

OISE: MT CTL7023Y

Curriculum and Teaching in Science: Biology (Intermediate/Senior)

Course Outline
2017-2018

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Teaching Room:	University of Toronto Schools (UTS), 371 Bloor Street West
Class Schedule:	Mondays and Wednesdays, 1:00 pm – 4:00 pm
Office:	Room 323C, UTS, 371 Bloor Street West
Office Hours:	By appointment. Please send me an email to schedule a meeting during business hours; I will aim to respond to your email within 24 business hours.
Supplementary Course Information:	http://www.oise.utoronto.ca/ese

The Pepper platform will be used for course readings, announcements and assignments; all course materials are posted on this site. In the event of the instructors' absence or unexpected circumstances, you will be notified directly through your University of Toronto e-mail using the Pepper mail system. It is your responsibility to regularly check your email and Pepper accounts.

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1. Course Description

This course will introduce candidates to the methodologies and issues relevant to teaching Biology in Ontario in the Intermediate and Senior divisions (Grades 7-12). The course provides opportunities to develop a practical understanding of instructional methods and skills through unit and lesson planning in a variety of classroom contexts. Furthermore, candidates will be introduced to safe laboratory work, the effective selection and use of resources, the integration of technology into teaching, a variety of assessment/evaluation strategies, and to creating an inclusive and motivating learning environment. Throughout the program, efforts are made to

integrate theoretical ideas and perspectives from the educational research literature with teaching and learning practices in schools.

2. Course Expectations

The choice of the course expectations was guided by the MT Program’s seven core principles: Teaching Excellence; Equity, Diversity and Social Justice; Research Informed and Infused Practice; Cohort-Based Learning Communities; School/Field/University Partnerships; Faculty Collaboration; and Coherence as well as the goals of teacher education as outlined in the OCT Accreditation Guide.

Teacher Candidates must follow the guidelines for professional conduct developed by the Ontario College of Teachers, called the Standards of Practice (SOP), found at: http://www.oct.ca/standards/standards_of_practice.aspx. As such, the course expectations are aligned with the Standards of Practice for the Teaching Profession. The following tables illustrate that alignment as it relates to specific objectives of each class.

Expectations By the end of the course you will have had opportunity to ...	Standards of Practice
<p>Major Concepts of Science and Teaching Science:</p> <ul style="list-style-type: none"> • Relate science to technology, society and the environment (STSE) for all strands in the intermediate science and senior biology courses • Foster and develop the skills of investigation and critical thinking, including initiating and planning, performing and recording, analysing and interpreting and communicating, within intermediate science and senior biology students. • Understanding and teach basic science concepts for all strands in the intermediate and senior biology courses. 	Professional Knowledge Professional Practice
<p>Laboratory Skills and Safety</p> <ul style="list-style-type: none"> • Safely handle, use, store and dispose of chemicals and other materials used in intermediate science and senior biology. • Correctly operate science equipment, science related technology and tools commonly used in teaching intermediate and senior biology. (e.g. microscopes, Bunsen burners, hot plates) • Ensure a safe classroom and shared science areas for their students, colleagues and themselves. 	Commitment to Students and Student Learning Professional Practice Leadership in Learning Communities
<p>Pedagogy:</p> <ul style="list-style-type: none"> • Inquire critically into and demonstrate an understanding of different theoretical perspectives, research findings, curriculum expectations and effective teaching and learning practices related to intermediate and senior science. 	Commitment to Students and Student Learning Professional Practice Leadership in Learning Communities

<ul style="list-style-type: none"> • Plan, develop and implement a variety of differentiated teaching/learning strategies that respect learner diversity, and create an equitable and inclusive learning environment that promotes student engagement and success in science courses. • Plan, develop and implement a variety of differentiated assessment strategies that account for learner diversity and are aligned with the Ontario Curriculum’s Achievement Chart. • Work independently and collaboratively to build effective, equitable and inclusive learning communities. • Critically reflect upon their teaching practice and participate in activities that promote their on-going professional growth. • Effectively use learning technology in teaching and learning science. 	Ongoing Professional Learning
<p>The Importance of Teaching Science in a Societal Context</p> <ul style="list-style-type: none"> • Promote scientific literacy through teaching of the Nature of Science as outlined in Ontario curriculum guides for grade 9 and 10 science and grades 11 and 12 biology. • Understand and teach students about the political, social, economic, and cultural power of science and the impact science can have on society now and in the future. • Explore, participate in and contribute to professional learning communities that will keep them up to date on advancements in science and science education (i.e. STAO, NSTA, conferences, workshops etc.). 	Commitment to Students and Student Learning Professional Knowledge Leadership in Learning Communities Ongoing Professional Learning

3. Evaluation

The final grade for this course will be based on the assignments outlined below. The goal of evaluation is to assess and support the student’s enduring understandings of the key principles in science and biology. Specific details, evaluation criteria and due dates will be provided in class when each assignment is introduced and will be posted on the course Pepper site. In each assignment you need to demonstrate how your thoughts and reflections are connected to current research. A summary of assignments is listed below.

3.1. In-class and online assignments (20%)

There will be a range of in-class and online activities in which you are expected to participate. Some short assignments will be submitted and assessed throughout the course. Some will be done in class, some will begin in class and be completed later by the student, and some will be done as homework and then discussed in class or posted on Pepper. (e.g., questioning, article analysis, reflections, lab activities, in-class work, peer feedback, etc.).

3.2. Lesson Planning (20%)

You will research a topic and create a teaching and learning sequence for a topic in grade 9 or 10 that will include a unit overview, and detailed lesson plans for two sequential classes,

including the teaching notes, student materials, assessment materials as well as any other resources needed to implement the lessons.

3.3. Micro-teaching or Science Demonstration (20%)

Teacher candidates (TCs) who have not experienced micro-teaching in a previous MT science course will prepare a 7-10 min micro-lesson that they will teach to their peers. The teaching episode will be videotaped for later review. This assignment will provide opportunities to generate some useful data about strengths and areas for growth as a teacher. Logistics (which depend on class size and space) will be reviewed in class.

Teacher candidates who have previously done a micro-teaching presentation will prepare and present a science demonstration. After the presentation, teacher candidates will submit a summary that outlines the rationale for the demo choice, the (mis)conceptions addressed and a reflection of the process and presentation.

3.4. Curriculum Development (40%)

The purpose of this assignment is to give you an opportunity to develop curricula (in the form of each of an STSE case study, a minds-on or 'hook' and a lab sequence) that may be used in the future by you and/or your colleagues and to analyze the curriculum from a theoretical position. For this assignment you will in small groups, develop curriculum for teaching for senior Biology (that is Biology 11U, 11C, 12U). You will conduct the inquiry activity (lab) with your peers during an assigned class in January, March or April.

Assignment	Timeline	Weighting
In-class/online assignments	<ul style="list-style-type: none"> Throughout the year 	20
Lesson Planning	<ul style="list-style-type: none"> Planning conference- September 27 Due date - October 11 	20
Micro-teaching OR	<ul style="list-style-type: none"> Recording and viewing - October 18 Directed Reflection due date - October 25 	20
Science Demonstration	<ul style="list-style-type: none"> Planning and conferencing – October 18 Presentations – selected dates throughout the year 	
Curriculum Development	<ul style="list-style-type: none"> Planning conference - January 10 Draft for peer feedback - January 24 Presentation of the inquiry activity - Selected dates in January and February Due date for final submission - February 2 	40

4. Course Content

Below is a proposed outline of the themes explored in this course.

Class/Date	Themes	Associated readings
Class 1/Mon. Sep. 11	<ul style="list-style-type: none"> Personal perspectives on science teaching 	
Class 2/Wed. Sep. 13	<ul style="list-style-type: none"> Policy documents NOS Questioning 	Ch 2, p24-26, 28-33 prepare Ch 5 Act. 5.1 p79
Class 3/Mon. Sep. 18	<ul style="list-style-type: none"> The outdoor classroom 	Ch 5, p101-102 Water Quality Analysis summary
Class 4/Wed. Sep. 20	<ul style="list-style-type: none"> Environmental education Lesson and unit Planning Questioning 	Ch 12 p232-234 Ch 5, 78-95 Ch 14, 264-5
Class 5/Mon. Sep. 25	<ul style="list-style-type: none"> Student needs Questioning cont'd 	Ch 4, p58-64
Class 6/Wed. Sep. 27	<ul style="list-style-type: none"> Planning cont'd Content Knowledge (PK) Pedagogical Content Knowledge (PCK) Assessment and Evaluation 	Ch 14 Ch 4, p70-74
Class 7/Mon. Oct. 2	<ul style="list-style-type: none"> Teaching and learning strategies 	Ch 13
Class 8/Wed. Oct. 11	<ul style="list-style-type: none"> Scientific inquiry and labs Learning strategies Mindful use of technology Lesson Planning due 	Ch 7, p122-127, 131-2 Ch 9 Ch 14 p270
Class 9/Wed. Oct. 18	<ul style="list-style-type: none"> Micro-teaching recording and viewing OR science demonstration planning 	
Class 10/Mon. Oct. 23	<ul style="list-style-type: none"> Lab preparation and safety Difficult concepts and misconceptions 	Ch 8, esp. 151-5
Class 11/Wed. Oct. 25	<ul style="list-style-type: none"> Preparing for practicum Classroom management Meeting needs Micro-teaching reflection due 	Ch 5, p97-100 Appendix B, p311
Practicum		
Class 12/Mon. Nov. 27	<ul style="list-style-type: none"> Practicum debrief and sharing STSE 	Ch 10, 11
Class 13/Wed. Nov. 29	<ul style="list-style-type: none"> Equity 	Ch 3, p38-46

	<ul style="list-style-type: none"> Indigenous perspectives and other ways of knowing Science demos 1,2,&3 	
Class 14/Mon. Dec. 4	<ul style="list-style-type: none"> Design technology Science demos 4,5&6 	Ch 7, p139-140
Class 15/Wed. Dec. 6	<ul style="list-style-type: none"> Curriculum design Science demos 7,8 	
Class 16/Wed. Jan. 10	<ul style="list-style-type: none"> Curriculum design cont'd Curriculum Development planning conferences 	Ch 6 Ch 11, p205-209
Class 17/Mon. Jan. 15	<ul style="list-style-type: none"> Inquiry cont'd 	Lock, R. (1990). Open-ended, problem-solving investigations. <i>School science review</i> , 71(256), 63-72.
Class 18/Wed. Jan 17	<ul style="list-style-type: none"> STSE cont'd 	Ch 12 Pedretti, E., Bencze, L., Hewitt, J., Romkey, L., & Jivraj, A. (2008). Promoting issues-based STSE perspectives in science teacher education: Problems of identity and ideology. <i>Science & Education</i> , 17(8-9), 941-960.
Class 19/Wed. Jan. 24	<ul style="list-style-type: none"> Culture and world views Curriculum Design draft peer feedback 	Aikenhead, G. (1996). Science education: Border crossings into the subculture of science. <i>Studies in Science Education</i> , 27, 1-52.
Class 20/Mon. Jan. 29	<ul style="list-style-type: none"> Literacy and support for ELLs 	Fang, Z. (2006). The language demands of science reading in middle school. <i>International Journal of Science Education</i> , 28(5), 491-520.
Class 21/Wed. Jan. 31	<ul style="list-style-type: none"> Learning strategies Sharing inquiry activities from CD (1,2) Curriculum Development due Feb. 2 	
Practicum		
Class 22/Mon. Mar. 26	<ul style="list-style-type: none"> Practicum debrief Sharing inquiry activities from CD (3,4) 	
Class 23/Wed. Mar. 28	<ul style="list-style-type: none"> Learning strategies Sharing inquiry activities from CD (5,6) 	
Class 24/Wed. Apr. 4	<ul style="list-style-type: none"> Learning strategies Making a good beginning Sharing inquiry activities from CD (7,8) 	App. C p315

5. Required Text, Materials and Resources

5.1. Required Text

Pedretti, E., & Bellomo, K. (2014). *Explorations in Secondary School Science: Practice and Theory*. Toronto, ON: Pearson Education Canada.

Available in either bound or loose leaf format from:

The Bob Miller Bookroom
180 Bloor Street West.

5.2 Materials and Resources

In addition to the readings presented above and in the table below, readings, handouts, slide presentations, video and audio materials with proposed timelines for preparedness for class will be posted on the course Pepper site. As well, students will want to explore the rich variety of science teaching resource books to become familiar with demonstrations, lab activities, and teaching strategies. Field trips that are directly connected to our course content may require the collection of additional fees.

The Ontario Ministry of Education is in the process of updating and revising many key documents related to education in the province of Ontario. Some Ministry documents can be ordered by students from Service Ontario (www.serviceontario.ca) or acquired on the Ministry of Education website: www.edu.gov.on.ca. The following is a list of documents you should consult during this course:

- *The Ontario Curriculum, Grades 1-8 (7 & 8 only): Science & Technology (Ministry of Education, 2007)*
- *The Ontario Curriculum, Grades 9 and 10: Science (Ministry of Education, 2008)*
- *The Ontario Curriculum, Grades 11 and 12: Science (Ministry of Education, 2008)**Environmental Education Scope and Sequence of Expectations (2011)*
- *Aboriginal Education Strategy (2010)*
- *Growing Success: Assessment, Evaluation and Reporting in Ontario Schools. (2010)*
- *Realizing the Promise of Diversity: Ontario's Equity & Inclusive Education Strategy (2009)*
- *Learning for All (2011)*

5.3 Required Readings

These readings will be analyzed in class in small groups on the designated dates.

No.	Theme	Date	Article
1.	Inquiry	Jan. 15	Lock, R. (1990). Open-ended, problem-solving investigations. <i>School science review</i>, 71(256), 63-72.

2.	STSE	Jan. 17	Pedretti, E., Bencze, L., Hewitt, J., Romkey, L., & Jivraj, A. (2008). Promoting issues-based STSE perspectives in science teacher education: Problems of identity and ideology. <i>Science & Education</i>, 17(8-9), 941-960.
3.	Science as Culture	Jan. 24	Aikenhead, G. (1996). Science education: Border crossings into the subculture of science. <i>Studies in Science Education</i>, 27, 1-52.
4.	Language	Jan. 29	Fang, Z. (2006). The language demands of science reading in middle school. <i>International Journal of Science Education</i>, 28(5), 491-520.

6. Academic Support for Students

OISE Student Success Centre (OSSC) offers a range of services, including one on one writing, math and French language support. For more see:

http://www.oise.utoronto.ca/ss/OISE_Student_Success_Centre_%28OSSC%29/index.html - overview

7. Sustainability

OISE is committed to supporting the Ministry of Education's policy on Environmental Education, and creating a culture of sustainability in teaching and learning through paper and waste reduction, energy conservation and other initiatives. This course carries a Green Course Certificate which means that we are committed to making reductions in paper use. Please see OISE's Environmental and Sustainability Website at <http://www.oise.utoronto.ca/ese/>

8. Standards of Professionalism

In accordance with the Ontario College of Teachers' *Foundations of Professional Practice* (2012), this course emphasizes the Standards of Practice and Ethical Standards for the Teaching Profession. This document is available at the following URL:

<http://www.oct.ca/resources/categories/professional%20standards%20and%20designation>

9. Procedures and Policies

9.1. Final Grade Determination

Assignments are graded in accordance with the evaluation criteria set out by the University – please refer to Grading & Transcripts: University Assessment & Grading Practices Policy

<http://www.sgs.utoronto.ca/facultyandstaff/Pages/Policies-and-Guidelines.aspx>

Excerpt: 1.2.2. Graduate Studies uses a truncated refined letter grade scale (as follows) A+, A, A-, B+, B, B-, FZ

9.2. Academic Integrity

It is important to familiarize yourself with the University of Toronto's policies and procedures on academic matters. The Code of Behaviour on Academic Matters pertains to all students and faculty at the University of Toronto. This document states that it is an offence for a student knowingly "to represent as one's own any idea or expression of an idea or work of another in academic examination or term test or in connection with any other form of academic work, i.e. to commit plagiarism". It also defines a number of other offences, which the University expects all students to know about and avoid.

Please review the complete document online:

www.governingcouncil.utoronto.ca/policies/behaveac.htm. The University of Toronto also has a website dedicated to Academic Integrity and associated UofT resources, www.utoronto.ca/academicintegrity that includes: 1) Definitions of Academic Offences at <http://www.utoronto.ca/academicintegrity/academicoffenses.html> 2) "How Not to Plagiarize" at <http://www.writing.utoronto.ca/advice/using-sources/how-not-to-plagiarize>, and 3) "Standard Documentation Formats" <http://www.writing.utoronto.ca/advice/using-sources/documentation>

Note that **ANY** adaptation of another person's work (i.e. teacher's guides, textbooks, Ministry of Education Profiles, Lesson Plans, etc.) for **ANY** assignment (presentations, handouts, lesson plans, unit plans, etc.) must be correctly cited. This includes items found on the Internet.

9.3. Professional & collegial behaviour expectations

The methods and assignments in this course involve active participation, based on the demonstration of professional/collegial behaviours, as outlined in the *Foundations of Professional Practice* by the Ontario College of Teachers, 2012 and the OISE/UT companion document *Teacher Candidates & Professionalism, 2006, Professional and Ethical Standards 2015*.

Success in this course is related to your contribution to and participation in daily activities and collaborative tasks, drawing upon assigned readings and personal experience. As with all OISE classes, punctual and regular attendance is not only highly beneficial to your development as a teacher, but it is also an expectation of professionalism.

Participating in a professional culture may be new for some teacher candidates, for most it is a habit of mind that develops over time. In the case of unavoidable lateness or absences, you are expected to notify the instructor (and colleagues who might be affected) **in advance if at all possible** by phone or email. When in-class assignments and activities are missed during such absences, candidates may be asked to make them up in mutually agreeable ways.

You are welcome to use laptops in order to engage in classroom learning activities. However, during our classes, please do not use devices for personal activities unrelated to our learning. Please turn off or mute your cell phones during class.

9.4. Timely submission of assignments

The instructor expects that all assignments will be submitted by their posted due date. It is expected that arrangements for an alternate due date, if required, will be made directly with the instructor no later than 5 business days before the assignment is due. Decisions regarding accepting late assignments will be made at the discretion of the instructor. Exceptions may be made on the basis of relevant accommodations outlined in a *Letter of Accommodation* or a *Letter of Consideration* generated by OISE's Student Services Office.

9.5. Freedom of information and protection of privacy

As of June 10, 2006 all Ontario universities have been covered by the Freedom of Information and Protection of Privacy Act (FIPPA). This Act supports access to University records and protection of privacy, including the protection of personal information about individuals that is held by the University and the provision of access for individuals to their personal information. Teacher Candidates will be contacted by using only their utoronto.ca email address.

9.6. Accommodations

Students with diverse learning styles and needs are welcome in this course. The University of Toronto recommends that students immediately register with Accessibility Services <http://www.studentlife.utoronto.ca/as/new-registration>. In particular, if you have a disability or health consideration that may require accommodation, please approach the instructor and/or the Accessibility Services Office as soon as possible. This course works with the assumption that access is always an issue and needs to be negotiated by all those involved in the course. This negotiation includes considering the consequences of our many conceptions of 'disability', as these relate to the classroom at the level of individual rights and needs, and as they relate to scholarly inquiry and research.

For more information on services and resources available to instructors and students and/or if you have a learning need that requires an accommodation, please register with Accessibility Services at <http://www.studentlife.utoronto.ca/as/new-registration> and directly with Jeananne Robertson, Student Success Specialist at jt.robertson@utoronto.ca (OISE Rm. 8-226).

OISE has accessible washrooms on the ground floor and fifth floor, containing barrier-free access via automated door (with touch to open, lock & unlock), gender-neutral signage, space for adequate maneuvering of a variety of mobility devices, automated fixtures at a universalized level, and assistance required signage. Another accessibility washroom located within the main floor of the OISE library, is accessible during library hours.

9.7. Continuity planning in case of disruption to classes

In the event of an unforeseen interruption of classes or a closure of the OISE site or the larger university, the updates to the course syllabus, course materials, assignments and notices will be regularly posted online on the class Pepper site.

9.8. Coursework extension

A coursework extension may be appropriate if academic (e.g., unexpected problems of research in a course) or non-academic (e.g., illness) reasons make it impossible for you to complete course requirements on time.

You may apply for an extension by submitting the [course extension form](#) to your graduate unit prior to the deadline for completion of course work.

If you have been granted a course extension, the graduate unit will assign the temporary non-grade report SDF (Standing Deferred) until your final grade report is received. During an approved coursework extension, you will continue to pay tuition fees according to your program status (i.e., full-time or part-time, domestic, or international).

If you are unable to complete the required coursework during the extension period, you may apply to your graduate unit for a continuation of the extension. Second coursework extensions must also be considered by SGS. Second coursework extension requests must be made before the expiry date of the first extension period.

<https://www.sgs.utoronto.ca/calendar/Pages/Registration-and-Enrolment.aspx>