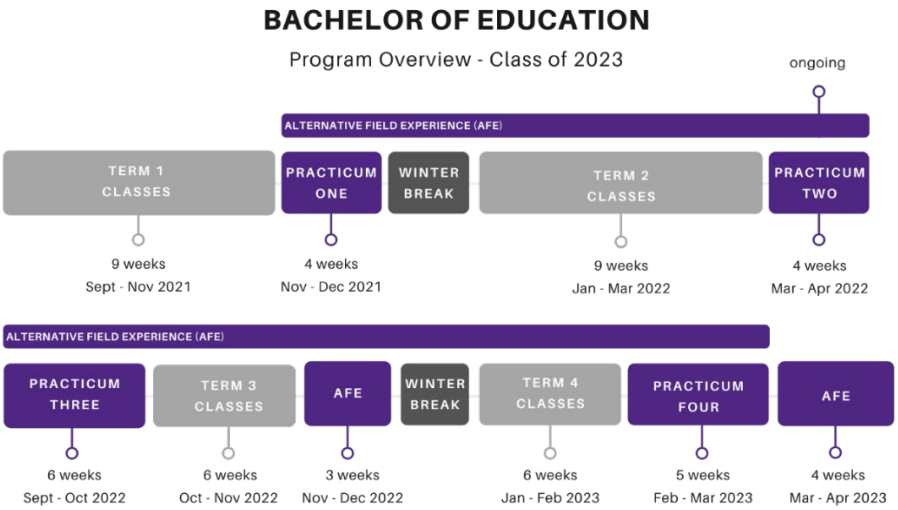
Schedule:

Section 001 (PJ):	Mon 2:30PM-4:30PM, Room: 2051	**Section 002 (PJ):**	Mon 4:30PM-6:30PM, Room: 2051
Section 003 (PJ):	Tues 8:30AM-10:30PM, Room: 2054	**Section 004 (PJ):**	Tues 10:30AM-12:30PM, Room: 2054

Program Context:

This is a **PJ/JI Curriculum Course** taken by Teacher Candidates during **Year 1, Full Year** of the Bachelor of Education.



Elementary Science & Technology - Primary/Junior (EDUC 5178 PJ)

Approaches to and strategies for the teaching of science in the elementary school grades. Course content focuses on curricula and pedagogies that are true to the nature of science, consistent with the desired educational aims, and appropriate for young learners. Significant attention is paid to environmental and sustainability education. 2 hours per week, full year, .5 credit.

In this course, teacher candidates will develop an understanding of the principles underlying the teaching of science and technology in the Primary and Junior Divisions. Using a diverse format of presentations, discussions and hands-on activities, participants will develop their knowledge of the Ontario Science and Technology curriculum, understand what it means to teach in ways that are meaningful and relevant, as well as practice the skills of inquiry and technological design. Emphasis will be placed on teaching practices that link science and technology to society and the environment (STSE), and intensionally represent equity, diversity, inclusive, and decolonization (EDI-D). Integral to the course is the objective to help teacher candidates develop their commitment to students and student learning, further professional knowledge through ongoing professional learning, and apply professional knowledge to professional practice in learning communities.

All resources will be posted on OWL weekly.

Number of Credits : 0.5

Number of Weeks: 18

Week 1: Welcome; Course Overview; Curriculum Documents (Sept 6-7/21)

- 1. How is the curriculum document set up? (Strands, Big ideas, Overall expectations, specific expectations)
- 2. What is science and technology?
- 3. What is STSE? What are the goals for environmental education?

Learning Activities

Type	Name	Description
Discussion	Participation	
Reading	Week 1 Materials & Readings	Ontario Ministry of Education. (2016). The Kindergarten Program. Available [On-line]: https://files.ontario.ca/books/edu_the_kindergarten_program_english_aoda_web_oct7.pdf; Ontario Ministry of Education. (2019). The 2019 Addendum to The Kindergarten Program. Available [On-line]: http://www.edu.gov.on.ca/eng/curriculum/elementary/addendum-to-kindergarten-program.pdf; Ontario Ministry of Education. (2007). The Ontario Curriculum Grades 1-8: Science and Technology. Toronto: Queen's Printer.; The Ontario Curriculum Grades 1-8: Environmental Education. Available [On-line]: http://www.edu.gov.on.ca/eng/curriculum/elementary/environmental_ed_kto8_eng.pdf;

Week 2: Scientific Literacy; Myths/Misconceptions in Science; Constructivism & The Learning Cycle (Sept 13-14/21)

- 1. What are myths/misconceptions you have in science? How can a teacher's misconception shape classroom learning?
- 2. How does environmental education connect to the goals, topics and expectations in the Science & Technology curriculum?
- 3. What is constructivism?

- 4. How does understanding of the learning cycle help in teaching?
- 5. What is Scientific Literacy? Is science considered a literacy?

Learning Activities		
Type	**Name**	**Description**
Formative Assessment	Formative (for/as learning)	
Practice	Identify/Connect key ideas	
Discussion	Participation	
Reading	Week 2 Materials & Readings	Ontario Ministry of Education. (2007). The Ontario Curriculum Grades 1-8: Science and Technology. Toronto: Queen's Printer. More resources will be provided

Week 3: Equity and Differentiation in Science & Technology; EDI-D (Equity, Diversity, Inclusion, Decolonization) (Sept 20-21/21)

- 1. Why are equity and differentiation important to student learning?
- 2. What are the implications for the science & technology classroom?
- 3. How can I plan a lesson that is inclusive and reflects EDI-D

Learning Activities		
Type	**Name**	**Description**
Formative Assessment	Formative (for/as learning)	
Practice	Identify/Connect key ideas	
Discussion	Participation	
Reading	Week 3 Materials & Readings	Ansberry, K. R., & Morgan, E. (2005). Picture Perfect Science Lessons Using Children's Books to Guide Inquiry. Arlington, Virginia: NSTA Press. ISBN 0-87355-243-1; Barba, R. (1998). Science in the multicultural classroom. Allyn & Bacon, ISBN 0-205-26737-8; Ontario Ministry of Education. (2009). Acting Today, Shaping Tomorrow: A Policy Framework for Environmental Education in Ontario Schools. Available [On-line]: http://www.edu.gov.on.ca/eng/teachers/enviroed/ShapeTomorrow.pdf

Week 4: Inquiry in Science teaching; Questioning; Effective Questions (Sept 27-28/21)

- 1. What are the characteristics of investigative and experimental questions?
- 2. How do student and teacher questions drive inquiry and support learning?
- 3. What is scientific inquiry and its implications for instruction in science?

Learning Activities		
Type	**Name**	**Description**
Formative Assessment	Formative (for/as learning)	
Practice	Identify/Connect key ideas	
Discussion	Participation	

Learning Activities		
Type	**Name**	**Description**
Reading	Week 4 Materials & Readings	Ontario Ministry of Education (May 2013). Special Edition #32. Inquiry-based Learning. Available [On-line]: http://www.edu.gov.on.ca/eng/literacynumeracy/inspire/research/cbs_inquirybased.pdf; Ontario Ministry of Education (October 2011). Special Edition #24. Getting Started with Student Inquiry. Available [On-line]: http://www.edu.gov.on.ca/eng/literacynumeracy/inspire/research/cbs_studentinquiry.pdf; Banchi, H., & Bell, R. (2008). The Many Levels of Inquiry. Science and Children, 26–29. https://www.michiganseagrant.org/lessons/wp-content/uploads/sites/3/2019/0;

Week 5: Inquiry and Questioning continued; Transformative learning (Oct 4-5/21)

- 1. What is the head/heart/hands model of transformative learning?

Learning Activities		
Type	**Name**	**Description**
Practice	Identify/Connect key ideas	
Discussion	Participation	
Reading	Week 5 Materials & Readings	Head, heart and hands model for transformative learning: Place as a context for changing sustainability values (Singleton, 2015; TEDx [TED]. (2009, September). Simon Sinek: How great leaders inspire action [Video]. TedX. https://www.ted.com/talks/simon_sinek_how_great_leaders_inspire_action?language=en ;

Week 6: Assessment Part 1: Growing Success; Differentiated and Integrated Science Planning; Universal Design (Oct 18-19/21)

- 1. How can I plan a lesson that addresses the needs of a variety of learners?
- 2. Growing Success Document: Goals, Assessment for, as, of
- 3. Variety of learners: learning styles, ELL, Cultural Inclusion, First Nations
- 4. What is Universal Design?

Learning Activities		
Type	**Name**	**Description**
Discussion	Participation	
Formative Assessment	Formative (for/as learning)	
Practice	Identify/Connect key ideas	

Learning Activities		
Type	**Name**	**Description**
Reading	Week 6 Materials & Readings	O.M.E. (2010). Growing Success. Assessment, Evaluation, and Reporting in Ontario Schools. Available [On-line]: http://www.edu.gov.on.ca/eng/policyfunding/growsuccess.pdf; O.M.E (2016). Growing Success The Kindergarten Addendum. Assessment, Evaluation, and Reporting in Ontario Schools. Available [On-line]: http://www.edu.gov.on.ca/eng/policyfunding/GSKindergartenAddendum2018.pdf; Knowing and responding to learners: A differentiated instruction educator's guide (edugains.ca, 2016); The differentiated instruction scrapbook (OME, 2010)

Week 7: Technological Integration; Issues using technology in class (Oct 25-26/21)

- 1. What are the benefits and disadvantages of using technology in classrooms?
- 2. How do we address issues using technology in classrooms?
- 3. How can technology be integrated into lessons? Critically assess its usage and benefits.

Learning Activities		
Type	**Name**	**Description**
Formative Assessment	Formative (for/as learning)	
Practice	Identify/Connect key ideas	
Discussion	Participation	
Reading	Week 7 Materials & Readings	TBD

Week 8: Lesson Planning; Lesson Deconstruction Assignment (Nov 1-2/21)

- 1. Video: 5E lesson model
- 2. Design Thinking; how can we apply design thinking process to classrooms?
- 3. Work on Lesson Deconstruction Assignment

Learning Activities		
Type	**Name**	**Description**
Formative Assessment	Formative (for/as learning)	
Practice	Identify/Connect key ideas	
Discussion	Participation	
Reading	Week 8 Materials & Readings	Spencer,J, (2019) https://spencerauthor.com/what-is-design-thinking/; An Introduction to Design Thinking Process Guide https://web.stanford.edu/~mshanks/MichaelShanks/files/509554.pdf

Week 9: Lesson Planning: Lesson Deconstruction; Mid-Year Reflection (Nov 8-9/21)

- 1. Working on Lesson Deconstruction Assignment.
- 2. Mid-Year Reflection

Learning Activities

Type	Name	Description
Practice	Identify/Connect key ideas	
Discussion	Participation	

Week 10: Resource Sharing Symposium: Lesson Deconstruction Assignment Presentation (Jan 3-4/22)

- You will bring the Lesson Deconstruction Assignment to present to class. Resources will be shared on OWL.

Learning Activities

Type	Name	Description
Summative Assessment	DUE: Lesson Deconstruction Assignment	
Discussion	Participation	

Week 11: Cross-Curricular Activity; STEM Integration; Coding (Jan 10-11/22)

- Guest Speaker - Dr. DeCoito
- 1. What are the benefits of cross-curricular learning?
- 2. What is STEM/STEAM and how does it look like in Science&Technology Classroom?

Learning Activities

Type	Name	Description
Class Meeting	Cross-curricular Mini Unit Assignment	Class activity
Discussion	Participation	
Assignment	Week 11 In Class Activities - Participation Identify/Connect Key Ideas	Students (1) identify and connect key ideas from course materials and discussions and (2) participate in large and small group discussions by listening attentively and respectfully to others as well as contributing your own thoughts and ideas, participating in hands-on activities.
Reading	Week 11 Materials & Readings	Ontario Ministry of Education (September 2010). Special Edition #14. Integrated Learning in the Classroom. Available [On-line]: http://www.edu.gov.on.ca/eng/literacynumeracy/inspire/research/cbs_integrated_learning.pdf ; Coding in Elementary: A professional resource for Ontario educators (edugains.ca); Coding and robotics in the elementary curriculum (stao.ca); Ontario Ministry of Education (September 2010). Research Monograph # 28. Integrated Curriculum. Available [On-line]: http://www.edu.gov.on.ca/eng/literacynumeracy/inspire/research/ww_integrated_curriculum.pdf

Week 12: Other ways of knowing in Science – Focus on FNMI perspective (Jan 17-18/22)

- Guest Speaker - TBD
- 1. How can Indigenous perspectives be embedded in Science & Technology instruction?
- 2. What is the difference between Western science and Indigenous knowledge?

Learning Activities		
Type	**Name**	**Description**
Practice	Identify/Connect key ideas	
Discussion	Participation	
Assignment	Week 12 In Class Activities - Participation Identify/Connect Key Ideas	Students (1) identify and connect key ideas from course materials and discussions and (2) participate in large and small group discussions by listening attentively and respectfully to others as well as contributing your own thoughts and ideas, participating in hands-on activities.
Reading	Week 12 Materials & Readings	Ontario Ministry of Education (September 2011). Research Monograph # 36. Teaching for Ecological Sustainability: Incorporating Indigenous Philosophies and Practices. Available [On-line]: http://www.edu.gov.on.ca/eng/literacynumeracy/inspire/research/ww_teaching_ecological.pdf

Week 13: Assessment Part 2 (Jan 24-25/22)

- 1. What are various effective assessment practices and tools?
- 2. How can I use a variety of assessments throughout a unit so that students have multiple and varied opportunities to show what they know and can do?

Learning Activities		
Type	**Name**	**Description**
Practice	Identify/Connect key ideas	
Discussion	Participation	
Assignment	Week 13 In Class Activities - Participation Identify/Connect Key Ideas	Students (1) identify and connect key ideas from course materials and discussions and (2) participate in large and small group discussions by listening attentively and respectfully to others as well as contributing your own thoughts and ideas, participating in hands-on activities.
Reading	Week 13 Materials & Readings	Assessing scientific inquiry (Peters, 2008); The art of reviewing science journals: Questions to keep in mind when planning and assessing students' journal entries (Shepardson and Britsch, 2004); Assessment for learning (ETFO Voice, 2010); OME: Growing Success Documents

Week 14: Safety in Science; Experimental Design (Jan 31-Feb 1/22)

- 1. How do you keep Science classroom safe?
- 2. How do we design experiments in elementary classroom? - No Science lab
- 3. How do we address safety in P/J class

Learning Activities		
Type	**Name**	**Description**
Practice	Identify/Connect key ideas	
Discussion	Participation	

Learning Activities		
Type	**Name**	**Description**
Assignment	Week 14 In Class Activities - Participation Identify/Connect Key Ideas	Students (1) identify and connect key ideas from course materials and discussions and (2) participate in large and small group discussions by listening attentively and respectfully to others as well as contributing your own thoughts and ideas, participating in hands-on activities.
Reading	Week 14 Materials & Readings	TBD

Week 15: Research and Development: Learning Centres (Feb 7-8/22)

- Working on the Learning Centres Assignment

Learning Activities		
Type	**Name**	**Description**
Practice	Identify/Connect key ideas	
Discussion	Participation	
Assignment	Week 15 In Class Activities - Participation Identify/Connect Key Ideas	Students (1) identify and connect key ideas from course materials and discussions and (2) participate in large and small group discussions by listening attentively and respectfully to others as well as contributing your own thoughts and ideas, participating in hands-on activities.

Week 16: Research and Development: Learning Centres (Feb 14-15/22)

- Working on the Learning Centres Assignment

Learning Activities		
Type	**Name**	**Description**
Practice	Identify/Connect key ideas	
Discussion	Participation	
Assignment	Week 16 In Class Activities - Participation Identify/Connect Key Ideas	Students (1) identify and connect key ideas from course materials and discussions and (2) participate in large and small group discussions by listening attentively and respectfully to others as well as contributing your own thoughts and ideas, participating in hands-on activities.

Week 17: Research and Development: Learning Centres; Presentation (Feb 28-29/22)

- Working on the Learning Centres Assignment
- Presentations

Learning Activities		
Type	**Name**	**Description**
Practice	Identify/Connect key ideas	
Discussion	Participation	

Learning Activities		
Type	**Name**	**Description**
Assignment	Week 17 In Class Activities - Participation Identify/Connect Key Ideas	Students (1) identify and connect key ideas from course materials and discussions and (2) participate in large and small group discussions by listening attentively and respectfully to others as well as contributing your own thoughts and ideas, participating in hands-on activities.

Week 18: Research and Development: Learning Centres Presentation (Mar 7-8/22)

- 1. Presentations
- 2. Course Evaluation
- 3. End of the year celebration
- 4. All presentations will be shared on OWL

Learning Activities		
Type	**Name**	**Description**
Practice	Identify/Connect key ideas	
Summative Assessment	Summative (of learning)	

Assessment Activities		
Type	**Name**	**Description**
Assignment	Due Wk 05: Inquiry Mini-Assignment	Teacher candidate will choose a picture from online and come up with ten inquiry questions. Reflect EDI-D, and STSE in the questioning activity. This will be in-class assignment that teacher candidates are not expected to use outside of class time. Detailed instruction will be shared on OWL. .
Assignment	Due Wk 10: Lesson Deconstruction	In this assignment, teacher candidates will analyze and modify (if necessary) one science lesson plan or activity appropriate for your practicum grade involving the development of science and technology skills. You will critically look at an existing lesson/ activity considering the inquiry, differentiated instruction, constructivism, EDI-D, and curricular integration. You will present this and share the lesson on OWL. Detailed instruction will be shared on OWL. .
Assignment	Due Wk 18: Learning Centre Modules	In groups of 4 or less, teacher candidates will develop a series of activities addressing a specific curriculum topic organized in a learning centre format. The learning centers will address: a) different learning styles, b) cross-disciplinary/ integrated approaches, c) principles of EDDI-D, d) inquiry-based learning, and e) technology integration. Detailed instruction will be shared on OWL .

Assessment Activities

Type	Name	Description
Assignment	Ongoing: Professionalism/Participation	This is an ongoing assessment. Candidates are expected to demonstrate participation through careful preparation, critical analysis, and thoughtful commentary on the material discussed in each class. Each individual bears the responsibility of making a significant contribution to the learning of others while working in groups. Success in this component of the course will also reflect appropriate attendance and punctuality. Detailed expectations will be shared on OWL .

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 online) 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.

Support 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