

## EDUC 5202 & 5241

### Curriculum & Pedagogy in Senior Biology & Environmental Science

#### Instructor:

**Kelly Zuber 001**  
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#### Schedule:

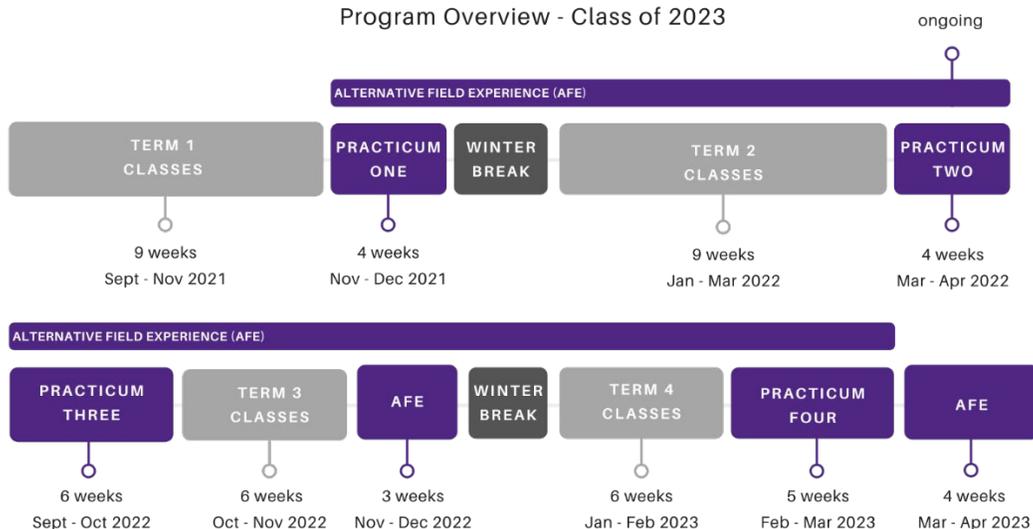
**Section 001:** Mon/Wed 12:30PM-2:30PM,  
Room: 2036

#### Program Context:

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

#### BACHELOR OF EDUCATION

Program Overview - Class of 2023



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# Curriculum and Pedagogy in Senior Biology & Senior Environmental Science (EDUC 5202-5241)

EDUC 5202: An introduction to curriculum and pedagogy in science with particular emphasis on biology. A focus on pedagogical practice and theoretical perspectives on science teaching, the nature of science, and cognitive, behavioural and social theories of science learning and adolescent development. Ontario secondary science curricula are also examined. 4 hours per week, full year, 1.0 credit.

EDUC 5241: An introduction to curriculum and instruction in science for the senior grades with a particular focus on the curriculum in environmental science. A focus on pedagogical practice and theoretical perspectives on science teaching, the nature of science, and cognitive, behavioural and social theories of science learning and adolescent development. Ontario secondary science curricula are also examined. 4 hours per week, full year, 1.0 credit.

The course will focus on Ontario grade 11 and 12 biology and environmental science teaching methods and the themes and issues in science education. Topics addressed, but not limited to, will include: the Ontario Science Curriculum; the nature of learning and teaching in science; science teaching strategies and classroom management; assessment, evaluation and reporting; inquiry in science education; STSE, planning and time management; numeracy and literacy in science; 21st Century teaching and learning, inclusiveness and equity; and democratic and holistic education.

There is no required textbook or prescribed readings for evaluation for this course. All outside class readings will arise from class discussions/interactions based on need for further reflection, understanding and to foster follow-up discussion in the subsequent class(es). These short, current, topical readings will be posted 1-3 classes in advance (depending on perceived class needs) along with a tentative course schedule on OWL.

Number of Credits : 1

Number of Weeks: 18

## **Week 1: Introduction and The Senior Science Curriculum**

- Introduction and general overview of the course.
- Introduction to the nature of science and begin to explore the pedagogy of teaching science.
- Review of the Ministry Senior Science Curriculum.

<b>Learning Activities</b>		
<b>Type</b>	<b>Name</b>	<b>Description</b>
<b>Discussion</b>	Week 1 Discussion	Connecting the nature of science and the Science Curriculum. Class participation, discussions, and ad-hoc reflection exercises.
<b>Reading</b>	Week 1 Materials & Readings	The Ontario Senior Science Curriculum.

## **Week 2: The Nature of Learning and Teaching in Senior Science**

- Active learning pedagogies engage and empower senior students by placing a greater degree of responsibility on the learner.
- Using various strategies such as problem solving, case studies, role plays, experiential learning, inquiry learning, problem-based learning etc.
- Exploring the nature of science learning and teaching.

## Learning Activities

Type	Name	Description
<b>Discussion</b>	Week 2 Discussion	Ontario Senior Science Curriculum analysis and connections to how students learn science. Further exploration of the nature of science. Class participation, discussions, and ad-hoc reflection exercises.
<b>Reading</b>	Week 2 Materials & Readings	The Ontario Senior Science Curriculum. Nature of Learning and Teaching Senior Science Articles.

## Week 3: Senior Science Teaching Strategies and Classroom Management

- Effective lesson plans are derived from the theories of learning and offer a framework for creating rich learning activities that develop and deepen students' understanding. They can also be used to develop assessments that determine whether students understand concepts and can apply learning to new situations.
- Lesson planning also serves to develop assessments that determine whether students understand concepts and can apply learning to new situations.
- Effective questioning techniques are pivotal to senior learner engagement and are a key strategy for supporting thoughtful and critical analysis of more complex concepts and ideas.

## Learning Activities

Type	Name	Description
<b>Discussion</b>	Week 3 Discussion	An analysis of how students learn science. An analysis of traditional didactic teaching in terms of learning and connection to Ministry expectations. An exploration of effective teaching strategies. Class participation, discussions, and ad-hoc reflection exercises.
<b>Reading</b>	Week 3 Materials & Readings	Articles Outlining Effective Senior Science Lesson Strategies. Engaging Critical Thinking Articles.

## Week 4: Senior Science Teaching Strategies and Classroom Management

- Effective lesson plans are derived from the theories of learning and offer a framework for creating rich learning activities that develop and deepen students' understanding.
- Lesson planning also serves to develop assessments that determine whether students understand concepts and can apply learning to new situations.
- Effective questioning techniques are pivotal to senior learner engagement and are a key strategy for supporting thoughtful and critical analysis of more complex concepts and ideas.

Learning Activities		
Type	Name	Description
Discussion	Week 4 Discussion	Analysis of alternative pedagogical strategies to optimize engagement and critical thinking. Class participation, discussions, and ad-hoc reflection exercises.
Reading	Week 4 Materials & Readings	Alternative Pedagogical Strategies Analysis. Complete the First Assignment.

## Week 5: Assessment and Evaluation

- Different types of assessment enhance senior-level teaching and learning.
- Assessment, evaluation, and reporting practices must be fair, transparent, and equitable for all students, and are ongoing, varied in nature, and administered over a period of time to provide multiple opportunities for senior students to demonstrate the full range of their learning.

## Learning Activities

Type	Name	Description
Discussion	Week 5 Discussion	Analysis of assessment and evaluation strategies, goals and outcomes. Outlining the roles of evaluation. Class participation, discussions, and ad-hoc reflection exercises.
Reading	Week 5 Materials & Readings	Articles Outlining Common and Traditional/Conventional Evaluation Strategies. Classroom Assessment Articles.

## Week 6: Assessment and Evaluation

- Different types of assessment enhance senior-level teaching and learning.
- Assessment, evaluation, and reporting practices must be fair, transparent, and equitable for all students, and are ongoing, varied in nature, and administered over a period of time to provide multiple opportunities for senior students to demonstrate the full range of their learning.
- Utilizing assessment and evaluation technology to document and facilitate incremental growth and learning capacity.

## Learning Activities

Type	Name	Description
Discussion	Week 6 Discussion	Outlining the utilization of classroom assessment to engage students and enhance learning. Outlining strategies and technology to enhance evaluation. Class participation, discussions, and ad-hoc reflection exercises.
Reading	Week 6 Materials & Readings	Bloom's Taxonomy. Growing Success: Assessment, Evaluation and Reporting. Habits of Mind, Learning Outcomes, Feedback and Evaluation Technology Articles.

## Week 7: 21st Century Teaching and Learning

- Proper assessment and evaluation feedback effectively progresses and enriches student learning capacity.

- Global competencies encompass knowledge, skills and attitudes/values.
- Integration of learning technology expands and progresses student learning competencies.
- The 21st century calls for education systems to explicitly emphasize and integrate global competencies such as critical thinking, collaboration and creativity in teaching and assessment practices.

<b>Learning Activities</b>		
<b>Type</b>	<b>Name</b>	<b>Description</b>
<b>Discussion</b>	Week 7 Discussion	Analysis of informative growth-based feedback from assessment and evaluation. Outlining the need to develop student global competencies. Addressing how technology plays a prominent role in the learning environment. Class participation, discussions, and ad-hoc reflection exercises.
<b>Reading</b>	Week 7 Materials & Readings	21st Century Education, Global Competencies and Developing Learning Outcomes Articles. Rethink Secondary Learning. Introduction to Inquiry Articles.

## **Week 8: Inquiry Learning in Senior Science Education**

- Constructed learning created by an inquiry approach requires careful planning and diligent execution.
- Students who engage in carefully constructed authentic inquiry experiences develop enhanced problem-solving and critical-thinking skills. This is specifically challenging and important at the senior-level.

<b>Learning Activities</b>		
<b>Type</b>	<b>Name</b>	<b>Description</b>
<b>Discussion</b>	Week 8 Discussion	Examination of aspects of a scientific investigative/inquiry/problem-based approach to learning. Class participation, discussions, and ad-hoc reflection exercises.

## Learning Activities

Type	Name	Description
Reading	Week 8 Materials & Readings	Teaching Science Through Inquiry Articles. Developing Science Inquiry Investigations. Utilizing Technology in an Inquiry Setting

## Week 9: Inquiry Investigations & STSE Education

- Hands-on experiences significantly advance learning in all levels of science education when appropriately designed and guided by qualified educators.
- Safely constructing understanding of the uses and limitations of experimental and recording technology to enhance inquiry investigations supports the nature of science and makes learning authentic.
- Incorporating Science, Technology, Society and Environment (STSE) creates an authentic learning experience by investigating broader, real-world issues.
- Teaching using socio-scientific issues can be enriching but challenging because of their contentious nature.

## Learning Activities

Type	Name	Description
Discussion	Week 9 Discussion	Analysis of the implementation of an investigative inquiry-based approach. Examination of the safety issues and learning benefits of exploring experiment technology. Outlining integration of STSE into science lessons. Class participation, discussions, and ad-hoc reflection exercises.
Reading	Week 9 Materials & Readings	Managing Context and Controversy Articles. Literacy and Numeracy Articles.

## Week 10: STSE & Literacy and Numeracy

- Controversial science topics abound in senior secondary science classes. Teachers often employ specific pedagogical strategies to successfully manage controversy in

the classroom to engage and enhance student learning.

- Scientific literacy and numeracy are vital for complete, robust student lifelong learning.

## Learning Activities

Type	Name	Description
<b>Discussion</b>	Week 10 Discussion	Developing strategies to manage context and controversy in science. Investigating the need for enhanced literacy and numeracy education in science. Class participation, discussions, and ad-hoc reflection exercises.
<b>Reading</b>	Week 10 Materials & Readings	Literacy and Numeracy Articles.

## Week 11: Literacy and Numeracy in Senior Science

- Developing senior-level scientific literacy enhances student learning and requires specific teaching strategies.
- Developing senior-level science mathematical literacy and numeracy enhances student learning and requires specific teaching strategies.
- Introduction to Inclusiveness and equity.

## Learning Activities

Type	Name	Description
<b>Discussion</b>	Week 11 Discussion	Investigating strategies to enhance scientific literacy and mathematical literacy/numeracy in senior science education.
<b>Reading</b>	Week 11 Materials & Readings	Science Literacy and Numeracy Articles. Fostering Inclusiveness and Equity in Science Articles. First Scientists Video.

## Week 12: Inclusiveness and Equity & Lesson Plans

- Inclusiveness and equity should be prioritized in all educational improvement efforts.
- All students can and should learn complex science. However, achieving equity and social justice in science education is an ongoing challenge. Teachers play a key role in fostering student inclusion and well-being.

<b>Learning Activities</b>		
<b>Type</b>	<b>Name</b>	<b>Description</b>
<b>Discussion</b>	Week 12 Discussion	Investigating inclusiveness and equity in Ontario education. Class participation, discussions, and ad-hoc reflection exercises. Group work on the second assignment.
<b>Reading</b>	Week 12 Materials & Readings	Complete The Second Assignment.

## **Week 13: Lesson Plan Presentations**

- Consolidation of education concepts demonstrated in a specific senior science lesson plan.
- Introduction to diversity and inclusion.

<b>Learning Activities</b>		
<b>Type</b>	<b>Name</b>	<b>Description</b>
<b>Discussion</b>	Week 13 Discussion	Present your group lesson plan.
<b>Reading</b>	Week 13 Materials & Readings	Indigenous Science Education Articles

## **Week 14: Inclusiveness and Equity & Democratic and Holistic Education**

- Other ways of knowing should be embedded and supported in science.
- Creating an enriching senior learning community requires careful planning and support and respects student input, choice and methods of learning.

- Student learning does not occur in isolation. Optimal education embraces the holistic learner thriving in a democratic environment.

<b>Learning Activities</b>		
<b>Type</b>	<b>Name</b>	<b>Description</b>
<b>Discussion</b>	Week 14 Discussion	Examining inclusion of other ways of knowing in science classes. Outlining the value and integration of democratic and holistic education. Class participation, discussions, and ad-hoc reflection exercises.
<b>Reading</b>	Week 14 Materials & Readings	Democratic Learning Articles and Holistic Education Articles.

## **Week 15: Senior-Level Planning and Time Management**

- Finding the best, authentic resources for senior science can be a challenge.
- Reflective educators are constantly learning about their students, themselves, and the art of teaching to improve student learning.
- Decisions about lesson sequencing and depth greatly impact the learning environment.

<b>Learning Activities</b>		
<b>Type</b>	<b>Name</b>	<b>Description</b>
<b>Discussion</b>	Week 15 Discussion	Examination of curriculum planning to create thriving learning environments. Class participation, discussions, and ad-hoc reflection exercises.
<b>Reading</b>	Week 15 Materials & Readings	Senior Curriculum Planning and Delivery Articles. Complete the Third Assignment.

## **Week 16: Senior Science Professional Development Sessions**

- Teachers have a professional obligation to reflect a growth-mindset to research, implement and reflect on a wide variety of contemporary education issues.
- Professional collaboration enriches all stakeholders in the learning community.

<b>Learning Activities</b>		
<b>Type</b>	<b>Name</b>	<b>Description</b>
<b>Discussion</b>	Week 16 Discussion	Exploring contemporary issues via peer presentations.
<b>Reading</b>	Week 16 Materials & Readings	Complete the Third Assignment.

## **Week 17: Senior Science Professional Development Sessions**

- Teachers have a professional obligation to reflect a growth-mindset to research, implement and reflect on a wide variety of contemporary education issues.
- Professional collaboration enriches all stakeholders in the learning community.

<b>Learning Activities</b>		
<b>Type</b>	<b>Name</b>	<b>Description</b>
<b>Discussion</b>	Week 17 Discussion	Exploring contemporary issues via peer presentations.
<b>Reading</b>	Week 17 Materials & Readings	Complete the Third Assignment.

## **Week 18: Senior Science Professional Development Sessions and Conclusion**

- Teachers have a professional obligation to reflect a growth-mindset to research, implement and reflect on a wide variety of contemporary education issues.
- Professional collaboration enriches all stakeholders in the learning community.
- Wrapping up curriculum and pedagogy in senior science.

## Learning Activities

Type	Name	Description
<b>Discussion</b>	Week 18 Discussion	Exploring contemporary issues via peer presentations. A conclusion to concepts explored during the course.
<b>Reading</b>	Week 18 Materials & Readings	Teacher Reflection Articles.

## Assessment Activities

Type	Name	Description
<b>Assignment</b>	Ongoing: Class participation, discussions and ad-hoc reflection exercises.	<p>Professionalism includes how well each candidate contributes to the learning of others. Teacher candidates are expected to demonstrate participation through diligent preparation, critical analysis, and thoughtful commentary on the material being discussed in each class. Periodically reflections based on class concepts/discussions may be due during class.</p> <p>Teacher candidates are expected to demonstrate participation through diligent preparation, critical analysis, and thoughtful positive, engaging and progressive commentary on the material being discussed in each class.</p> <p>Periodically reflections based on class concepts/discussions may be due during class.</p>

## Assessment Activities

Type	Name	Description
<b>Summative Assessment</b>	Due Week 5: Lesson Plan Report 1	Select one grade 11 or 12 course from the Ontario Science Curriculum document in your teachable subject and prepare a detailed lesson plan addressing ministry expectations and how this lesson will be effectively delivered.
		Completed individually and cannot utilize lessons already covered in this course.
<b>Summative Assessment</b>	Due Week 13: Lesson Plan Report 2	Select one grade 11 or 12 course from the Ontario Science Curriculum document in your teachable subject and prepare new (different than report 1) detailed lesson plan addressing ministry expectations and how this lesson will be effectively delivered.
		In addition, this lesson plan must also clearly utilize 2 of the pedagogical strategies outlined in this course and cannot utilize lessons already covered in this course.
		This assignment is completed in groups (size will be determined during the course based on time needed).
		Groups will present lesson plan 2 to peers for review/evaluation.
		The submitted lesson plan will only be evaluated by the instructor.

## Assessment Activities

Type	Name	Description
<b>Summative Assessment</b>	Due Weeks 16-18: Senior Science Professional Development Session	<p>Develop and deliver one professional development session with an accompanying digital resource that must be shared with peers prior to your P.D. session.</p> <p>The P.D. session/resource must deal with a current educational issue or strategy that was not covered in this course and must also be useful in some capacity for teaching senior science.</p> <p>This assignment is completed in groups (size will be determined during the course based on time needed) and will also be presented for peer review/evaluation.</p> <p>The submitted digital resource will only be evaluated by the instructor.</p>

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# 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/BEEd/policies.html](http://edu.uwo.ca/CSW/my-program/BEEd/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](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)