MATH IN LITERATURE & POETRY

MAT193H1 | University of Toronto | Winter 2021

What you will learn

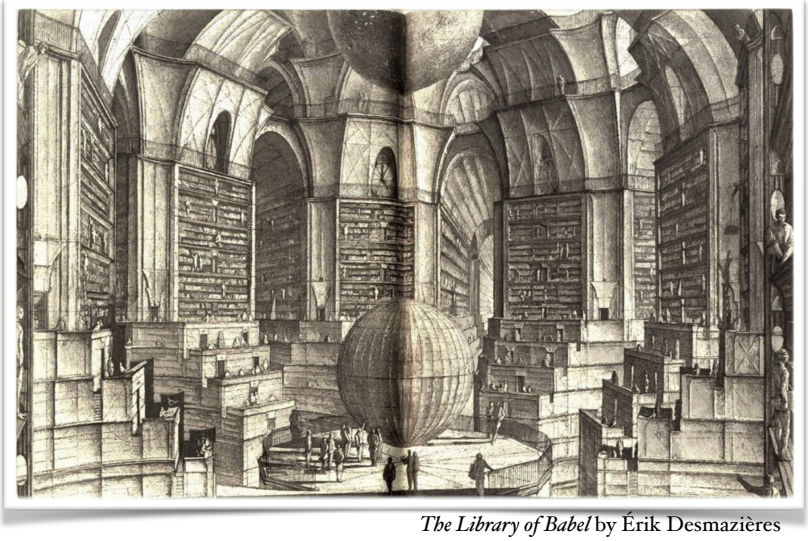
This course focuses on learning about and using contemporary mathematics through its connections with literature . You'll learn math not typically seen in high school or early-university while gaining academic skills.

What you will read

You will read novels, short stories, poetry, and creative non-fiction. When possible, I'll give you choice in what to read, although there will be common course readings to give us a basis for our discussions.

What you will do

Classes will be as active as possible and will include student-led math presentations, whole-class discussions, and a guest speaker. Outside of class you'll prepare a variety of small creative assignments. The final module will be focused on a project of your choice that connects literature and math.



The Library of Babel by Érik Desmazières
(inspired by one of the stories we'll study)

Welcome!

First-year seminars are my favourite courses to design and teach, and I am so excited to finally be teaching this one. It's been in the works for at least 5 years. While I am disappointed that we won't be able to discuss literature around the same table and do math on the same blackboard this semester, I am committed to creating a solid first-year seminar experience virtually. I will get to know each of you well: you can expect that I won't only know your name, but I'll also know what you enjoy reading, your strengths, what you are working on, why you took this course, and other things that make you a unique student. Welcome to the course! I look forward to learning with you this semester!

How We'll Connect Online

MEET SYNCHRONOUSLY on Zoom each week (Thursdays 9:10 to noon): While we might not always meet as a full group for 3 hours, you will have something to do for the full 3 hours.

Class Attendance is mandatory to complete the class. If you cannot make a class meeting due to circumstances email me before class or as soon as possible after class.

CHAT ASYNCHRONOUSLY on Perusall or the course message boards.

MEET IN SMALL(er) GROUPS during office hours: I'll hold an office hour for this course each week over Zoom. I will find a time that works for everyone, or will alternate. I'm planning for drop-in office hours.

No matter what form our connection takes, I expect that everyone will treat treat others in a polite and respectful manner. I intend to nurture an environment that challenges your ways of thinking and allows you to re-examine your beliefs. This is difficult work. Any student that puts another person down or shows disrespect will not be allowed to participate.

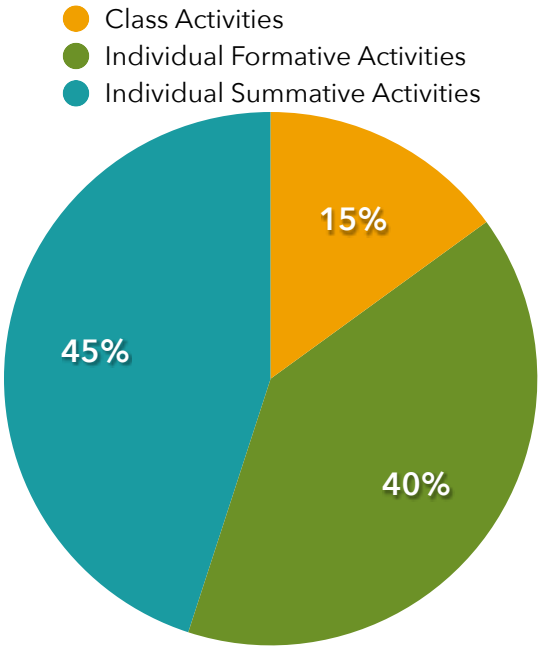
Content Units

The schematic above lays out the content of the course. It is divided into three units:

- Unit 1: Literature about mathematicians
- Unit 2: Mathematics in Literature & Poetry
- Unit 3: Literature to Better Understand Mathematics

The schedule for the course reflects these 3 units.

Grading & Assessments



The chart shows how your grade will be calculated. In the individual categories you will have some choice as to how your grade will be calculated by submitting a form before the add-drop deadline.

Class Activities

There are three main class activities that you will be assessed on in this seminar.

Learning Strategies Portfolio: I know that this course requires some very different types of learning strategies. On one hand you need to read and learn from math texts and on the other hand you need to read and learn from literature. Reading these types of texts requires different skill sets. In cooperation with your classmates (and with the help of University resources!) you will put together a portfolio that summarizes the learning strategies that *you* find useful for navigating each type of reading.

Portfolio of Mathematical Arguments: In this portfolio the class will put together different arguments for the same mathematical result (you can find many through research!) and make a commentary on the differences, similarities, and qualities of each one.

Guest Poet: In one of the later classes this term, I'd like to invite a poet to be our guest and talk to the class. You will help to choose the guest, arrange their visit to the class and will ensure that you make their visit worthwhile by being well-prepared and asking good questions.

Individual Formative Activities

Formative Activities are the activities that you do to learn. I'm attaching a grade to the formative activities to ensure that you've done them, so this component will be graded mainly for completion, effort, and level of reflection rather than on how accomplished your result is.

Mathematical & Literary Autobiography: At the beginning of the course you'll write an autobiography of yourself as a reader and as a mathematician. I will encourage you to share at least part of it with the entire class.

Course Journal: I am giving you a lot of freedom in this course to read what you would like and do the exercises that you would like. I believe that you'll learn more when you are interested in what you are learning. However, since I won't be asking you to hand in a "uniform" homework every single class I need to see evidence of your consistent work. I'll ask you to hand-in your Course Journal at unannounced times during the term (expected to hand in immediately if we're in class or within 24-48 hours if we're not), as well as at the end, to ensure that you are keeping up with this side of the class work.

- Format: Have a place where you can keep the journal and share it with me easily. I recommend a Google Doc or a shared OneDrive. If you prefer to handwrite entries on paper (which I actually recommend you do at least some of the time since you'll be doing some math!), consistently take photos and upload them each time. If you have a tablet you may be able to upload these automatically.
- What to write: This is where you'll keep your rough notes on reading, your mathematical arguments, your responses to discussion prompts, and so on. I'll sometimes give you prompts and ask you to include them in your journal. Anything that we don't ask you to post somewhere else or submit somewhere else should go in the journal. Make sure that you also include reflection: do you like what

you read? What do you know about the author? Are you planning to do something with this reading? What connections can you make?

- Polish: Your entries can be very rough. You can scribble things out. You can write ideas that you'll later change your mind to. You should NOT make this look like something you will hand in. Do not put any effort into proofreading your journal. It's supposed to be rough.

Class Contributions & Citizenship: What you do matters. It matters to me, and it matters to your classmates. This class cannot function without you. This is true in large classes, but it's *especially* true in a small seminar. As incentive to be a good citizen (and to recognize those who are good class citizens) I've decided to make this a portion of your grade. This portion of your grade includes contributions to the online class discussions on Perusals or on the Quercus discussion boards and also mini-math presentations.

Individual Summative Activities

Summative Activities are where you show us what you have learned. While they are also for learning, I will be grading you on the skills that you demonstrate.

Mind of a Mathematician: In this assignment you will write a short argumentative piece responding to the question: "In what ways is the creative process of a mathematician similar to and different than the creative process of a writer?" The evidence for your argument will be two first-person accounts: one from a writer describing the process of writing and one from a mathematician describing the process of discovering mathematics. The purpose of this assignment is to prepare you for the argumentative part of the Final Cumulative Project.

Oulipo Poetry Assignment: In this assignment you will take a mathematical object or phenomena and use it to create a piece of poetry. You will draw the form from the Oulipo (abbreviation for "Workshop for Potential Literature" in French) group, one of our topics of study in the second unit of the course.

Final Cumulative Project: In the Final Cumulative Project you will be challenged is to make an argument for how literature enhances the understanding of math or how math enhances the understanding of literature. The product can be of any form of your choosing. Possible examples include: a unit for a high school class, an original collection of poems , a short story or play, a work of art, an essay, or a collection of mathematical proofs. You will present your project to your classmates in a short final presentation at the end of the course.

What you will learn

Fundamental Knowledge:
- Identify works of literature where math and mathematicians appear
- Describe areas of contemporary mathematics
- Explain what a disciplinary culture is and features of the mathematical culture

Application:
- Solve mathematical problems inspired by reading
- Critique the use of math in literature and in poetry; critique depictions of mathematicians in literature and in poetry
- Use mathematical principles to design and write own poems
- Make a strong argument, tailor the argument to an audience, and convey that argument in speaking and in writing

Integration:
- Contrast the ways math is used to illustrate ideas in literature with the ways literature is used to illustrate mathematical ideas
- Compare experience of creation in literature and in mathematics
- Compare the similarities and differences between reading different types of texts

Human Dimension
- Come to see yourself as capable a mathematician, reader, and writer
- Discuss mathematical arguments and interpretations of literature with peers, both one-on-one and in groups
- Reconsider your own arguments and interpretations after discussions with others

Caring
- Value mathematics and mathematical thinking as an art and as a way to enliven art

Learning how to learn
- Develop skills to critically evaluate and read passages (mathematical or literary) and see similarities and differences
- Identify strategies for effectively reading and solving problems in a time-efficient manner.

Required Readings

The novels should be available at the University Bookstore or through booksellers. All other course readings will be available on the course website.

Novels

- Abbott, EA. *Flatland a romance of many dimensions*. 1899.
- Ogawa, Yoko. *The Housekeeper and the Professor: A Novel*. Picador, 2009.

Short Stories

- Borges, Jorge Luis. "The library of Babel." 1941. (Any translation)
- Huxley, Aldous. "Young Archimedes." In Fantasia Mathematica. Ed. Fadiman, C. Simon & Schuster, 1958.
- Porges, Arthur. "The Devil and Simon Flagg." In Fantasia Mathematica. Ed. Fadiman, C. Simon & Schuster, 1958.
- Kostler, Arthur. "Pythagoras and the Psychoanalyst." In Fantasia Mathematica. Ed. Fadiman, C. Simon & Schuster, 1958.

Non-Fiction

- Buchanan, Scott Milross. "1. Mathematics & Poetry." *Poetry and mathematics*. Lippincott, 1962.
- Dijkgraaf, Robbert. "The Two Forms of Mathematical Beauty." *Quanta Magazine*. 2020.
- Growney, JoAnne. "Mathematics in poetry." *Journal of Online Mathematics and Its Applications* 6 (2006).
- Henle, James. "Is (some) mathematics poetry?." *Journal of Humanistic Mathematics* 1.1 (2011): 94-100.
- Hutson, Matthew. "Comparing Beauty in Mathematics and Art" *Scientific American Online*. 2019
- Lockhart, Paul. *A mathematician's lament: How school cheats us out of our most fascinating and imaginative art form*. Bellevue literary press, 2009.
- Moskowitz, Clara. *Equations are Art in a Mathematician's Brain*. *Scientific American Online*. 2014.
- Pagli, Paolo. "The Mathematical Mind—Iconography of a Tension." *Imagine Math 2*. Springer, Milano, 2013. 57-65.

Poems with Mathematical Imagery

You will choose some poems from the list to read – the number is up to you. This list comes from Growney,Karaali, and Lesser

"Geometry" by Rita Dove

"Figures of Thought" by Howard Nemerov

"Six Significant Landscapes" by Wallace Stevens

"Pi" by Wislawa Szymborska

"Gravity and Levity" by Bin Ramke

"Arithmetic" by Carl Sandburg

"Algebra" by Linda Pastan

"Euclid Alone Has Looked on Beauty Bare" by Edna St. Vincent Millay

"Through Two Points Only a Straight Line Can Pass: Theorem in Geometry" by Yehuda Amichai

There is also additional required reading of your choice; in particular, you have choice in the poems that you read for the course and for the final works. The list also does not include reading to help understand mathematical concepts See the calendar at the end of the syllabus and the optional readings posted on the course website.

About Me & Course Contact Information

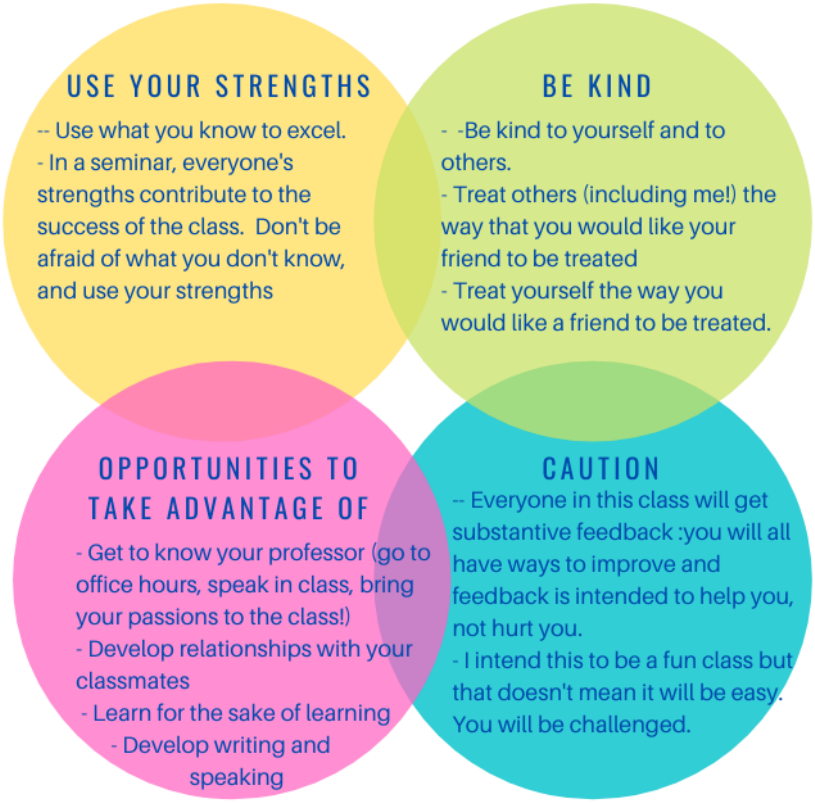
I'm a mathematician and a professor in the Department of Mathematics. I was awarded my doctorate in math in 2013 from the University of Michigan with a thesis entitled *The Asymptotic Behaviour of Generic Initial Systems.* I enter into the study of math in literature (and literature in math) from this perspective; indeed, this is a math course and you can expect to learn a lot of math.

After I received my PhD I begun teaching at Quest University Canada - in large part because I wanted to teach a lot of First-Year Seminars and learn how to design courses like this from experts! I taught there for four years and learned both the value of this type of study (interdisciplinary and multidisciplinary).

So, what makes me qualified to teach this course, even though I'm not a "trained expert" in the entirety of the content? I am a scholar. Over many years of formal education, self-study, and work I have learned how

to ask critical questions, seek out answers, and engage in scholarly conversations (written and oral). I won't always have the answers for you, but I will help you to find those answers for yourself and then communicate these with your audience. This is one of the purposes to a first-year seminar.

The course contact information is my email (not Quercus inbox - I don't check it and won't ever get your message): smt@math.toronto.edu. Please put MAT193 in the title so I know what course you are talking about! But, before you email me, make sure you've read this syllabus, checked course announcements, and looked on the course website. A prerequisite to being a scholar is being able to find information for yourself, and I will expect that you have checked those places first. If you do not receive a response, it is likely because the information is already available online somewhere.



Succeeding in this Seminar

This seminar does not require any prerequisites in math, English, or any other subject. This means that the most important things that you can bring to the course is your unique strengths and your engagement. Make sure that you take advantage of the unique opportunities that being in a first-year seminar offers! And make sure that you work with others. The syllabus says below what is and is what not a violation of academic integrity: if you have any questions about whether working with someone on an assignment is allowed or not, ask me!

Important Course Policies

Academic Integrity & What It Means in This Course

Academic integrity is fundamental to learning and scholarship at the University of Toronto and beyond. Participating honestly, respectfully, responsibly, and fairly in this academic community ensures that the U of T degree that you earn will be valued as a true indication of your individual academic achievement, and will continue to receive the respect and recognition it deserves. Violating standards of academic integrity

will prevent you from learning material, refining your problem-solving skills, and developing self-sufficiency and self-esteem.

I am strongly committed to assigning grades based on students' honest efforts to demonstrate learning in this course. Academic dishonesty in any form will thus not be tolerated in this course.

Students are expected to know what constitutes academic integrity: familiarize yourself with the information available at this site. It is the rule book for academic behaviour at the U of T. Potential offences include, but are not limited to:

- Having another student, stranger, or someone else write a paper or assignment for you (in part or in full)
- Copying or paraphrasing a source without citing it
- Allowing someone else to copy the ideas in your journal, papers, or other assignments
- Taking unattributed text from some- where else
- Misrepresenting reasons for being late or absent for a class or presentation

The following actions are NOT offences in this class.

• Discussing questions from homework with classmates, building off of each others' ideas

• Using online resources to help you understand the content of the course or homework problems

• Using sources for ideas and quoting them with citations

In accordance with the University's Code of Behaviour on Academic Matters, we will actively investigate any suspected cheating, plagiarism, misrepresentation or other dishonest practices. The consequences for academic misconduct can be severe, including a failure in the course, a notation on your transcript, suspension, and expulsion.

If you have any questions about what is or is not permitted in this course, please do not hesitate to contact your me. Students are usually reluctant to report incidents of academic dishonesty. As we are working together to preserve the fairness of this course, I encourage you to let me know (anonymously, if necessary) if you observe behaviour that you feel might be unethical. Your name will be held in confidence.

Academic Accommodations

If you have a documented academic accommodation please share your letter from Accessibility Services with me as soon as you can in the term so that we can work together to provide an equitable learning environment for you. If you suspect that you need academic accommodations, I encourage you to contact the Accessibility Services office.

Technical Requirements: Computer & Internet

To participate in this course you must satisfy the Technical Requirements for Online Learning from the Provost's office. A technology start guide will be posted on the course website.

- Reliable Internet: Access to the internet that meets the minimum standards as outlined by the Provost's Office. In particular, note that high speed broadband access (LAN, Cable or DSL) with minimum download speed of 5Mbps is strongly recommended.
- Microphone and Camera: You need to have a place where you can speak and listen to class during our 3-hour class sessions each week. To participate in this class, you will need to speak. Since this class is a seminar, using a camera is also important . If it is not possible (due to your living situation, etc.) I understand. If you are hesitant to use your camera I encourage you to explore Zoom backgrounds as a way to disguise your surroundings but so that others can still see your face!
- Method to Maintain your Course Journal and upload course assignments: At the beginning of the course you'll need to find a reliable system to maintain your course journal that also fits with your access to technology. If you have a tablet, you might want to hand-write it on your tablet. If you have a phone with a camera, you might want to write it on paper and then take pictures for upload. Develop a workflow early so that you can carry it out often. You may also need to upload hand-written or typed course assignments online, so you will need access to a camera and word-processor.

Due Dates & Late Policy

All assignments and readings are due at the beginning of the lecture for the week it is listed, unless otherwise announced (for example, peer reviews may be due in the middle of the week)

Due to the special circumstances of the 2020-21 academic year, I will accept late assignments this term, as long as no one else is depending on them (e.g. for peer review or for a presentation). I will record when assignments are late, and you will not receive any feedback on future assignments until you are up-to-date on your assignment submissions. All assignments will be due by the last day of classes so that I can calculate final grades.

Week-by-Week Summary of Key Learning

Note: This schedule is tentative and is subject to change throughout the semester.

Unit 1: Literature about Mathematicians

	Week 1	Week 2	Week 3
TOPIC or FOCUS:	What is Math? Who are Mathematicians?	A mathematician in a novel: The Housekeeper and the Professor	How do portrayals of mathematicians influence our perceptions of them? Are these portrayals accurate?

Primary LEARNING OUTCOME:	Explain what a disciplinary culture is and features of the mathematical culture Presenting mathematical arguments and interpretations of literature with peers, both one-on-one and in groups	Critique depictions of mathematicians in literature and in poetry	Compare experience of creation in literature and in mathematics
Reading *before* Class (Required unless noted otherwise)	The Mathematician's Lament Ch. 1 of Mathematics & Poetry (Buchanan)	The Housekeeper & The Professor (NOVEL!)	The Mathematical Mind – Iconography of a Tension The Devil and Simon Flagg Pythagoras and the Psychoanalyst Young Archimedes
Due this Week	Mathematical & Literary autobiography (Due before class – post before class!) Technology Start Guide	Assigned math problems Submit a tentative reading list for other works (poems, short stories, novels, or creative non-fiction) that you'd like to read to inform final project. (Minimum of 3, including 1 novel.)	Mind of a Mathematician task (mini-essay)
Feedback you'll receive from me	Feedback on autobiographies	General - Comments on interactions with peers and contributions to class	Class-wide feedback on Mind of a Mathematician task

Peer comments & Feedback you'll *give* (and receive!)		Peer feedback on presentations	Mind of a Mathematician feedback (on PeerScholar)

Unit 2: Mathematics to Construct Literature & Poetry

	Week 4	**Week 5**	**Week 6**
TOPIC or FOCUS:	How is math used to understand and structure poetry?	How are mathematical words and ideas used to enhance literature?	Performance task: Oulipo poetry assignment
Primary LEARNING OUTCOME:	Value mathematics and mathematical thinking as an art and as a way to enliven art	Develop skills to critically evaluate and read and see similarities and differences between reading different types of texts (literary versus mathematical)	Use mathematical principles to design and write own poems inspired by given works (should be a NEW principle to them)
Reading *before* Class (Required unless noted otherwise)	Mathematics in Poetry by Growney Examples of poetry that fall into categories of poems in the Growney reading (categories and poems – your choice!)	The Library of Babel (Borges) Poems (of choice) where mathematical imagery is used – see LIST	Oulipo Poetry Assignment Research Reading for Final project
Due this Week	Revision of Mind of a Mathematician Task (before class)	Learning Strategies Class Assignment (time to begin this in-class) Submit 2-3 possible ideas for your final project (before class).	Oulipo Poetry Assignment
Feedback you'll receive from me	Feedback on math presentations		Feedback on the Oulipo projects and presentations
Peer comments & Feedback you'll *give* (and receive!)		Ideas for final project	Feedback on the Oulipo projects and presentations

Unit 3: Learning Math through Literature

	Week 7	**Week 8**	**Week 9**
TOPIC or FOCUS:	How can stories and analogy be used to help us understand mathematical ideas better?	In what ways is mathematics beautiful?	Thematic summary: In what ways do mathematics & literature interact? How are they similar? How are they different?
Primary LEARNING OUTCOME:	Reconsider their own arguments and interpretations after discussions with others		Contrast the ways math is used to illustrate ideas in literature with the ways literature is used to illustrate mathematical ideas
Reading *before* Class (Required unless noted otherwise)	Flatland: A Romance of Many Dimensions (NOVEL)	Is some mathematics poetry? (Henle, 2011) Equations are Art in a Mathematician's Brain The Two Forms of Mathematical Beauty Comparing Beauty in Mathematics and Art	Reading for final project – 2 out of 3 works due (sharing with classmates) Something else?
Due this Week	Guided Reading Notes Proposal for the Final project. Final reading list	Research Record on what you have researched related to the project.	Portfolio of Mathematical Arguments (Group Assignment)

Feedback you'll receive from me	Feedback on individual contributions during class discussions	Portfolio of Mathematical Arguments grading & feedback Knowledge Grid – Class-wide Feedback (in-class activity, no grades)
Peer comments & Feedback you'll *give* (and receive!)		Group members' feedback

Unit 4: Final Project

	Week 10	**Week 11**	**Week 12**
TOPIC or FOCUS:			Finishing Touches on the Work
Primary LEARNING OUTCOME:	Critique the use of mathematics in literature and poetry and poetry to understand mathematics	Contrast how mathematics is used in literature and poetry with how literature and poetry is used to understand mathematics	Value mathematics and mathematical thinking
Reading *before* Class (Required unless noted otherwise)	Additional Reading of Choice for Final Project.	TBA	TBA
Due this Week	Draft of Final Project Due	Short (5-10 minute) presentation on their work that conveys the argument.	Complete Final Project Due Complete Portfolio Due (of how you have achieved learning goals throughout the term – some time given during class to work on this).

Feedback you'll receive from me	Response to Question about draft.	Complete feedback on presentation – can inform the final draft, hopefully	
Peer comments & Feedback you'll *give* (and receive!)	Final Project Drafts (feedback on peerScholar)	Peer Responses to presentations	