Chemistry
UNIVERSITY OF TORONTO

JSC 301H: PRINCIPLES AND PRACTICES IN SCIENCE EDUCATION

Winter 2025 Course Syllabus (January 6, 2025)

I TEACHING TEAM

INSTRUCTORS

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II COURSE OVERVIEW

This course provides an introduction to effective science education and public outreach. There is no specific textbook for this course, although a draft text is provided to students via Quercus for readings. Students will also be provided with additional reading materials, including relevant reviews and original articles from the educational research literature; websites, videos, and magazine articles related to course topics, and practical advice on learning activities and principles of effective communication. To aid students encountering educational and cognitive psychology research for the first time, study and discussion questions will be provided for key readings, which will be followed up with in-class discussion.

STUDENT LEARNING OUTCOMES:

At the end of this course, students will be able to:

- Describe key concepts related to teaching and learning and relate these concepts to their own learning experiences.
- Describe and create learning activities and assessments appropriate for a specific audience, in either a formal or informal setting.
- Discuss and identify traits of effective science communication.
- Consider and adapt to the target audience for the information.
- Place science communication into the wider context of formal and informal learning.
- Select and prepare an appropriate medium to convey scientific information.

PREREQUISITE COURSE(S):

There is no prerequisite course. However, students should have completed at least 3.0 FCE science credits prior to taking this course.

READINGS:

Initial readings are indicated in the course schedule (below) but may be supplemented with additional materials as the course progresses.

III COURSE ORGANIZATION

This is course is divided between four major themes, each of which will be revisited in more detail as the course progresses. These themes are:

- The nature of science as an intellectual and educational endeavour
- The science of knowledge and learning (cognitive, social, neurological)
- Effective science communication within a variety of contexts:
    - Formal education (K-12, higher, and adult/continuing education)
    - Informal education (museums, science centres, STEM outreach)
    - Science promotion (news articles, social media, documentaries)
    - Other venues (science policy, advocacy, public health)
- Tips, Tools, and Technology for science education and outreach

Classes will be held in-person for two 1-hour sessions per week, and will consist of a mixture of lectures, discussions, and activities related to the course content. External speakers will also be invited to share their experience in communicating science in a variety of different contexts.

COURSE SCHEDULE & RELEVANT SESSIONAL DATES:

Date	Week	Monday	Wednesday
Jan. 6	1	Overview and introduction (Ch.1-1.1) (DCS)	Science concepts, language, method, and models (Ch.1.2-1.5) (DCS)
Jan. 13	2	Exploring cognitive connections through concept mapping. (CGB)	Describing and quantifying learning & intellectual development (Ch.2-2.1) (DCS)
Jan. 20	3	Learning & the Brain (Ch.2.2-2.5) (DCS)	Learning to Learn (Ch.3) (DCS)
Jan. 27	4	Communication & Curriculum (Ch.4-4.2) (DCS)	Concept Inventories and Misconceptions (Ch.4.3) (CGB)
Feb. 3	5	Learning styles and preferences (Ch.5) (CGB)	Assessment in and for learning (both?)
Feb. 10	6	Communication	Misc. topics
Feb. 17	–	Family Day holiday and reading week – no classes	
Feb. 24	7	Class Visitors	Meaningful graphics
Mar. 3	8	Class Visitors	Effective use of technology (CGB)
Mar. 10	9	Class Visitors	Labs and demonstrations (DCS)

Mar. 18	10	Class Visitors	field experiences (CGB)
Mar. 25	11	Student presentations	Student presentations
Apr. 1	12	Student presentations	Course debriefing session

Note: specific dates and topics may be subject to change.

IV EVALUATION/GRADING SCHEME

OVERVIEW:

- Concept map assignment (10%) – January 20th 2025
- Written assignment (20%) February 28th 2025. Choice from:
  - 4-pg essay on learning
  - 4-pg essay on misconceptions
- Short news article (20%) based on an interview with a faculty member, post-doc, or graduate student about their research; "elevator pitch", write an article (~1 page) (February 3rd)
- Project (50% total):
  - draft proposal (10%) – February 10th 2025
  - detailed design document [Mar. 7th 15%]
  - 10 min in-class presentation [last 2 weeks of class] and final submission [last day of classes] [combined 25%]

V COURSE POLICIES

Each member of this course is expected to maintain a:

- professional and respectful attitude during all course activities, including classes, laboratories, tutorials, and online activity.
- personal calendar/schedule/organizer to ensure that all course activities are completed, and due dates are met.
- collection of notes recorded independently based on concepts covered in course activities (students registered with Accessibility Services requiring a class note-taker will have access to this accommodation)
- familiarity with the university policy on Academic Integrity

The University of Toronto is committed to equity, human rights, and respect for diversity. All members of the learning environment in this course should strive to create an atmosphere of mutual respect where all members of our community can express themselves, engage with each other, and respect one another's differences. As a Course Instructor, I will neither condone nor tolerate behaviour that undermines the dignity or self-esteem of any individual in this course and wish to be alerted to any attempt to create an intimidating or hostile environment. It is our collective responsibility to create a space that is inclusive and welcomes discussion. Discrimination, harassment and hate speech will not be tolerated. If you have any questions, comments, or concerns, we encourage you to reach out to the staff in our Equity Offices.

Communication with instructor:

Generally, students will receive a response within 24 hrs. on weekdays. Please note that instructors may not be available to respond on evenings, holidays, and weekends.

In the event of illness or any other absence:

Students are reminded that the policy for absence declarations via ACORN has changed significantly from previous years. The following four items are the recognized forms of documentation:

1. Absence Declaration via ACORN: students must additionally contact me/the course coordinator/the course administrator to discuss their situation within five business days of the missed piece of work. This is essential action for any consideration to be granted.
2. U of T Verification of Illness or Injury Form
3. College Registrar's letter: For extended absences and for absences due to non-medical reasons, make sure to contact your College Registrar's Office. They can help you decide between a request for an extension or other types of academic consideration.
4. Letter of Academic Accommodation from Accessibility Services: Discussions with accessibility services are fully confidential. Students registered with Accessibility Services are strongly encouraged to talk with the instructors about their specific situation, as AS are *not* allowed to disclose any personal information and have somewhat limited options for the accommodations they can provide directly.

Submission methods:

All term work should be submitted through Quercus by the posted deadline. Where an adjusted deadline has been arranged with the instructor for any reason, students will be given an individual submission date and time on Quercus.

Policy for late assignment submissions:

Extensions on individual items may be granted if a reasonable request is made before the deadline (see above); otherwise, a late penalty of 5% per working day applies.

Artificial Intelligence:

Students may use artificial intelligence tools (Large Learning Models (LLMs) such as ChatGPT and other generative AI systems) in certain instances, for example as assistance to improve grammar and spelling. AI should never substitute as a search tool, and the submitted assignments must be original work produced by the student alone. The use of AI should be clearly declared (e.g., on the title page of an assignment).

Privacy language and appropriate use of course materials:

For additional information, see the syllabus "Copyright" section below.

Process for requesting re-grading of course work.

All of us make errors, and you may find an error in the grading of your work or disagree with how it was graded. You have two weeks from the date the work was returned to you to make a request for a remark. Please send an email with a note why you should get more points, please be specific (eg, wrong summation of points, your opinion why a certain answer should be counted as correct). Note that we may not agree with your request and your grade may stay the same or even go down.

VI TECHNOLOGY REQUIREMENTS

- Specific guidance from the U of T Vice-Provost, Students regarding student technology requirements is available here: https://www.viceprovoststudents.utoronto.ca/covid-19/tech-requirements-online-learning/
- This course requires the use of computers, and technical issues are possible. When working on a piece of academic work, students are responsible for scheduling enough time to allow for reasonable delays due to technical difficulties to be overcome, so such issues will not be acceptable grounds for deadline extension. Particularly, maintaining an up-to-date independent backup copy of your work is strongly recommended to guard against hard-drive failures, corrupted files, lost computers, etc.

VII INSTITUTIONAL POLICIES & SUPPORT

ACADEMIC INTEGRITY

Academic integrity is essential to the pursuit of learning and scholarship in a university, and to ensuring that a degree from the University of Toronto is a strong signal of each student's individual academic achievement. As a result, the University treats cases of cheating and plagiarism very seriously. The University of Toronto's Code of Behaviour on Academic Matters (governingcouncil.utoronto.ca/secretariat/policies/code-behaviour-academic-matters-july-1-2019) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences. Potential offences include, but are not limited to:

- Falsifying institutional documents or grades.
- Falsifying or altering any documentation required by the University.
- Using someone else's ideas or words without appropriate acknowledgement.
- Submitting your own work in more than one course without the permission of the instructor.
- Making up sources or facts.

- Obtaining or providing unauthorized assistance on any report.

All suspected cases of academic dishonesty will be investigated following procedures outlined in the Code of Behaviour on Academic Matters. If you have questions or concerns about what constitutes appropriate academic behaviour or appropriate research and citation methods, you are expected to seek out additional information on academic integrity from your instructor or from other institutional resources (see www.academicintegrity.utoronto.ca/).

Plagiarism Detection

Students will not be required to submit their written work to a plagiarism detection tool. Students are reminded that the University policies on Academic Integrity – including plagiarism – remain in full effect (see above).

COPYRIGHT

All course materials are copyright of the instructors. If a student wishes to copy or reproduce class presentations, course notes or other similar materials provided by instructors, they must obtain the instructor's written consent beforehand. Otherwise, all such reproduction is an infringement of copyright and is absolutely prohibited.

ACCESSIBILITY NEEDS

Students with diverse learning styles and needs are extremely welcome in this course. The University of Toronto is committed to accessibility: if you require accommodations for a disability, or have any other accessibility concerns about the course, please contact Accessibility Services as soon as possible.

ACCOMMODATIONS FOR RELIGIOUS OBSERVANCES

Following the University's policies, reasonable accommodations will be made for students who observe religious holy days that coincide with the due date/time of an assignment, tutorial, class or laboratory session. Students must inform the instructor **before** the session/assignment date to arrange accommodations.

ADDITIONAL SERVICES & SUPPORT

The following are some important links to help you with academic and/or technical service and support:

- General student services and resources at Student Life
- Full library service through University of Toronto Libraries
- Resources on conducting online research through University Libraries Research
- Resources on academic support from the Academic Success Centre
- Learner support at the Writing Centre
- Information for Quercus Support

ACKNOWLEDGEMENT OF TRADITIONAL LANDS

We wish to acknowledge this land on which the University of Toronto operates. For thousands of years, it has been the traditional land of the Huron-Wendat, the Seneca and, most recently, the Mississaugas of the Credit River. Today, this meeting place is still the home to many Indigenous people from across Turtle Island and we are grateful to have the opportunity to work on this land.