

# JSC301H1 S LEC0101 20241:Principles and Practices in Science Education

Edit

## Instructors

- Dr David Stone (Dept of Chemistry, [david.stone@utoronto.ca](mailto:david.stone@utoronto.ca), office LM218)
  - Office hours Tuesdays 2-3 pm or by appointment
- Dr Carl-Georg Bank (Dept of Earth Sciences, [charly.bank@utoronto.ca](mailto:charly.bank@utoronto.ca), office ES2107)
  - Office hours Mondays 4:30-5:30 pm, or by appointment

## Course Information

This course provides an introduction to effective science education and outreach, covering aspects of what science is, why it can be hard, how we learn, how we can communicate effectively, and the types of activities and tools used by science communicators in both formal and informal education settings.

One of us (DCS) is in the process of writing a book to serve as a companion to this course, a [draft copy of which](#) will be available to students. In addition, we will provide a variety of resources, 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. Classes will be a mixture of lecture and discussion, with an emphasis on active learning activities throughout the semester.

## Course Format:

The course will primarily operate as an in-person class. We will meet in Earth Sciences ES1062 from 3-4 pm on Mondays and Wednesdays. The course will be organized around four major themes:

- 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

## Evaluation:

Course evaluation will be split between various activities and assignments, including a science blog, presentations, essays, and a term project. Students wishing to take this course only for CR/NCR are advised to discuss requirements with one of the instructors, and develop a plan to ensure they stay on track throughout the semester. Extensions on individual items may be granted if a reasonable request is made before the deadline; otherwise, a late penalty of 5% per day past the deadline applies.

## Course Grading Scheme:

- Blogs (10%) – 4 at various times throughout the semester
- Concept map assignment (10%) – mid-January
- Written assignment (15%) choice from:
  - A. 4-pg essay on learning
  - B. 4-pg essay on misconceptions
- Short news article (15%) based on an interview with a faculty member, post-doc, or graduate student about their research.
- Project (50% total):
  - 10% draft proposal [due early Feb]
  - 10% detailed design document [due early Mar]
  - 10% 10 min in-class project presentation [during 2nd to last week of class]
  - 20% final submission [last week of class]

## Other:

Students will get the opportunity to interact with visitors whose careers span of different a range of science communication activities. To facilitate a discussion with these visitors, pairs of students will prepare questions beforehand and lead the 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 traits of effective science communication, and consider 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

Additional information can be found

at: <https://sites.chem.utoronto.ca/chemistry/coursenotes/JSC301/>

## Schedule & Sessional Dates:

### Draft Lecture & Reading Schedule for Winter 2024

Date	Week	Monday	Wednesday
Jan. 8	1	Overview and introduction (Ch.1-1.1)	Science concepts, language, method, and models (Ch.1.2-1.5) ( <a href="#">Lecture recording</a> )
Jan. 15	2	Exploring cognitive connections through <a href="#">concept mapping</a> .	Describing and quantifying learning & intellectual development (Ch.2-2.1) ( <a href="#">Lecture recording</a> )
Jan. 22	3	Learning & the Brain (Ch.2.2-2.5) ( <a href="#">Lecture recording</a> )	Learning to Learn (Ch.3) ( <a href="#">Lecture recording</a> )
Jan. 29	4	Visit: Vasa Lukich (CCA), science policy ( <a href="#">Class recording</a> )	Communication & Curriculum (Ch.4-4.2) ( <a href="#">Class recording</a> )
Feb. 5	5	<a href="#">Concept inventories &amp; Misconceptions</a> (Ch. 4.3)	<a href="#">Learning styles or preferences?</a> (Ch 4.4-4.5)
Feb. 12	6	Types of assessment and creating them ( <a href="#">Class recording</a> )	Project/mid-term debrief session
Feb. 19	–	Family Day holiday and reading week – no classes	
Feb. 26	7	Assessments and Language ( <a href="#">Class recording</a> ) (Ch.4.6)	Meaningful graphics

Mar. 4	8	visit Heidi Daxberger (UTSC) visualizations	effective use of technology
Mar. 11	9	Visit: Astronomy & Astrophysics - public media outreach	safety in labs and demonstrations
Mar. 18	10	Visit Immanuel Estrade (Vic) creativity in the sciences	field experiences
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.