

## EDUC 5178

### Curriculum & Pedagogy in Elementary Science & Technology – Junior/Intermediate

#### Instructor:

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#### Schedule:

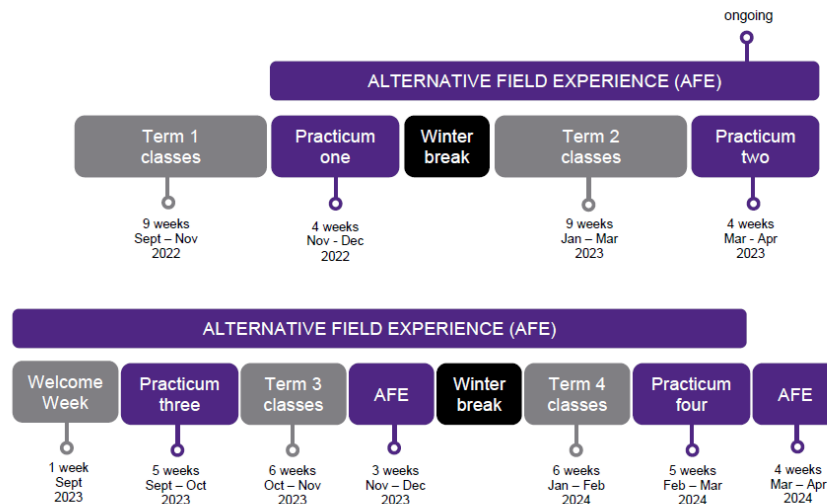
**Section 005 (JI):** Wed 4:30PM-6:30PM,  
Room: 2040

#### Program Context:

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

### Bachelor of Education

Program Overview – Class of 2024



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## Elementary Science & Technology - Junior/Intermediate (EDUC 5178 JI)

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.

This is a curriculum science course designed by teachers, for learning teachers. It focuses on junior/intermediate science within the Ontario classroom. The course will meet once a week, for a two-hour period. The course will follow a diverse format of lecture, discussion, presentations, and hands-on activities. The goal of this course is combine both theory and practice; it will mirror, study, and engage directly with the JI curriculum and give students an opportunity to model and share in order to demonstrate what it means to be a science teacher.

Number of Credits : 0.5

Number of Weeks: 18

### Week 1: Introduction to the Course, Assignments, and Each Other (07. 09, 2022)

- What is Science? Who is a scientist? What myths surround the notion of science?
- What should a good science lesson/experience look like?
- How do we create an inclusive science classroom which supports 21st century competencies? Overview of new Curriculum.

#### Learning Activities

Type	Name	Description
Assignment	Week 1 Activities	*Synchronous Learning
Reading	Week 1 Materials & Readings	Achieving transformative sustainability learning: engaging head, hands, and heart (Sipos, Battisti, & Grimm, 2006)
		Unleashing Student Superpowers: Practical Teaching Strategies for 21st Century Students (Swanson, & Ferguson, 2014)

### Week 2: Science and the Ontario Curriculum Utilizing a Hybrid Approach (14. 09, 2022)

- Review: What is Science?
- What are the goals of the Ontario Science curriculum for J/I?
- What are the major strands that are taught?
- What tools afford students opportunities for success?

## Learning Activities

Type	Name	Description
Assignment	Week 2 Activities	Utilize G Suite Tools, Nearpod, Educational Technology Tools Etc.
	Week 2	Brooks, Michael (2012). Why the scientist stereotype is bad for everyone, especially
Reading	Materials & Readings	kids. <a href="https://www.wired.com/2012/06/opinion-scientist-stereotype/">https://www.wired.com/2012/06/opinion-scientist-stereotype/</a>
		The Ontario Curriculum Grades 1-8, Science and Technology, 2022

### Week 3: Inquiry Based Education in 21st Century Classrooms (21. 09, 2022)

- How do children think and learn in Science?
- What is inquiry and what does it look like?
- How can educators support inquiry learning today?

## Learning Activities

Type	Name	Description
Assignment	Week 3 Activities	Explore EdPuzzle interactive video. Create an interactive experiment.
		Inquiry Based Science Learning in Primary Education (Suduca, Bizoia, and Gorghiub, 2015)
Reading	Week 3 Materials & Readings	Banchi, H., & Bell, R. (2008). How do children learn? The nature of inquiry. Science and Children 46(2), 26-29 <a href="https://search.proquest.com/docview/236901022/fulltextPDF/995115CEDDEC4672PQ/12?accountid=15115">https://search.proquest.com/docview/236901022/fulltextPDF/995115CEDDEC4672PQ/12?accountid=15115</a>
		Spencer, J. (2017). What is Inquiry Based Learning? <a href="https://www.youtube.com/watch?v=QlwkerwaV2E">https://www.youtube.com/watch?v=QlwkerwaV2E</a>

### Week 4: Questions Driving Experiments & 5E Scientific Model (28. 09, 2022)

- What is an effective question? How can we foster synergies within STEM Education?
- How do student questions drive inquiry?
- What is the role of the teacher questions in inquiry learning?
- What is the 5E Model?

## Learning Activities

Type	Name	Description
Reading	Week 4 Materials & Readings	Asking the Right Questions: Using Literature and Higher Level Thinking Questions to Enhance Science Instruction, C. Kracl and D. Harshbarger, Science and Children, Summer 2017, p. 78 <a href="http://link.galegroup.com/apps/doc/A503272918/AONE?u=lond95336&amp;sid=AONE&amp;xid=4f5c52ce">http://link.galegroup.com/apps/doc/A503272918/AONE?u=lond95336&amp;sid=AONE&amp;xid=4f5c52ce</a> .
		Martens, M, (1999). Productive Questions: Tools for Supporting Constructivist Learning. Science and Children 36(8), 24-28
		Edutopia (2015). Inquiry Baed Learning in the Science Classroom.

<https://youtu.be/Bbq>

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Differentiation, Science Lessons, & In Class Lesson

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## Week 5: Differentiation & Lesson Deconstruction Assignment #1 (05. 10, 2022)

- How do I plan an effective Science lesson which caters to all learners?
- What are the components of an effective lesson?
- Learning to create meaningful low floor/high ceiling activities.
- Teacher candidates will apply learning based upon lesson planning to deconstruct a science lesson. Students will work in groups but independently create a critical analysis of the lesson as discussed in groups.

### Learning Activities

Type	Name	Description
Assignment	Week 5 - Assignment #1 DUE	Formative: Teacher candidates deconstruct a science lesson and create a critical analysis of the lesson as discussed within their groups and/or on an individual basis. Materials to be shared and attempted during their first practicum. Please post to OWL. DUE

## Week 6: Introduction to DRIVE Science Part I: Observe & Infer (19. 10, 2022)

- What is DRIVE Science?
- How do we utilize this in the classroom?
- How can pictures play a role in Science?
- The impact of Science for ELLs

### Learning Activities

Type	Name	Description
Assignment	Week 6 Activities	Create your own Observe & Infer using Collaborative Slides

## Week 7: DRIVE Science Part II: Design & Replicate (26. 10, 2022)

- What follows Observe/Infer?
- How can we create simple experiments?
- Where is the Data?
- How is it measured?

### Learning Activities

Type	Name	Description
Assignment	Week 7 Activities	Teacher candidates to post their own design and replicate. Please post to OWL.

## Week 8: Creating Centres in Science Class & Assignment #2 (02. 11, 2022)

- The pedagogical application of centres?
- How are they designed?

- Introduction of assignment #2 where teacher candidates create their own Centres.

## Learning Activities

Type	Name	Description
Assignment	Week 8 - Assignment #2 DUE Nov 10	STEM/STEAM Stations: Cross- Curricular Integration of Science- In small groups, plan a series of stations/centres that align with the curriculum for a selected grade. Centres must include an integration of STEAM subject areas and should include some form of computer and technology use in at least one of the centres. Prepare a teacher's information and instructional guide to accompany stations. Please include success criteria, accomodations, images, and self assessment. DUE Nov 10th

## Week 9: Design Thinking within K-12 (09. 11, 2022)

- What is design thinking and what does it look like within J/I?
- How is design thinking rooted in empathy?
- Is technology required to ensure pedagogical practice?

## Learning Activities

Type	Name	Description
Reading	Week 9 Materials & Readings	The Design Thinking Process (2017). <a href="https://youtu.be/_r0VX-aU_T8">https://youtu.be/_r0VX-aU_T8</a>  Donato, G. (2015). Design Thinking Projects and Challenges. The K12 Lab Wiki. <a href="https://dschool-old.stanford.edu/groups/k12/wiki/956b6/Design_Thinking_Projects_and_Challenges.html">https://dschool-old.stanford.edu/groups/k12/wiki/956b6/Design_Thinking_Projects_and_Challenges.html</a>  Spencer, J, (2019). What is Design Thinking. <a href="http://www.spencerauthor.com/what-is-design-thinking/">http://www.spencerauthor.com/what-is-design-thinking/</a>  Computational Thinking & Computer Science Part

## Week 10: Living Space Canadian Space Agency & Computer Science (04. 01, 2023)

- What is Computational Thinking?
- What are the conditions for life? Do the conditions for life change in space?
- We will uncover several scientific topics through this National Science Project.

## Learning Activities

Type	Name	Description
Assignment	Week 10 Activities	Formative online sharing.
Reading	Week 10 Materials & Readings	Wing, J. M. (2006). Computational thinking. Communications of the ACM, 49(3), 33-35  Sneider, C., Stephenson, C., Schafer, B., & Flick, L. (2014). Exploring the science Framework and NGSS: Computational thinking in the science classroom. Science Scope, 38(3), 10-15.  Grover, S., Pea, R., (2013). Computational Thinking in K-12: A Review of the State of the Field. Educational Researcher 42(1), 38-43.

## Week 11: STEM/STEAM: Women in Science (11. 01, 2023)

- Who are important women in Science?
- Are we constructing lessons which give everyone an equal voice?
- Understanding the importance of cultural contributions/

### Learning Activities

Type	Name	Description
Assignment	Week 11 Activities	Share a scientific contribution from varying cultural/gender contributions.
Reading	Week 11 Materials & Readings	Rham, C. de, Burton, H., Nelson, J., & Haigh, J. (2021). Women in Science. San Francisco, California, USA: Ideas Roadshow.

## Week 12: Integrating STSE with Global Goals Education & Assignment #3 (18. 01, 2023)

- What are the UN Sustainability Goals and why are they relevant to STSE?
- How can we integrate STSE with an equity lens?

### Learning Activities

Type	Name	Description
Assignment	Week 12 Activities	Resources Share- Select a resource that could be used to encourage student engagement and scientific conceptual understanding. Identify where this resource fits in the curriculum (grade, topic, expectations). Explain in detail when in a lesson this resource might be used and how you would frame its use in your instruction. Post in OWL Forum. DUE:
Reading	Week 12 Materials & Readings	Gilbert, J., & Kotelman, M. (2005). Science and Children, p28-32. <a href="https://drive.google.com/file/d/1TfPGEVHI1ue02o6X989EQ4ZATqRZMvIB/view?usp=sharing">https://drive.google.com/file/d/1TfPGEVHI1ue02o6X989EQ4ZATqRZMvIB/view?usp=sharing</a> Kerr, K. (2019). Teacher development through coteaching outdoor science and environmental education across the elementary-middle school transition. The Journal of Environmental Education.  Assignment #3

## Week 13: Exploring Differentiation & Indigenous STEM (25. 01, 2023)

- What are the fundamental elements of STEM/STEAM?
- How can these be applied beyond science class?
- What does Indigenous STEM look like?

### Learning Activities

Type	Name	Description
Assignment	Week 13 Activities	Design & Build Using Actua Indigenous STEM Kit

## Learning Activities

Type	Name	Description
Reading	Week 13 Materials & Readings	Stager, G. (2018). The Lost Art of Teaching. <a href="http://stager.tv/blog/?tag=constructing-modern-knowledge">http://stager.tv/blog/?tag=constructing-modern-knowledge</a>
		Robelen, E. (2011). STEAM: Experts Make Case for Adding Arts to STEM. Retrieved from: <a href="https://www.edweek.org/ew/articles/2011/12/01/13steam_ep.h31.html">https://www.edweek.org/ew/articles/2011/12/01/13steam_ep.h31.html</a> BBHCSD Media (2014).
		STEM Education Overview. <a href="https://www.youtube.com/watch?v=5GWhwUN9iaY">https://www.youtube.com/watch?v=5GWhwUN9iaY</a>

## Week 14: Circuits & Maker Education (01. 02, 2023)

- What are circuits? How do they work?
- How many types are there?
- In what ways can we demonstrate circuits both in person and remote classrooms?

## Learning Activities

Type	Name	Description
Assignment	Week 14 Activities - Assignment #3 DUE	Post a Maker activity you would like to attempt on OWL
		Assignment #3 DUE
Reading	Week 14 Materials & Readings	Dougherty, D. (2013). The Maker Mindset. Retrieved from <a href="http://llk.media.mit.edu/courses/readings/maker-mindset.pdf">http://llk.media.mit.edu/courses/readings/maker-mindset.pdf</a>
		Stager, G. (2015). A Broader Perspective on Maker Education - Interview Gary Stager. Academica Business College. <a href="https://www.youtube.com/watch?v=kFolerX_RiQ">https://www.youtube.com/watch?v=kFolerX_RiQ</a>
		Stager, G. (2014). Progressive Education and the Maker Movement. Constructing Modern Knowledge. Retrieved from <a href="http://stager.tv/blog/wp-content/uploads/2016/05/FabLearn-2014-paper-for-web.pdf">http://stager.tv/blog/wp-content/uploads/2016/05/FabLearn-2014-paper-for-web.pdf</a>

## Week 15: Effective Assessment in Science Class & Assignment #4 (08. 02, 2023)

- What is the role of formative and summative assessment in science?
- What are various effective assessment practices?
- The role of self assessment?
- What is the triangulation of assessment look like in science class?

## Learning Activities

Type	Name	Description
Assignment	Week 15 Activities	This assignment will be created in groups and presented to the class. Your goal is to create a lesson, demonstrate it to the class, and have an assessment strategy in place. Please consider accommodations/modifications. Presentations can vary in nature and creative selections are highly recommended. Your lesson should also integrate at least one additional subject area (cross-curricular). Be sure to include the specific grade and curriculum expectations



explored. This is an opportunity to explore and

push the boundaries of what science is and how it can be viewed in J/I classrooms. Additional details to be shared in class.

## Learning Activities

Type	Name	Description
Reading	Week 15 Materials & Readings	Science and Children (2017). Embedding Formative Assessment into the 5E Instructional Model, 55(4).
		Abell, S., & Volkman, M (2016). Seamless Assessment in Science
		CASLT ACPLS (2015). Using Assessment and Evaluation Strategies to Support Students. <a href="https://youtu.be/-wePut0cfzA">https://youtu.be/-wePut0cfzA</a>
		Professional Development & Introduction to Seminar

### Week 16: Science of Natural Phenomenon (15. 02, 2023)

- How does this topic fit into the science curriculum?
- Can we extend this beyond the walls of the classroom?

## Learning Activities

Type	Name	Description
Assignment	Week 16 Activities	Please share your ideations to OWL.

### Week 17: Seminar Presentations Week 1 (01. 03, 2023)

- The first group of students will begin to share their seminar topics. The second group will provide feedback.

## Learning Activities

Type	Name	Description
Assignment	Week 17-18 - Assignment #4 DUE	*Synchronous presentations* Groups to offer feedback for reflection.

### Week 18: Seminar Presentations Week II & Conclusions (08. 03, 2023)

- The second group of students will begin to share their seminar topics. The first group will provide feedback.
- Consolidate intended outcomes.

## Learning Activities

Type	Name	Description
Reading	Week 15 Materials & Readings	Science and Children (2017). Embedding Formative Assessment into the 5E Instructional Model, 55(4).
		Abell, S., & Volkman, M (2016). Seamless Assessment in Science
		CASLT ACPLS (2015). Using Assessment and Evaluation Strategies to Support Students. <a href="https://youtu.be/-wePut0cfzA">https://youtu.be/-wePut0cfzA</a>
		Professional Development & Introduction to Seminar



## Learning Activities

Type	Name	Description
Assignment	Week 17-18 - Assignment #4 DUE	*Synchronous presentations* Groups to offer feedback for reflection.

## Assessment Activities

Type	Name	Description
Assignment	Assignment #1: Lesson Deconstruction (Due Oct 5th, 2022)	Teacher candidates will apply learning based upon lesson planning to deconstruct an existing science lesson. Students will work in groups but independently create a critical analysis of the lesson as discussed in groups/and or individually.
Assignment	Assignment #2: STEM/STEAM Stations (Due Nov 10th, 2022)	Cross-Curricular Integration of Science- In small groups, plan a series of stations/centres that align with the curriculum for a selected grade. Centres must include an integration of STEAM subject areas and should include some form of computer and technology use in at least one of the centres. Prepare a teacher's information and instructional guide to accompany stations. Please include success criteria, accommodations, images, and self-assessment.
Assignment	Assignment #3: Resource Sharing (due Jan 25th, 2023)	Resources Share: Select a resource that could be used to encourage student engagement and scientific conceptual understanding. Identify where this resource fits in the curriculum (grade, topic, expectations). Explain in detail when in a lesson this resource might be used and how you would frame its use in your instruction. Post in OWL Forum.
Assignment	Assignment #4: Interactive Choice Board: Seminar & Presentation (Due Mar 1st-8th, 2023)	This assignment will be created in groups and presented to the class. Your goal is to create a lesson, demonstrate it to the class, and have an assessment strategy in place. Please consider accommodations/modifications. Presentations can vary in nature and creative selections are highly recommended. Your lesson should also integrate at least one additional subject area (cross-curricular). Be sure to include the specific grade and curriculum expectations explored. This is an opportunity to explore and push the boundaries of what science is and how it can be viewed in J/I classrooms. Additional details to be shared in class.
Assignment	Professionalism & Participation	Consistently demonstrates respect, integrity, and embodying the traits of a professional educator.

# 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 policies 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](http://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](http://dcp.edu.gov.on.ca/en)

## Campus Services & Resources:



**Health and Wellness**  
[uwo.ca/health](http://uwo.ca/health)



**Peer Support**  
[westernusc.ca](http://westernusc.ca)



**Learning Skills**  
[uwo.ca/sdc/learning](http://uwo.ca/sdc/learning)



**Indigenous Services**  
[Indigenous.uwo.ca](http://Indigenous.uwo.ca)



**Student Accessibility  
Services**  
[sdc/uwo.ca/ssd](http://sdc/uwo.ca/ssd)



**Writing Support**  
[writing.uwo.ca](http://writing.uwo.ca)



**Financial Assistance**  
[registrar.uwo.ca](http://registrar.uwo.ca)



**Not sure who to ask?**  
Contact the Teacher Education Office at [eduwo@uwo.ca](mailto:eduwo@uwo.ca)