Western Education

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EDUC 5205/5221

Curriculum & Pedagogy in Senior Chemistry & Physics

Instructor:

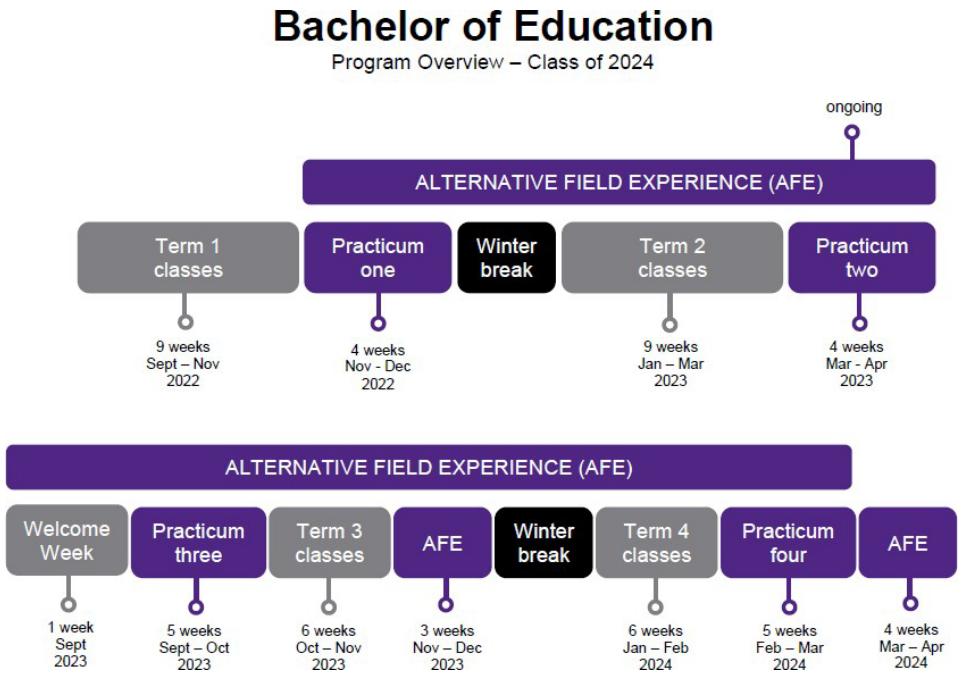
Inna Ellacott, MSc, BEd
E: inna.ellacott@uwo.ca
T: 519-661-8111
Office Hours: by appointment

Schedule:

Tuesday 4:30 – 6:30 pm
Thursday 4:30 – 6:30 pm

Program Context:

This is a 1.0 credit course taken by Teacher Candidates during year 1, terms 1&2 of the Bachelor of Education.



Course Description

The course is an introduction to curriculum and instruction in chemistry & physics in the Senior division. Teacher candidates design and critique instructional approaches based on a consideration of the nature of science and science education. Attention to constructivist, cognitive, behavioural and social theories of learning, and to motivation, student diversity and classroom management.

The course will focus on Ontario grade 11 and 12 physics/chemistry 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 and evaluation, inquiry in science education, STSE, planning and time management, inclusiveness and equity, numeracy and literacy in science, 21st Century teaching and learning, inclusiveness and equity, and democratic and holistic education.

There is no required textbooks for this course.

Number of weeks: 18

Week 1: Ontario Seniour Science Curriculum

- Introduction
- Course overview
- Discovering Ontario Science Curriculum

Type	Name	Description
Discussion	Week 1 Discussion	-Class participation, discussions, and ad-hoc reflection exercises.
Reading	Week 1 Readings	The Ontario Senior Science Curriculum

Week 2 : Ontario Chemistry/Physics Curriculum

- Exploring chemistry/physics Ontario curriculum: courses (pre-requisites and electives), units, chapters, topics.
- Curriculum resources and materials available to physics and chemistry teachers.
- Learning Cycle

Type	Name	Description
Discussion	Week 2 Discussion	- Class participation - Starting the Curriculum Teacher's Package
Reading	Week 2 Readings	The Ontario Senior Science Framework Examining the Learning Cycle

Week 3: Curriculum and Pedagogy: Nature of Science Education

- Learning Cycle in science
- Characteristics of the nature of science
- How do adolescents learn chemistry and physics?

Type	Name	Description
Discussion	Week 3 Discussion	Class participation, discussions, and ad-hoc reflection exercises - Learning cycle and didactic teaching - Interpreting Ministry Expectations - Nature of science - Continuing the Curriculum Teacher's Package
Reading	Week 3 Readings	NOS in Physics/science class

Week 4: Curriculum and Pedagogy: Science Learning Cycle

- 5E Learning Cycle in Physics/Chemistry
- Physics/Chemistry Curriculum planning strategies

Type	Name	Description
Discussion	Week 4 Discussion	- Discussion of reading materials - Planning Exercise - Class participation, discussions, and ad-hoc reflection exercises.
Reading	Week 4 Readings	A Learning Cycle

Week 5: Long term, Short Term planning and Time Management

- Creating Semester Outline
- Creating Unit Plan for Physics/Chemistry Unit

Type	Name	Description
Discussion	Week 5 Discussion	- Work in class using provided Semester and Unit Plan templates - Week Readings discussion - Class participation, discussions, and ad-hoc reflection exercises. - Curriculum Teacher's Package due
Reading	Week 5 Readings	New Teachers: Lesson and Curriculum Planning

Week 6: Lesson Planning

- Creating a Lesson Plan for physics/chemistry class
- Lesson Plan Templates
- 5E Lesson Plan for Physics/Chemistry
- Teachers' Resources on Lesson Planning

Type	Name	Description
Discussion	Week 6 Discussion	- Completing the long-term planning exercise - Lesson planning ideas - Week Readings discussion - Class participation, discussions, and ad-hoc reflection exercises.
Reading	Week 6 Readings	Teachnology Lesson Plans Share my Lesson

Week 7: Introduction to Assessment and Evaluation Policies

- Ontario Ministry of Education Assessment and Evaluation Policies
- Assessment categories in Physics and Chemistry classroom (KICA)

Type	Name	Description
Discussion	Week 7 Discussion	- Class participation, discussions, and ad-hoc reflection exercises. -Advantages of Traditional or Conventional Evaluation -Classroom Assessment -Seven Keys to Effective Feedback -Assessment categories - Semester/Unit/Lesson Plan due
Reading	Week 7 Readings	Growing Success

Week 8: Feedback and Reporting

- Effective, inclusive communication and feedback
- Provincial Report Cards, Chemistry/Physics reporting
- Special Considerations

Type	Name	Description
Discussion	Week 8 Discussion	- Class participation, discussions of reding materials, and ad-hoc reflection exercises.
Reading	Week 8 Readings	Reporting Students Learning

Week 9: Science, Technology, Society and Environment

-Implementing socio-scientific issues in the science classroom
-Connecting curriculum to real-world issues
-Pedagogical strategies for STSE lessons

Type	Name	Description
Discussion	Week 9 Discussion	- Class participation, discussions of reding materials, and ad-hoc reflection exercises. - Environmental/Sustainability - Issues in science education - Dilemmas and Controversies in Science - KICA Workbook and Reflection due
Reading	Week 9 Readings	Teaching for Ecological Sustainability

Week 10: Welcome Back! Introduction to Science Classroom Management

- Fundamental Principles of classroom management in a science lab setting
- Diversity of the learning styles and needs in Chemistry/Physics.

Type	Name	Description
Discussion	Week 10 Discussion	-Practicum experiences and reflection -Intervention and Support -Communication and follow up -Case studies
Reading	Week 10 Readings	Survive and Thrive Progressive Discipline Classroom Management Tips For New Science Teachers

Week 11: Professional Development Presentations

Teacher candidates present their assignment "Professional Development"

Type	Name	Description
Discussion	Week 11 Discussion	"Professional Development" presentations
Reading	Week 11 Readings	

Week 12: Science Classroom Management: Diverse Learners in Chemistry/Physics Classroom

- What is Inter-cultural inquiry?
- Teaching students with IEP
- Diverse learners in chemistry/physics classroom

Type	Name	Description
Discussion	Week 12 Discussion	- Class participation, discussions of reding materials, and ad-hoc reflection exercises.
Reading	Week 12 Readings	Culturally Responsive Pedagogy Ontario First Nation, Métis, and Inuit Education Policy Framework Caring and Safe Schools in Ontario

Week 13: Inquiry learning

- Many Levels of Inquiry
- Guiding questions
- Designing Inquiry Lessons

Type	Name	Description
Discussion	Week 13 Discussion	- Inquiry exercises - Designing an Inquiry Lesson - Class participation, discussions of reding materials, and ad-hoc reflection exercises.
Reading	Week 13 Readings	Inquiry based Learning

Week 14: Inquiry Teaching

- Why engage in teacher inquiry?
- Characteristics of teacher inquiry

Type	Name	Description
Discussion	Week 14 Discussion	- Inquiry teaching case analysis. - Class participation, discussions of reding materials, and ad-hoc reflection exercises.
Reading	Week 14 Readings	Collaborative Teacher Inquiry

Week 15: Technology Incorporation in Chemistry/Physics Classroom

-Global Competencies (knowledge, skills, attitudes/values)
-Promotion of critical thinking, collaboration and creativity through teaching and assessment practices
- 21st Century teaching and learning beyond textbooks: essential technology in science classroom
- Overview of digital learning tools resources (3D, immersive, interactive, etc.)

Type	Name	Description
Discussion	Week 15 Discussion	- Participating in class discussion and review of reading materials. - Sharing own academic experiences related to the use of technology in the classroom. - Exercises in coding for science classroom (parabolic projectile)
Reading	Week 15 Readings	21 Century Teacher 21st Century Competencies

Week 16: Democratic and Holistic Education

-Creating and planning an enriching senior learning community
-Teaching subjects as cross-curricular concepts
-Incorporating student input, choice and methods of learning

Type	Name	Description
Discussion	Week 16 Discussion	- Class participation, discussions of reding materials, and ad-hoc reflection exercises. -Democratic Learning -Holistic Education
Reading	Week 16 Readings	Democratic Learning Holistic Education

Week 17: Technology in the Chemistry/Physics Classroom presentations

Using multimedia technology for learning, teaching and assessment.

Type	Name	Description
Discussion	Week 17 Discussion	Technology in the Chemistry/Physics Classroom presentations
Reading	Week 17 Readings	

Week 18: Final Reflection

- What is science education?
- Life Long Learning and Professional Development

Type	Name	Description
Discussion	Week 18 Discussion	- Class participation, discussions of reding materials, and ad-hoc reflection exercises. - Written Cumulative/Final Reflection due
Reading	Week 18 Readings	Principles and big ideas of science education

ASSIGNMENTS:

*Please save and submit all your work in **.pdf** format!*

1. **Curriculum Teacher's Package – due Week 5**
   - Please study the Ontario Science Curriculum In your subject, either Chemistry or Physics.
   - Prepare a 2-parts document: Part 1 - Grade 11 University Preparation course and Part 2 - Grade 12 University Preparation course.
   - For each of five strands in each course describe one inquiry activity, one laboratory activity and one assessment to address the title of the strand. You may utilize and summarize the activities found in the respective textbooks, currently approved by the school boards in Ontario.
   - Organize your package well: use clear titles and subtitles, point format when justified, step-by-step instructions, reasonable amount of illustrative material. Consider dedicating one page to each strand - the package will contain 10 pages in total.

2. **Semester/Unit/Lesson Plan – due Week 7**
   Select one course, grade 11 or 12, from the Ontario Science curriculum document in your respective subject and prepare a document containing:

   - Semester (long term) plan – 5 Units
   - Unit plan – 16 lessons
   - Lesson plan – 75 min

   The format and templates for the long- and short-term planning will be reviewed in class in great detail.

3. **KICA Workbook and Reflection – due Week 9**
   As the group of four, create a KICA (Knowledge, Inquiry, Communication, Application) workbook for an assigned curriculum unit in grade 11 or 12 chemistry or physics. Your KICA Workbook will begin with a *unit plan overview* that includes:
   - 16 lesson titles,
   - one overall expectation that each lesson addresses

- an indication of which KICA category each lesson will focus on
- the type of assessment included in each lesson.

Each group member will select a lesson for *one* of four categories and create a full lesson plan. Each KICA category must be represented in the assignment.

In the end, collectively write a one-page reflection on advantages and disadvantages, on your opinion, of KICA evaluation approach.

4. Science Teacher Professional Development – due Week 11

Participate independently in a science teacher professional development activity. Some examples of professional development activities:

a) attending Science Teachers Association of Ontario conference online
b) participating in a laboratory safety workshop
c) attending a science lesson demonstration
d) working with an associate teacher on developing a lesson/unit or a classroom activity.
e) visiting a science related destination of the potential field trip determined by you.
f) participating in a science related workshop or webinar.

Using a presentation graphic software of your choice (PowerPoint, Prezi…) prepare a 10-minute presentation to share your experience with your peers in our classroom. Report on your activity describing it , how you benefited from the participation and possible ways to incorporate the activity or what you learned from it into your science teaching repertoire.

5. Technology Incorporation in Science Classroom – due Week 17

This assignment will be completed with a partner.

The current state of technology utilization in the science classroom will be thoroughly discussed in class. You will be presented with a list of various software products that may be utilized in the senior chemistry/physics teaching and learning process.

Please select one product from the list or propose a software of your own choice and prepare a 15 min fragment of the "lesson" that would instruct *our classroom* on potential utilization of these products in the teaching process. Your presentation must contain indication of connection to the curriculum and a demonstration of one complete activity for a chosen application.

6. Final Reflection – due Week 18

Write a 500-700 words reflection on your experience as a science student in the past and how this experience would inform your future teaching practices. What kind of an educator would you like to become?

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