

University of Waterloo  
 Science Communications in the Physical Sciences (08)  
 SCCOM100/ENGL193/SPCOM193  
 Fall 2018

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Mon-Wed.  
 4:00-5:20 pm  
 STC 1019



**Territorial Acknowledgement**

We acknowledge that we are living and working on the traditional territory of the Attawandaron (also known as Neutral), Anishinaabe and Haudenosaunee peoples. The University of Waterloo is situated on the Haldimand Tract, the land promised to the Six Nations that includes 10 kilometres on each side of the Grand River.

For more information about the purpose of territorial acknowledgements, please see the [CAUT Guide to Acknowledging Traditional Territory \(PDF\)](#).

## **COURSE DESCRIPTION**

Communication is an essential skill for researchers in the sciences.

The sciences expand our understanding of the world by posing questions and by collecting evidence to address these questions. In order to have an impact, the information and insights generated by scientific research also need to be effectively communicated, whether to publics, policymakers, or to other scientists. But while the act of communicating science has been around for centuries (at least since the scientific revolution in the XVII Century), a very area dedicated to communicating science in a systematic, diversified and even compelling way is roughly 30 years old. In a recent volume published in 2010, LeeAnn Kahlor and Patricia Stout explain that “the public’s lack of knowledge about basic scientific facts and the scientific process can have far reaching implications (Kahlor & Stout 2010).” This issue reveals a need to improve science literacy in schools and public institutions. However, science literacy is not the only issue at stake. Scientists themselves should become better communicators of their own findings. In addition to the many political backlash we are witnessing today, media spectacle, fast and user friendly media tools and worldwide dissemination through social media and the web makes it so that communicating science is no longer an option.

Communicating science today is both exhilarating and challenging: scientists can count on a plethora of models, a variety of media and genres to initiate dialogues and collaborate with other scientists, to speak to the media and to explain their findings to a diverse range of audiences. How to navigate this universe? Where does science ends and fiction begins? How can different genres and media be used to communicate to different audiences/communicate better? How does science connects to culture and society and how is it manipulated to fit political, social, cultural agendas?

In this course you will learn effective written, oral, and visual communication with a particular focus on the physical sciences. You will have the opportunity to shape these communication skills through iterative design processes that emphasize attention to your audience, the purpose of your communications, and student agency. You will work individually and collaboratively to craft messages for internal and external audiences, including scientists, government stakeholders, affected communities, or broader publics. You will learn a variety of genres such as research reports, grant proposals, conference abstracts, conference posters, public talks, blog posts, and podcasts. Overall, this course will help you enhance your capacity to conduct research and report research findings, communicate ethically, and thereby effect important change.

## **GOALS AND LEARNING OUTCOMES**

### *Course Outcomes*

By the end of the course, you should be able to:

- Design, draft, and persuasively deliver scientific communications to expert and non-expert audiences;
- Justify decisions about the language, content, and genre used when communicating scientific information;
- Practice collaboration and peer review in support of iterative communication design processes, including revision;
- Practice research processes to find, assess, document, incorporate, and cite research resources and communicate research findings;
- Describe and appraise the purposes and ethical concerns of science communication.

By meeting these goals, you will develop skills in analysis, writing, and communication:

### *Analysis and Writing*

- Students will develop, practice, and master some practical tools for becoming better writers in relation to a range of texts and contexts.
- Students will expand their capacity to think critically. This class will enable them to explore scientific practices and ideas in a sustained, substantive, sophisticated, and insightful manner.
- Students will be able to improve their capacity to engage in research and to identify important topics and issues to assess and analyze.

*Communication*

- This class will allow students to develop and practice writing skills that clearly convey critical analysis. Students will be expected to turn in writing that demonstrates a clear command of the issues under discussion.
- Students will be given an opportunity to write texts of different lengths for different contexts. They will learn how to shape and organize rhetorical powerful texts across a range of genres that are important to scientific communication.
- Students will be given an opportunity to shape their ability to work in groups and to communicate ideas with their peers.
- Students will also be given an opportunity to develop their skills and capacities to undertake live presentations of their ideas—an important in both academic and non-academic settings.

**REQUIRED TEXTS**

Course readings will be made available to students as downloadable PDFs on Learn.

**COURSE REQUIREMENTS AND ASSESSMENT**

A passing grade in this course is 50%. **Late work will be penalized 1/3 grade per day (e.g. B = B-).** Your attendance in class is mandatory. Should you miss class, you are responsible for getting materials covered in class from a classmate.

**Important:** unless otherwise indicated, all assignments are due **BEFORE the class on the due date.** Please, upload your documents onto LEARN.

Your grade will be assessed through the following assignments:

Course Requirement	Due dates	Grade	Oral	Group
Participation (involvement in peer review; class discussion)		10	10	
Media and Communication analysis	Oct 3, 17, 31	10X3		
Science writing assessment	Nov. 14	20		
Storytelling exercise	Nov 26	20		
Research Project and presentation (group work)	Dec 3	20	20	20
		<b>100</b>		

**Note:** The grading is set up to enable 70% writing and 30% oral grades, and assessments for 80% individual and 20% group work.

**Participation 10%:** It is very important that you attend class AND participate actively. You might be shy or not accustomed to interacting with people you just met: I know it is hard, but it is an important requirement of being part of society and the labor force. I will make sure that the environment is inclusive and relaxed enough for everybody to participate.

A note on **attendance:** attendance is mandatory. Attendance sheet will be circulated during each class. You are allowed to miss 1 class without penalty. After this, you will be penalized 1% each class you miss. Should you miss more classes for medical or family reasons, you will be asked to bring proof. Religious celebrations are excluded.

**Media and Communication analysis 3 entries worth 10% each:** Every week, you will exposed to different texts such as articles, visuals, writing genres and styles produced by academia, popular science and technical communities. I ask you to produce 3 short texts documenting your understanding of what the text tries to do and how it communicates it, your general impressions, and a brief critical assessment. Use the reading guide to be distributed in class and posted on LEARN.

**Science Writing Assessment 20%:** Choose a science blogger/science writer/scholar/artist/podcaster. Select a few stories he/she has created. Analyze their audience, their purpose and the media they use: how do they address their audience? Why are they using these media, styles, genre? Write a short report on your findings. Guidelines will be distributed in class and posted on LEARN

**Storytelling Exercise 20%:** Now it's your turn! pick a topic you are currently studying, an experiment you are starting, a series of lab rules you have just learnt in any other classes. Pick your style, a media tool, a form of expression. How can you communicate them effectively to a public that knows nothing about it? Feel free to try any of the styles we will encounter in our classes. Feel free to experiment.

**Research Project (group work) 20% total (work in itself can be oral or in other non-written forms, but presentation will be done as a collective and will constitute the final “face” of your research):** groups of 3 (max4) students will choose one of the big topics we will have selected in class in the first 2 weeks. I ask you to perform a more in depth research on the chosen topic and to present it as if you were at a conference, a science fair, a private company, a popular science environment, or the government. Plan everything accordingly (attire is also important). The product can take any of the genres or media we have examined in class. It can be a poster, a white paper, a policy brief, a video, a podcast etc... Work will be presented during last day of class (Dec 3).

**Note about the group project:** Group work is an important component of this class. You will often work with your peers to select, assess and analyze material in class. By working together on the development of a research project, students will be given an opportunity to learn how to improve its delivery. Even for those who have had previous opportunities to work in teams, group work can remain a challenge. As a member of a team of researchers, it is essential that you treat each other with respect throughout the process of developing and executing the assignment and that you put in equal amounts of work in the project. More specific policies and protocols governing group work (including the process of setting up groups in the class) will be circulated in class and posted on LEARN.

#### E. COURSE OUTLINE

Week	Topic	Activities & Assignments
1. Sept. 10	Intro to Course	Getting to know each other Naomi Oreskes: Why Should We Believe In Science? : NPR. (2018). Retrieved September 1, 2018, from <a href="https://www.npr.org/2017/02/24/516709308/naomi-oreskes-why-should-we-believe-in-science">https://www.npr.org/2017/02/24/516709308/naomi-oreskes-why-should-we-believe-in-science</a>
Sept. 12	Communication in the Sciences – Why and How?	Read: Brossard, D., & Lewenstein, B. V. (2010). A Critical Appraisal of Models of Public Understanding of Science. In <i>Communicating Science. New Agendas in Communication</i> (pp. 11–17). New York: Routledge.  Excerpts from Bultitude, K. (2011). The Why and How of Science Communication. In P. Rosulek (Ed.), <i>Science Communication</i> (5-15). Pilsen: European Commission. Retrieved from <a href="http://discovery.ucl.ac.uk/1381028/">http://discovery.ucl.ac.uk/1381028/</a>  Marcus, A., & Oransky, I. (2017, December 21). Opinion   What's Behind Big Science Frauds? <i>The New York Times</i> . Retrieved from <a href="https://www.nytimes.com/2015/05/23/opinion/whats-behind-big-science-frauds.html">https://www.nytimes.com/2015/05/23/opinion/whats-behind-big-science-frauds.html</a>  <b>Activity: how do you read and evaluate science?</b>
2. Sept. 17	Science – by whom and for whom?	Read: Latour, B. (1988). <i>Science in Action</i> . (pp.1-17) Cambridge MA: Harvard University Press.

Sept. 19		<p>Bensaude-Vincent, B. (2009). A Historical Perspective on Science and Its “Others.” <i>Isis</i>, 100(2), 359–368. <a href="https://doi.org/10.1086/599547">https://doi.org/10.1086/599547</a></p> <p>TallBear, K. (2016, March 16). Failed Settler Kinship, Truth and Reconciliation, and Science. Retrieved September 7, 2018, from <a href="http://indigenousts.com/failed-settler-kinship-truth-and-reconciliation-and-science/">http://indigenousts.com/failed-settler-kinship-truth-and-reconciliation-and-science/</a></p> <p><b>Activity: Testing scientific biases. Big Science, Marginal Science, DIY Science, citizen science</b></p> <p><b>Sept 19: Form groups for research project</b></p>
3. Sept. 24	Tell me a Story: Narratives, what they do, and why they count	<p>Read: Willingham, D. T. (2011). Trust Me, I’m a Scientist. <i>Scientific American</i>, 304(5), 12–12. <a href="https://doi.org/10.1038/scientificamerican0511-12">https://doi.org/10.1038/scientificamerican0511-12</a></p>
Sept. 26		<p>Hayes, R., &amp; Grossman, D. (2006). The Scientist as Celebrity Activist. In <i>A scientist’s guide to talking with the media: practical advice from the Union of Concerned Scientists</i> (pp. 153–171). New Brunswick, N.J.: Rutgers University Press.</p> <p>Podcast: Krulwich, R. (2008). <i>Tell Me A Story   Radiolab   WNYC Studios</i>. Retrieved from <a href="https://www.wnycstudios.org/story/91852-tell-me-a-story/">https://www.wnycstudios.org/story/91852-tell-me-a-story/</a></p> <p><b>Activity: telling a story</b></p>
4 Oct. 1 LIB -W	<p>Doing research in the Lab, the Library and in the field: what counts as evidence?</p> <p><b>Oct. 1 Library Workshop</b></p>	<p><b>Oct. 1 Library Workshop</b> – guest presentation by Kate Mercer, STEM Librarian and Kari D. Weaver, Instructional Design Librarian - Introduction to library resources for science; making good choices about sources; developing a research archive</p> <p><b>Read:</b> Hirsch, H., &amp; Hirsch, H. L. (2001). Chapter 1 The Written Document: Prose and Panic. In <i>Essential Communication Strategies: For Scientists, Engineers, and Technology Professionals</i> (pp. 9–24). Hoboken, UNITED STATES: John Wiley &amp; Sons, Incorporated.</p>
Oct. 3	Oct.3 : media analysis #1 due	<p><b>Examples of different genres available to scientists</b></p> <p><b>Activity: Developing an argument</b></p>
5 Oct 12	<b>Groups meet separately to choose topic</b>	
6 Oct. 15	Science Fiction / Science in Fiction	<p>Read: van Dijck, J. (2006). 4 Picturizing Science. The Science Documentary as Multimedia Spectacle. In J. Willems &amp; W. Göpfert (Eds.), <i>Science and the power of TV</i> (pp. 47–62). Amsterdam: VU University Press &amp; Da Vinci Institute.</p>
Oct. 17	Oct 17 media analysis #2 due	<p>Heinlein, R. (1951). All You Zombies. Retrieved September 6, 2018, from <a href="https://gist.github.com/defunkt/759182">https://gist.github.com/defunkt/759182</a></p> <p><b>Activity: science and fiction – a critical analysis</b></p>

7 Oct. 22	<b>Writing (for) science</b>	Read: Bik, Luzón, M. (2013). Public Communication of Science in Blogs: Recontextualizing Scientific Discourse for a Diversified Audience. <i>Written Communication</i> , 30(4), 428–457. <a href="https://doi.org/10.1177/0741088313493610">https://doi.org/10.1177/0741088313493610</a>
Oct. 24		Falk, Dan. (2014). <i>The Science of Shakespeare. A look at the Playright's Universe</i> Chapter 9. "Does the world go round?" Shakespeare and Galileo (pp. 192-217). Fredericton, NB: Goose Lane Editions.
8 Oct. 29	<b>Visual Communication</b>	Read: Graves, H., & Graves, R. (2012). Chapter 6 Communicating through visuals. In <i>A strategic guide to technical communication</i> (2nd ed, pp. 137–149). Peterborough, Ont: Broadview Press.
Oct. 31	<b>Oct. 31 media analysis #3 due</b>	Vertesi, J. (2012). Seeing like a Rover: Visualization, embodiment, and interaction on the Mars Exploration Rover Mission. <i>Social Studies of Science</i> , 42(3), 393–414. <a href="https://doi.org/10.1177/0306312712444645">https://doi.org/10.1177/0306312712444645</a>  <b>Activity: visual communication analysis (how to read: data viz, science viz, science illustration, graphic art etc..)</b> <b>Creating and Presenting Dynamic Scientific papers</b>
9 Nov. 5	<b>Communicating among scientists and communicating with the media</b>	Read: Dudo, A. (2015). Scientists, the Media, and the Public Communication of Science. <i>Sociology Compass</i> , 9(9), 761–775. <a href="https://doi.org/10.1111/soc4.12298">https://doi.org/10.1111/soc4.12298</a>
Nov. 7		Jackson, A. (2014). The Power of using Infographics to Communicate Science : Of Schemes and Memes Blog. Retrieved September 3, 2018, from <a href="http://blogs.nature.com/ofschemesandmemes/2014/01/20/the-power-of-using-infographics-to-communicate-science">http://blogs.nature.com/ofschemesandmemes/2014/01/20/the-power-of-using-infographics-to-communicate-science</a>  Podcast: Dankoski, J. (2013). <i>Making Sense of Science Infographics</i> . Retrieved from <a href="https://www.npr.org/2013/10/18/237100766/making-sense-of-science-infographics">https://www.npr.org/2013/10/18/237100766/making-sense-of-science-infographics</a>  <b>Activities: Posters, Infographics, charts and the value of composition in conference presentation</b> Scientific Reports. Handouts. Retrieved September 4, 2018, from <a href="https://writingcenter.unc.edu/tips-and-tools/scientific-reports/">https://writingcenter.unc.edu/tips-and-tools/scientific-reports/</a>
10 Nov. 12	<b>Science and Social Media</b>	<b>Nov. 12 EDGE workshop</b>  Read: H. M., & Goldstein, M. C. (2013). An Introduction to Social Media for Scientists. <i>PLOS Biology</i> , 11(4), e1001535. <a href="https://doi.org/10.1371/journal.pbio.1001535">https://doi.org/10.1371/journal.pbio.1001535</a>
Nov. 14	<b>Oct. 24 EDGE workshop</b>  <b>Nov. 14 Science writing Due</b>	Yeo, S., Cacciatore, M., & Xenos, M. (2014). Science Gone Social. Retrieved September 2, 2018, from <a href="https://www.the-scientist.com/critic-at-large/science-gone-social-36766">https://www.the-scientist.com/critic-at-large/science-gone-social-36766</a>  Singh Chawla, D. (08 March 2017). The quest to reveal science's hidden female faces. <i>Nature News</i> . <a href="https://doi.org/10.1038/nature.2017.21614">https://doi.org/10.1038/nature.2017.21614</a>

<b>11 Nov. 19</b>	<b>Museums, Art and public engagement</b>	Read: Cain, V., & Rader, K. A. (2017). Science Communication and Museums' Changing Roles. <i>The Oxford Handbook of the Science of Science Communication</i> . <a href="https://doi.org/10.1093/oxfordhb/9780190497620.013.23">https://doi.org/10.1093/oxfordhb/9780190497620.013.23</a>
<b>Nov. 21</b>		Caulfield, T. (2018). Mixing science and art to make the truth more interesting than lies. Retrieved September 5, 2018, from <a href="http://theconversation.com/mixing-science-and-art-to-make-the-truth-more-interesting-than-lies-100221">http://theconversation.com/mixing-science-and-art-to-make-the-truth-more-interesting-than-lies-100221</a>  Lachman, R. (2017). STEAM not STEM: Why scientists need arts training. Retrieved September 5, 2018, from <a href="http://theconversation.com/steam-not-stem-why-scientists-need-arts-training-89788">http://theconversation.com/steam-not-stem-why-scientists-need-arts-training-89788</a>  <b>Field Trip</b>
<b>12 Nov. 26</b>	<b>interdisciplinary practices and the challenge of policy making</b>  <b>Nov. 26 Storytelling exercise due</b>	Dosemagen, S., Warren, J., & Wylie, S. A. (2013). GRASSROOTS MAPPING-Public Laboratory. <i>The Journal of Aesthetic &amp; Protest</i> , (8). Retrieved from <a href="https://www.joaap.org/issue8/GrassrootsMapping.htm">https://www.joaap.org/issue8/GrassrootsMapping.htm</a>  Austen, K. (2013, June 26). Citizen scientist: Out of the lab and onto the streets. Retrieved September 7, 2018, from <a href="https://www.newscientist.com/article/mg21829236-300-citizen-scientist-out-of-the-lab-and-onto-the-streets/">https://www.newscientist.com/article/mg21829236-300-citizen-scientist-out-of-the-lab-and-onto-the-streets/</a>
<b>Nov. 28</b>		
<b>Dec. 3</b>	<b>Presentations</b>	<b>Group Project Presentation and Fair!</b> Group Assignment due – presentation of projects on the major topics chosen by students

Note: Each section of this course will include one 50-minute *Skills Identification and Articulation Workshop*, conducted by a career advisor from the [EDGE Program](#).

The Skills Identification and Articulation Workshop helps students identify the skills they are developing throughout their undergraduate career. Students who complete this workshop will become better able to recognize their skills and develop strategies for expressing these to target audiences (e.g. to potential employers in job interviews). The workshop was developed and will be facilitated by a Career Advisor from the Centre for Career Action. It has been tailored to the Science Communications course, so as to help students gain a deeper understanding of how class activities and concepts can be applied in a variety of employment and professional contexts. Students who are actively pursuing the EDGE certificate, or who wish to pursue the program in the future, will receive a milestone for participation in the workshop.

- Submitting Assignments

Instructions on how to hand in and deliver assignments will be circulated in class.

## FACULTY AND UNIVERSITY POLICIES

*Academic Integrity:* In order to maintain a culture of academic integrity, members of the University of Waterloo are expected to promote honesty, trust, fairness, respect and responsibility.

*Discipline:* A student is expected to know what constitutes academic integrity, to avoid committing academic offences, and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about “rules” for group work/collaboration should seek guidance from the course professor, academic advisor, or the Undergraduate Associate Dean. When misconduct has been found to have occurred, disciplinary penalties will be imposed under Policy 71 – Student Discipline.

For information on categories of offenses and types of penalties, students should refer to Policy 71 - Student Discipline, <http://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-71>.

*Grievance:* A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70 - Student Petitions and Grievances, Section 4, <http://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-70>. In addition, consult <http://arts.uwaterloo.ca/student-grievances-faculty-arts-processes> for the Faculty of Arts' grievance processes.

*Appeals:* A student may appeal the finding and/or penalty in a decision made under Policy 70 - Student Petitions and Grievances (other than regarding a petition) or Policy 71 - Student Discipline if a ground for an appeal can be established. Read Policy 72 - Student Appeals, <http://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-72>.

*Academic Integrity website (Arts):* [http://arts.uwaterloo.ca/arts/ugrad/academic\\_responsibility.html](http://arts.uwaterloo.ca/arts/ugrad/academic_responsibility.html)

*Academic Integrity Office (uWaterloo):* <http://uwaterloo.ca/academic-integrity/>

### **Cross-listed course:**

Please note that a cross-listed course will count in all respective averages no matter under which rubric it has been taken. For example, a PHIL/PSCI cross-list will count in a Philosophy major average, even if the course was taken under the Political Science rubric.

### **Accommodation for Students with Disabilities:**

*Note for students with disabilities:* The AccessAbility Services (AS) Office, located in Needles Hall, Room 1401, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with the AS Office at the beginning of each academic term.

### **Mental Health Support**

#### **On Campus**

- Counselling Services: [counselling.services@uwaterloo.ca](mailto:counselling.services@uwaterloo.ca) / 519-888-4567 xt 32655
- **MATES:** one-to-one peer support program offered by Federation of Students (FEDS) and Counselling Services
- Health Services Emergency service: located across the creek from Student Life Centre

#### **Off campus, 24/7**

- **Good2Talk:** Free confidential help line for post-secondary students. Phone: 1-866-925-5454
- Grand River Hospital: Emergency care for mental health crisis. Phone: 519-749-433 ext. 6880
- **Here 24/7:** Mental Health and Crisis Service Team. Phone: 1-844-437-3247
- **OK2BME:** set of support services for lesbian, gay, bisexual, transgender or questioning teens in Waterloo. Phone: 519-884-0000 extension 213

Full details can be found online at the Faculty of ARTS [website](#)

### **GRADING STANDARDS**

#### **A (80-100%)**

Exceeds assignment guidelines; strong and consistently applied definition of audience and purpose; thoughtful and innovative adaptation of the subject to the audience's needs; subject developed and organized at every level for listener comprehension; speaker uses language appropriately, effectively and even inventively; maintains relaxed, inviting

delivery free of verbal fillers and distractions; cites sources appropriately both in spoken and written work; submits well-prepared required materials.

**B (70-79%)**

Meets assignment guidelines well; purpose and audience clearly defined; format consistently appropriate to audience and subject; subject supported with specifics as well as generalities; speaker maintains an economy of expression; information provided is sufficient to audience needs and coherently explained; speaker makes appropriate word choices. Citations clearly stated both on the outline and during delivery; speaker submits all required materials. Delivery may demonstrate signs of nervousness (pace, reading, etc.) but not sufficiently to interfere with the audience's comprehension. Minor revisions required.

**C (60-69%)**

Meets assignment guidelines; adequate use of format, organization, and content to meet audience needs; speaker demonstrates some problems with audience adaptation, content, organization, or format, but not to the extent that the presentation fails to meet minimal expectations. Citations adequately present; submitted materials may be poorly prepared. Delivery awkward in several categories, but again—meets minimal expectations. Considerable revision required.

**D (50-59%)**

Does not meet important requirements of the assignment; inadequate use of format; poor development of subject for audience needs; inadequate awareness of audience and/or purpose; problems with organization, content, logic, research and citations; ineffective use of language; delivery sufficiently poor to impede reception of presentation. Required materials poorly prepared or absent. Serious revision required.

**F (0-49%)**

Fails to meet most of stated assignment requirements: lack of focus on a subject; unsatisfactory format; lack of audience awareness and/or purpose; inadequate content poorly developed; lack of logical connection between parts of presentation and/or ideas; ineffective and/or careless use of language; absence of prepared materials. While delivery may be adequate, revision is pointless: speaker should start a new assignment, take the course more seriously, or drop the course.