

What is science?

LB 133: Introduction to  
History, Philosophy, and Sociology of  
Science, Technology, Environment, and Medicine

Instructor: Dr. **Isaac Record**, Holmes W25D, [irecord@msu.edu](mailto:irecord@msu.edu), and (text only) (517)402-2540.

Class meetings are **Tuesdays and Thursdays in Holmes C101 from 12:40-2:30pm**

Office hours: **Thursdays 3:00-4:30 in the CELL, Holmes W10**, or by arrangement.

Course materials are shared on **Google Drive**

## 1. Overview

LB 133 is a class about the nature of scientific practice and what kind of scientist you want to become. My intention is to guide you through real cases to provoke you to reflect on your reasons for being here and to challenge you to become a responsible expert by showing you what is at stake in getting it right. You will need strong reading and writing skills in order to master the material and clearly communicate your considered thoughts about these matters.

What is science? How is science practiced? Why is some science controversial? As a class we will attempt to answer these questions by engaging with historical, philosophical, and sociological scholarship, making our own investigations into the practice of science, and examining the role of values in science. You will need strong teamworking skills in order to successfully complete these investigations.

My role is to guide you and to provide any support necessary to help you meet these expectations.

### Course Objectives

- Content
  - Critique and apply theories of science, its practice, disagreement, and communication
  - Explain and characterize the implicit and explicit values of science
  - Understand the frailties and strengths of scientific practices
- Skills
  - Develop professional skills of research and communication through assigned readings, presentations, and class discussion
  - Develop project management skills
- Professional Disposition
  - Exhibit curiosity
  - Develop a sense of expert responsibility and humility
  - Develop a sense of belonging in Briggs and in the sciences

## 2. Course Policies

**Respect—All course policies flow from a fundamental commitment to respect one another.** I aim to treat my students with respect, and I expect students to treat me and fellow students with respect. In a discussion-based classroom, this translates to listening charitably, speaking thoughtfully, and taking responsibility for your actions. In pursuit of this general maxim, I have created the following specific policies:

**Inclusion—In college we take on the challenge of examining our core values and beliefs, but in order to do so we must foster an inclusive, safe classroom environment.** All of us, myself included, need to feel safe before exposing or questioning our core values and beliefs. We need not always agree, but we must respect one another, allow one another to make mistakes, and—when appropriate—extend a helping hand. **If you ever feel excluded by me or a classmate, please talk to me or find some way to let me know.**

**Communication—Almost anything in this class can change, but for change to happen, you must communicate with me in a timely and respectful manner.** I will post major course updates online. Students may contact me during office hours, or offline via email (I will typically respond within 48 hours, not including weekends). If you do send me email, please use your MSU email account and include the course designation (“LB 133” and/or “Intro to HPS”) in the subject line. Please be polite, brief, and direct.

**Attendance—In case of absence, be proactive: contact me as soon as possible and suggest a plan** for making up any missed work or assignments. This class involves a significant amount of group work, so please also contact your group if relevant. I generally excuse *occasional* absences due to illness, interviews, funerals, court dates, family events, and other emergency situations, but please talk to me beforehand or provide documentation after the fact. **Consistently missing class, including leaving early or arriving late, will affect your grade. If you have concerns, please communicate them. If you act responsibly, I am likely to be accommodating.**

**Accommodation and special consideration—Students needing accommodation or special consideration should contact me as early in the semester as possible.** This includes Students with Disabilities, athletes, others requesting accommodation, or those who wish to explore an Honors Option. Students with Disabilities requesting accommodation should register with the Resource Center for Persons with Disabilities to receive accommodations. RCPD is in 120 Bessey Hall and may be reached at 353-9642.

**Plagiarism—I do not tolerate plagiarism.** You must give credit to those who contribute to your work. In general, this means explicitly identifying the source of the ideas, arguments, and evidence you make use of in this class. If in doubt, talk to me.

### 3. Evaluation

You are responsible for completing several individual projects (including reflective and research essays) and for contributing to your group's investigations, which will involve presentations, collaborative group work, and both formal and informal writing. Success in this class will depend on active participation in class discussions.

Grading works as follows:

GPA	Points Earned
4.0	400+ points
3.5	350-399 points
3.0	300-349 points
2.5	250-299 points
2.0	200-249 points

Points summary:

Boxology (100 points)  
Laboratory Study (100 points)  
Controversy Analysis (140 points)  
Personal portfolio (100 points)

Total: 440 points

## 3.1 Boxology

Science is a social practice of discovering and producing knowledge about the world. But how does one go about transforming a mystery into a scientific fact? What qualities of science make it a good vehicle for making knowledge? In order to explore the process of science, students will form groups of 4-5 and conduct an investigation into the mysterious nature of the “black box.” Groups will attempt to use scientific principles and methods to solve a mystery. Each group will receive a sealed box and will be tasked with answering one question: *what is in the box?* There is just one rule: *you may not open the box.* The class will negotiate ground rules; standards for evaluating claims, evidence, and reasoning; and criteria for determining success.

- **Groups will create a research proposal, complete an investigation, and present their findings in a slide deck and a short 2-3 page co-written scientific paper** detailing the methodology, evidence, and reasoning behind the claims made. You should make use of 4 or more course resources.
- **Teams and individual members will be evaluated on their teamwork.**
- **Each member of the group will also hand in a 3-4 page essay** using the discussions of science from at least four course resources in order to answer the question: In what ways was your group doing science to figure out what was in the black box? Note that in order to answer this question, you must say what science is.

Boxology (100 points)

Research proposal (group)	10
Research products (group)	10
Conference presentation (group)	30
Teamwork (individual)	20
Essay (individual)	30

## 3.2 Laboratory study

Science is not just a collection of facts; it is done by specific people in specific places with specific sets of instruments and written up in specific ways. What do the practices of producing knowledge in different scientific fields look like? In the Laboratory Field Study, you will be working to answer that question through participant observation in a laboratory. Students will form groups of 4-5 members. Each group will seek out a scientific lab to study, collect field notes about the way that knowledge is made in this scientific field, and read at least one scientific paper from the lab. Field notes are detailed records of your observations of practices, and could include a combination of written notes, drawings, collected materials, photographs and video. You will use your field notes, and those of your group, to answer the question of how the discipline you are studying creates material and social conditions for producing scientific knowledge.

- **Groups will present their studies in class**, describing the findings from their observations. You should produce a **slide deck** and a **4-5 page co-written scientific paper** explaining your method of observation and what you observed about how science is done in the laboratory that you were studying. You should make use of 4-5 course resources.
- **Teams and individual members will be evaluated on their teamwork.**
- **Each member of the group will also hand in a 2-3 page reflective paper** addressing the question: what kind of scientist do you want to be?

Laboratory Study (100 points)

Research proposal (group)	10
Research products (group)	10
Conference presentation (group)	40
Teamwork (individual)	20
Essay (individual)	20

### 3.3 Controversy analysis

The road from conducting scientific research to producing scientific facts is rarely smooth. Much scientific knowledge is contested and debated over time. Debates take place between scientists working within a given field, between scientists from different fields approaching similar questions, and between scientists and non-scientists. In the Controversy analysis project you will work with a group of 4-5 students to collect and analyze an archive of materials that represent different positions regarding a specific contested scientific “fact.” Your archive will include scientific or scholarly journal articles, newspaper stories, and websites that present perspectives on the “fact” that your group is exploring.

- **Groups will present their research**, explaining what scientific “fact” they explored, why it is/was up for debate, identifying the stakeholders in the debate, what arguments each side makes, and why. You should produce an **outreach project** (such as a website) that incorporates an **annotated bibliography**.
- **Teams and individual members will be evaluated on their teamwork.**
- **Each member of the group will also hand in a 4-5 page reflective paper** discussing the power and responsibility of scientific experts and your own ambitions. Please include 5-6 course resources.

Controversy Analysis (140 points)

Research proposal (group)	10
Research products (group)	10
Outreach project (group)	50
Teamwork (individual)	20
Essay (individual)	50

## 3.4 Personal portfolio

A major aim of this course is to help you develop your professional identity as a scientist. Most every assignment includes some component directed toward this objective. But in addition, I am asking you to create a personal portfolio exhibiting your curiosity and passion for science, your (hopefully) growing sense of responsibility as a budding expert, and your demonstrated responsibility in completing assigned tasks.

Personal portfolio (100 points)

Guided Reflections (5 @ 10 pts)	50
Quizzes and in-class activities (20 @ 2 pts)	40
Shares (5 @ 2 pts)	10

## 3.5 Detailed Rubrics and Guides

### 3.5.1 Guided Reflections

My educational philosophy is that learning requires active reflection. In addition to reflections associated with major projects, I have included five shorter (1-2 page) guided reflection essays as a crude measure of your reflective practice during the course. These assignments are primarily for you, although I am asking you to share them with me so that I can assess how I am doing in designing experiences for you to learn from. If your reflections are on the topics I expect, and are thoughtful and detailed, you will receive full credit.

#### Reflection 1: Why am I here?

Why did you choose Michigan State University? Lyman Briggs College? What do you hope to get out of your education here?

#### Reflection 2: Writing.

##### **Describe your experience with writing.**

-What kinds of writing have you done? (e.g., Personal reflection, history, persuasive, opinion)

-What have you achieved? (e.g., I have achieved understanding how to form a paper, from the beginning to the end. I have learned that I need to plan out what I want to say.)

What do you fear? (e.g., My fears include, not being up to the college standard of writing, and also not understanding the materials that I am supposed to be writing about.)

**What specific goals do you have for your writing this semester?** (Your goals might involve **content**: engaging with exciting ideas, learning something new, using the writing process to think deeply; or they might pertain to **skills**: planning, time management, reading and notes, stating the purpose, getting ideas flowing, thesis, structure, paragraphs, transitions, choosing evidence, citing, and revising; or your goals might be about developing your **professional disposition**: gaining

confidence in your writing, articulating your passion for science, gaining respect for your responsibilities as a budding expert.

### Reflection 3: Participation.

You may find my take on “participation” to be different from your past experiences. I believe in collaborative, experiential learning. This often works best in group settings where we can share with one another what we know and what we wonder. Showing up is important. That said, I recognize that participation has many forms. I do not believe in rigidly defining what participation has to be. Therefore, I ask you to tell me how you are participating, and why you’ve chosen to participate in those ways.

Participating in a course involves engaging individually and collaboratively with course material and concepts. Modes of participation include attending class, participating in discussion, coming prepared with questions, taking part in group activities, participating in study groups, reviewing the work of your peers, and taking detailed notes on the readings. It is expected that the specifics will vary from student to student.

Because some forms of participation are invisible to me, or are otherwise difficult to assess, I am asking you to contribute your own assessment of your participation. I will ask you to **submit a short reflection answering the following two questions: (1) In what ways have I participated in this course? (2) How has my participation contributed to (or detracted from) my progress towards the learning objectives identified in the syllabus?** For (1), identify each mode of participation, explain why it ought to be considered valid, and provide evidence that you have participated in this way (a short sample of your notes, a question you brought to class and a recollection of the resulting discussion, etc.). For (2), be sure to explicitly identify the learning objectives addressed.

Participation Rubric		
Comments & Praise	Expectations	Concerns

	<p><b>Multiple Modes</b></p> <p>The sum of the presented modes show that the student has actively engaged with the course in a variety of distinct ways, several of which go beyond the minimum expectations of the course.</p>	
	<p><b>Meets Objectives</b></p> <p>The essay identifies how each identified mode of participation supports or detracts from each learning objectives, and makes clear how the student views their own progress towards achieving the course objectives.</p>	
	<p><b>Evidence</b></p> <p>The evidence provided clearly supports the statement of participation. The reasons for participating in the indicated ways clearly support the claim that the indicated modes constitute participation in the course.</p>	
	<p><b>Professional style and language</b></p> <p>Writing is clear, concise and precise. The purpose of sentences, paragraphs and the paper as a whole are clear. The paper is well organized.</p>	

--Adapted from Jessey Wright, University of Western Ontario

Reflection 4: Why did you almost NOT come to Lyman Briggs College?

Reflection 5: Prove to me that you learned something important to you in this class.

Guided reflection rubric		
Comments & Praise	Expectations	Concerns
	<p style="text-align: center;"><b>Claim</b></p> <p>The reflective essay makes a compelling claim concerning the prompt.</p>	
	<p style="text-align: center;"><b>Evidence</b></p> <p>Although reflections contain opinions, they are also supported by evidence. Evidence is drawn from throughout the relevant course materials and experiences, and is consistently appropriate to advancing the claim.</p>	
	<p style="text-align: center;"><b>Reasoning</b></p> <p>Evidence and claim are consistently connected together by clear reasoning.</p>	
	<p style="text-align: center;"><b>Style and language</b></p> <p>Error-free prose that advances writer’s rhetorical purpose. Appropriate citation practices are used throughout.</p>	

### 3.5.2 Quizzes and in-class activities

Quizzes and in-class activities are a mix of different kinds of assessments. Some are “formative”, determining how the class is going and whether the selected readings and designed experiences are having the desired effect. Others are “summative”, measuring what you know. In both cases, the stakes are relatively low. There will be about 25 of these assessments, and you only need to complete 20 of them. There are no make-ups. No rubric is required: each assessment is pass/fail.

### 3.5.3 Shares

At five points throughout the semester, I will ask every student to add a slide to a shared deck the night before class and then present that slide during discussion. This assignment is pass/fail and is a good opportunity to share what you are excited about in science today.

### 3.5.4 Research proposal (group)

<b>Research Proposal Rubric</b>		
<b>Comments &amp; Praise</b>	<b>Expectations</b>	<b>Concerns</b>
	<p style="text-align: center;"><b>Plan</b></p> <p>Project management plan specifies tasks to be accomplished, resources needed, due dates, and individual assignments. It describes a mechanism for adjusting the plan.</p>	
	<p style="text-align: center;"><b>Methods</b></p> <p>The proposal clearly identifies specific and reasonable methods of investigation within the scope of the proposed investment.</p>	
	<p style="text-align: center;"><b>Investment</b></p> <p>The proposal makes reasonable, quantitative claims about the materials, time, and tools required for the investigation.</p>	
	<p style="text-align: center;"><b>Professionalism</b></p> <p>The proposal is well-organized and takes the task seriously.</p>	

### 3.5.5 Research products (group)

Research Product Rubric		
Comments & Praise	Expectations	Concerns
	<p style="text-align: center;"><b>Effort</b></p> <p>The team has made multiple empirical investigations.</p>	
	<p style="text-align: center;"><b>Creativity</b></p> <p>The variety of investigations demonstrate creative thinking and multiple approaches.</p>	
	<p style="text-align: center;"><b>Uncertainty</b></p> <p>The team has made attempts to reduce, measure, or otherwise account for sources of error and uncertainty in their investigations.</p>	

### 3.5.6 Conference presentation (group)

Conference Presentation Rubric		
Comments & Praise	Expectations	Concerns
	<p style="text-align: center;"><b>Claim</b></p> <p>The presentation provides a clear sense of a carefully planned investigation. The group makes a compelling claim that responds to the prompt.</p>	
	<p style="text-align: center;"><b>Evidence</b></p> <p>Evidence is drawn from throughout the relevant course materials, discussions, and team investigations. Evidence presented is consistently appropriate to advancing the major claim. Compelling visuals are used as appropriate.</p>	
	<p style="text-align: center;"><b>Reasoning</b></p> <p>The discussion of the readings and evidence adds insight beyond content description. Detailed analysis of the investigation using the readings persuasively supports the major claim.</p>	
	<p style="text-align: center;"><b>Organization</b></p> <p>Organization effectively enhances the development of ideas.</p>	
	<p style="text-align: center;"><b>Professionalism</b></p> <p>Slides are error-free and designed with care. Appropriate citation practices are used throughout. Delivery is practiced and clear.</p>	

### 3.5.7 Teamwork (individual and group)

Each team member will assess their team as a whole, their own individual contribution, and each of their teammates based on the following rubric. Individuals are expected to use this opportunity to provide specific feedback to teammates, including 1-2 specific, positive traits or actions and 1-2 specific, actionable suggestions. Meanness and generalities are not constructive.

<b>Teamwork Rubric</b>		
<b>Comments &amp; Praise</b>	<b>Expectations</b>	<b>Concerns</b>
	<p style="text-align: center;"><b>Participation</b></p> <p>Team has a project management plan outlining tasks to be accomplished, resources needed, due dates, and individual assignments. The team monitors progress, makes adjustments, and provides feedback to team members.</p>	
	<p style="text-align: center;"><b>Shared decision-making</b></p> <p>Team shares decision-making responsibility and has strategies in place to ensure every member a chance to share their ideas and fully consider the ideas of others, acknowledging that each member has a significant role to play and personal responsibility in decision-making.</p>	
	<p style="text-align: center;"><b>Adjust to unforeseen circumstances</b></p> <p>Team members have stated plan or demonstrated ability to deal with unforeseen circumstances.</p>	
	<p style="text-align: center;"><b>Diversity as a strength</b></p> <p>Team members recognize each other as legitimate contributors to the shared</p>	

	<p>goals; they build on each other's ideas and take responsibility for the overall advancement of knowledge of the team. They see diversity as a strength that helps to strengthen the overall outcomes. Team members encourage diverse points of view, openly negotiate emerging understandings and provide and accept specific feedback to and from each other to improve team processes and project outcomes.</p>	
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--Adapted from [http://galileo.org/tips/rubrics/t-c\\_rubric.pdf](http://galileo.org/tips/rubrics/t-c_rubric.pdf)

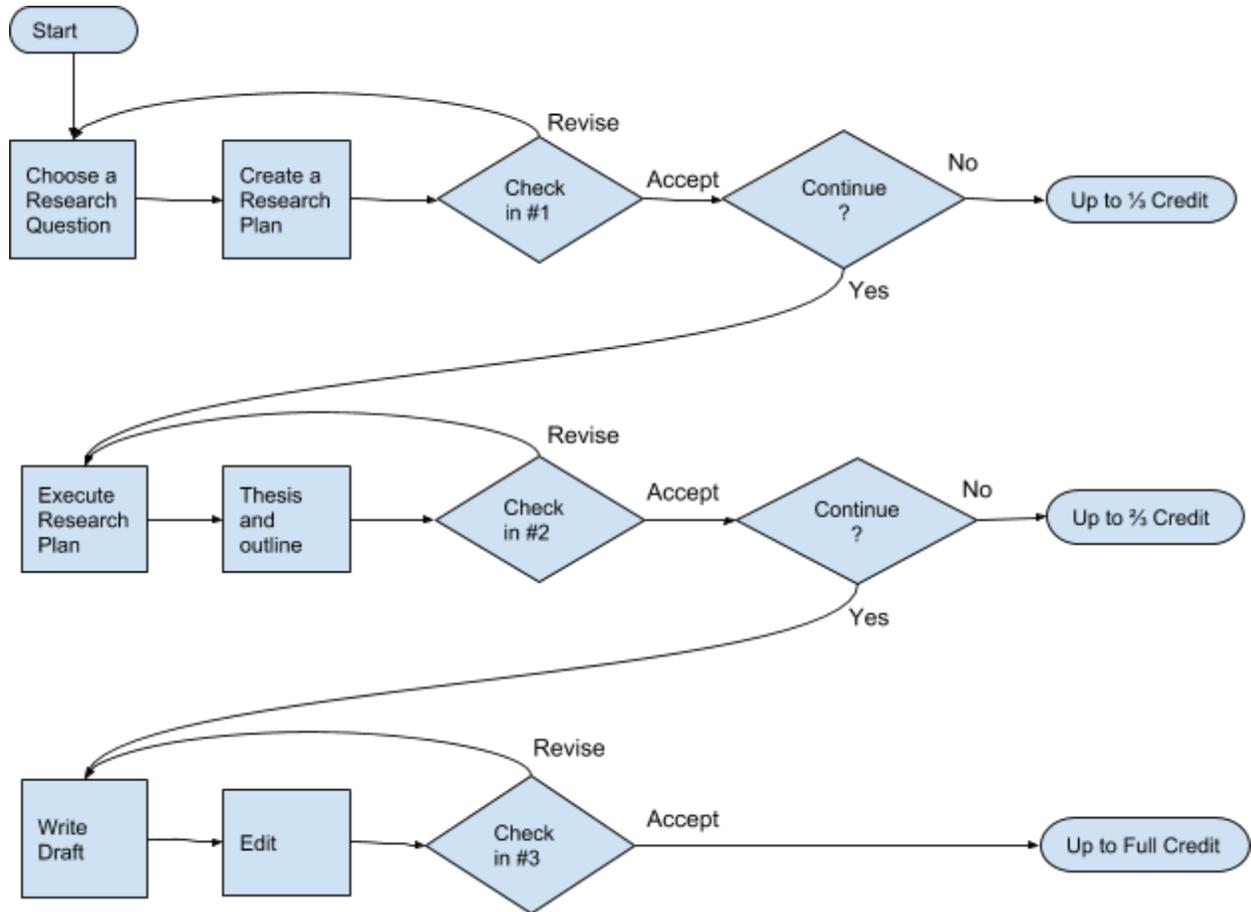
### 3.5.8 Essay Guidelines

In this class, you will have the opportunity to write many different kinds and lengths of essay. Fortunately, the overall research and writing process is fairly consistent across the gamut. Whether the essay is a scientific paper or a personal reflection, we are focused on reasoning from evidence to support a claim. What differs across these cases is the sort of claim you make and the kind of evidence that supports that claim.

Let me start by presenting you with a very general flowchart describing the complete research and writing process.

For a given assignment, you should choose the appropriate starting point and go from there. Example: for a prompted essay, you should skip the “choose a research question” stage because the prompt effectively makes that choice for you.

### Flowchart



My aim is to structure most assignments in such a way as to guarantee a successful outcome. This means that you can hand in work you are confident in, and I can have confidence that you have met the learning objectives involved in the assignments.

The guidelines below ask you follow a series of stages that model appropriate research practices. I require that you check in with me at appropriate junctures *before* moving on to the next stage.

At each of the three check-ins, I will give you one of two grades:

ACCEPT. You have completed this stage satisfactorily, and you have earned the points associated with this stage. You are free to pursue further stages, taking into account any minor revisions I have suggested.

REVISE. You have made progress, but significant changes are needed before you can move on to the next stage. In my comments, I will point out problems and identify possible solutions or strategies. I encourage you to talk to me if you have questions about how to proceed. *If you stop here without revising, no points will be awarded for this level, but you retain points from any previous levels.*

### A. Choose a research question.

Expect to spend no less than 20 minutes on this. You want to give your mind a chance to be creative. Doodle. Brainstorm. Write five different versions of the question. Freewrite for ten minutes. Take a long shower. Take a short walk. Sleep on it. There's no single way to do this, but you must do it. **Turn in the question and some evidence from this stage:** a journal reflecting on your thought process, a photo of your doodles, the actual freewrite, etc.

### B. Create a research plan

Spend no less than 30 minutes on this. **Turn in a written plan.** A research plan has a schedule and includes concrete steps to help you answer your research question. List the types of evidence you want to find and where you will look. Specify when you will do the work. Note any special equipment, apps, trips, or systems you will make use of (e.g., note cards, research diary, Broad Museum, list of google search terms, etc.).

### C. Check in with me (#1, up to 1/3 credit)

Research Proposal Rubric		
Comments & Praise	Expectations	Concerns
	<b>Plan</b> Project management plan specifies tasks to be accomplished, resources needed, due dates, and individual assignments. It describes a mechanism for adjusting the plan.	

	<p style="text-align: center;"><b>Methods</b></p> <p>The proposal clearly identifies specific and reasonable methods of investigation within the scope of the proposed investment.</p>	
	<p style="text-align: center;"><b>Investment</b></p> <p>The proposal makes reasonable, quantitative claims about the materials, time, and tools required for the investigation.</p>	
	<p style="text-align: center;"><b>Professionalism</b></p> <p>The proposal is well-organized and takes the task seriously.</p>	

#### D. Execute the research plan.

Spend no less than 30 minutes **looking for** sources. For each source, read the abstract or introduction first to evaluate if it will help answer your question. If not, dump it. If so, hang onto it until after your 30 minutes is done, and also consider using its bibliography to find more sources.

For sources you decide to use, spend an appropriate amount of time reading. **It will take you a minimum of 30 minutes to understand the basics of a scholarly article** and find a good quote or two. You can do the same for a well-structured book in about 90 minutes. (Basically, you'll spend an hour understanding the overall structure and message of the book and another 30 minutes finding relevant quotes.)

Turn in a bibliography and some evidence of your notes.

How do I take good notes?

I won't prescribe a note taking method, but whatever you do, your notes should include relevant bibliographic details so that it is easy to cite later, and they should clearly distinguish between your thoughts and reactions and the ideas expressed in the source itself.

Example: I use "quotes", summaries of ideas, and [I bracket my own thoughts]. I always note page numbers.

You will be tempted to just write down whatever you find out from each of your sources. But unless you are very lucky, most of your sources won't be addressing the same question you are. So you will need to be selective: which evidence speaks to my question? How can I interpret this evidence in such a way that it speaks to my question?

Let it stew

You might want to take another walk or do some more freewriting. Just be prepared to throw it all away, because this is a stage where you are working out what you think, not a stage where you are working to clearly express what you think. You might want to take a day or two off from this project to really think it through. On large writing projects, I take at least a week off.

#### E. Thesis and outline including key evidence.

This is the hardest step, and it has the biggest payoff. Every minute you spend on this step saves you five minutes later. I can't imagine spending less than 30 minutes on this. What's the

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one sentence answer to your original question? What's the evidence for it? What do you need to tell the reader to help convince them that you have found appropriate evidence?

Turn in the thesis and outline **including key evidence** (this means quotes with citations, short descriptions of cases, etc.).

F. Check in with me (#2, up to  $\frac{2}{3}$  credit)

<b>Thesis and Outline Rubric</b>		
<b>Comments &amp; Praise</b>	<b>Expectations</b>	<b>Concerns</b>
	<p style="text-align: center;"><b>Thesis</b></p> <p>Thesis answers the prompt, connecting course materials and experiences to a claim in a structured way. It is supportable, significant, bold, specific, manageable, and structured.</p>	
	<p style="text-align: center;"><b>Selection of evidence</b></p> <p>Evidence is drawn from throughout the relevant course materials and is consistently appropriate to advancing the thesis.</p>	
	<p style="text-align: center;"><b>Examination of text</b></p> <p>The examination of the readings adds insight beyond content description. Detailed analysis of the experiment using the readings persuasively supports the thesis.</p>	
	<p style="text-align: center;"><b>Organization</b></p> <p>Organization effectively enhances the development of ideas in addressing each of the prompt questions.</p>	

## G. Draft.

If you spent enough time on the outline, this could be the easiest step, and a reasonably fast one. You're just taking each outline element and adding the framing and connecting sentences. **Turn in the draft with full citations included, and a complete bibliography.**

How do I write a good first draft?

Depending on the detail of your outline, each smallest item might correspond to a sentence or a paragraph or a section. This makes structure relatively straightforward.

Decide whether this is the final draft. In principle, every piece of writing can be improved. In practice, at some point you need to turn it in. So the challenge is finding a stopping condition we both agree is satisfactory.

I apply the 80/20 rule, which states that you will spend 20% of your time getting the project 80% done, and 80% getting it the last 20% of the way there. When your rate of return on editing falls way off, stop. Either you are done or you need help. **You can find help from peers, from the Writing Center, or from me.**

## H. Edit.

Editing is one of the hardest parts of writing, in part because any piece of writing can be improved. As a rule of thumb, spend at least as much time editing as you spend writing. Turn in evidence of your editing process. Scribbles, reverse outline, notes from a peer or the writing center, or "track changes" in a word processor are all suitable.

How do I make the most of my time editing?

One of my favorite techniques is "reverse outlining". Take each paragraph and write down the one sentence that expresses the content of that paragraph. If you can't do it in one sentence, something has gone wrong. You tried to fit too many ideas into that paragraph, or perhaps didn't manage to put any ideas in there at all. If the sentence you wrote in your reverse outline is clearer than the ones in the paragraph, then put it in the new sentence and consider taking out one of the old ones. This exercise is especially useful for those of us who get carried away and put in irrelevant details. Now is the time to excise them.

- **Note that I would rather you turn in an on-topic paper that is short than an off-topic paper that meets my length guideline.**
- Read aloud.
- Your thesis statement is the most important sentence, and you should work hard on it. Use the simplest words you can. And the fewest.

- Your first paragraph is the most important paragraph, and you should work hard on it. It does a lot: hooks the reader, situates the question, and sketches the answer and the case you will make for it.

I. Check in with me (#3, up to full credit)

Essay Draft Rubric		
Comments & Praise	Expectations	Concerns
	<p><b>Thesis/Controlling idea</b> The introduction provides a clear sense of a carefully planned analysis that responds to the prompt. The essay makes a compelling claim.</p>	
	<p><b>Selection of evidence</b> Evidence is drawn from throughout the relevant course materials and is consistently appropriate to advancing the thesis.</p>	
	<p><b>Examination of text</b> The examination of the readings adds insight beyond content description. Detailed analysis of the experiment using the readings persuasively supports the thesis.</p>	
	<p><b>Organization</b> Organization effectively enhances the development of ideas in addressing each of the prompt questions.</p>	
	<p><b>Style and language</b> Error-free prose that advances writer's rhetorical purpose. Appropriate citation practices are used throughout.</p>	

Week	DATE	Topic	Work to complete PRIOR to class	In class activities:
1	<b>Tue Jan 8</b>	The character of science and its relationship to other institutions within society	<p>[1] Collins, Harry M., and Trevor Pinch. The golem: What you should know about science. Cambridge University Press, 1998. Introduction.</p> <p>[2] Syllabus and Schedule</p> <p>[3] Syllabus and Schedule Worksheet</p>	<p>Group project: create a representation of science as a golem Group project: annotate, explain and ask questions about syllabus and schedule</p> <p>Watch and discuss: John Oliver. "Science Studies." Last Week Tonight. HBO, May 8, 2016. <a href="https://www.youtube.com/watch?v=0Rnq1NpHdmw">https://www.youtube.com/watch?v=0Rnq1NpHdmw</a> [video, to 15:40]</p>
	<b>Thu Jan 10</b>	Reasoning  Time management	<p>[1] Okasha, Samir. Philosophy of science: A very short introduction (Vol. 67). Oxford Paperbacks, 2002. Read Ch 2. Scientific Reasoning</p> <p>[2] Crash Course. Induction &amp; Abduction. <a href="https://www.youtube.com/watch?v=-wrCpLJ1XAw">https://www.youtube.com/watch?v=-wrCpLJ1XAw</a> [video]</p> <p>[3] Reasoning Worksheet</p> <p>[4] Share #1</p>	<p>Share #1</p> <p>Group project: Claim, Evidence, Reasoning</p> <p>Mini-lecture: Introduction to Boxology</p> <p>Small group roundtable: Time management (GTD, structured procrastination, agendas, calendars, etc.)</p>
2	<b>Tue Jan 15</b>	Falsification  Study skills	<p>[1] Karl Popper, Conjectures and Refutations, London: Routledge and Keagan Paul, 1963, (33-39) <a href="http://stephenjaygould.org/ctrl/popper_falsification.html">http://stephenjaygould.org/ctrl/popper_falsification.html</a></p> <p>[2] Crash Course. Popper and pseudoscience. <a href="https://www.youtube.com/watch?v=-X8Xf0JdTQ&amp;list=PL8dPuualjXtNgK6MZucdYldNkMybYIHKR&amp;index=8">https://www.youtube.com/watch?v=-X8Xf0JdTQ&amp;list=PL8dPuualjXtNgK6MZucdYldNkMybYIHKR&amp;index=8</a> [video]</p> <p>[3] Putnam et al. Optimizing Learning in College.</p> <p>[4] Optimizing Learning Worksheet</p> <p>[5] Draft boxology research proposal</p>	<p>Quiz: falsification, pseudoscience, deduction, induction, inference to the best explanation</p> <p>Peer review of Optimizing Learning slides + Conference with Dr. Record on Boxology research proposals</p>
	<b>Thu Jan 17</b>	Realism and Antirealism	<p>[1] Okasha, Samir. Philosophy of science: A very short introduction (Vol. 67). Oxford Paperbacks, 2002. Read Ch 5. Realism/Antirealism</p>	<p>Roundtable: Optimizing Learning Findings</p> <p>Quiz: Aims of science, realism, antirealism</p> <p>Mini-lecture: Styles of Reasoning</p> <p>Discussion: How should we interpret boxological evidence?</p>
3	<b>Tue Jan 22</b>	Experimenter's Regress	<p>[1] Collins, Harry M., and Trevor Pinch. The golem: What you should know about science. Cambridge University Press, 1998. Read "The Germs of Dissent"</p>	<p>BBC Horizon, Homeopathy: The Test, BBC World video, 43:44, November 26, 2002, <a href="https://vimeo.com/101005591">https://vimeo.com/101005591</a> [video] <a href="http://www.bbc.co.uk/science/horizon/2002/homeopathy.shtml">http://www.bbc.co.uk/science/horizon/2002/homeopathy.shtml</a> [program description and transcript]</p> <p>Group project: Storyboard Pasteur-Pouchet dispute OR Homeopathy dispute</p> <p>Debate: can we escape the experimenter's regress?</p>

Week	DATE	Topic	Work to complete PRIOR to class	In class activities:
	<b>Thu Jan 24</b>	Collective effort	[1] Naomi Oreskes, Why we should trust scientists. TED Talk. <a href="https://www.ted.com/talks/naomi_oreskes_why_we_should_believe_in_science">https://www.ted.com/talks/naomi_oreskes_why_we_should_believe_in_science</a> [video]  [2] Individual Essay Thesis and Outline	Peer review and conference with Dr. Record: Thesis and outline  Discussion: Finalize boxology conference criteria  Mini-lecture: what makes a good presentation
<b>4</b>	<b>Tue Jan 29</b>	Presentations		Boxology Conference
	<b>Thu Jan 31</b>	Unit 1 Wrap	[1] Share #2  [2] Boxology Essays Due Sunday 3 February	Unit 1 Check-in  Share #2  Writing Workshop
<b>5</b>	<b>Tue Feb 5</b>	How is science done?	[1] Sismondo, Sergio. An introduction to science and technology studies. John Wiley & Sons, 2011. Read "Studying Laboratories"	Mini-lecture: Laboratory Study Guidelines  Discussion: Lab image from Latour & Woolgar  Group project: Jigsaw to create Qs, complete Briggs study
	<b>Thu Feb 7</b>	A social process of trust	[1] How to Think About Science, CBC podcast: Steven Shapin	Quiz: image of science, matter of fact  Small group roundtable: Julia Belluz, Brad Plumer, and Brian Resnick. (July 14, 2016). "The 7 biggest problems facing science, according to 270 scientists" Vox. <a href="http://www.vox.com/2016/7/14/12016710/science-challenges-research-funding-peer-review-process">http://www.vox.com/2016/7/14/12016710/science-challenges-research-funding-peer-review-process</a>
<b>6</b>	<b>Tue Feb 12</b>	Reconfiguration	[1] Karin Knorr-Cetina. Epistemic Cultures. Cambridge: Harvard, 1999. Read "What is a Laboratory?" (to page 43)  [2] Lab study workshop	Quiz: reconfiguration  Group work: Lab study proposal
	<b>Thu Feb 14</b>		[1] Karin Knorr-Cetina. Epistemic Cultures. Cambridge: Harvard, 1999. Read "What is a Laboratory?" (to end)	Rifkind, Richard A., and Carole Rifkind. 2010. Naturally obsessed: the making of a scientist. [video]
<b>7</b>	<b>Tue Feb 19</b>	Material	[1] Baird, Davis, and Thomas Faust. "Scientific instruments, scientific progress and the cyclotron." The British Journal for the Philosophy of Science 41, no. 2 (1990): 147-175. [Section 1, 2, and 4]  [2] Lab study proposal due	Quiz: trick of the cyclotron, theoretical knowledge, experimental knowledge  Hands on with an instrument  Peer review and conference with Dr. Record: lab study proposal
	<b>Thu Feb 21</b>	Progress	[1] Baird, Davis, and Thomas Faust. "Scientific instruments, scientific progress and the cyclotron." The British Journal for the Philosophy of Science 41, no. 2 (1990): 147-175. [Section 5]	
<b>8</b>	<b>Tue Feb 26</b>	Literary	[1] Meienschein, Jane (1991) "From Presentation to Representation in E.B. Wilson's The Cell." Biology and Philosophy 6: 227-254.	Eyes on with an image
	<b>Thu Feb 28</b>	Models	[1] Robert E. Kohler. "Drosophila: the natural history of experimental laboratories." Journal of the History of Biology 26 (1993): 281-310.	Hands on with a model

Week	DATE	Topic	Work to complete PRIOR to class	In class activities:
<b>9</b>	<b>Tue Mar 5</b>			---- Spring break, no meeting ----
	<b>Thu Mar 7</b>			---- Spring break, no meeting ----
<b>10</b>	<b>Tue Mar 12</b>	Social	[1] Steve Shapin (1984) "Pump and Circumstance: Robert Boyle's Literary Technology." <i>Social Studies of Science</i> . Vol 12 (4): 481-520 Read through 497	Material and literary  Peer review and conference with Dr. Record: scientific practice essay draft thesis and outline
	<b>Thu Mar 14</b>	The scientific style of reasoning	[1] Steve Shapin (1984) "Pump and Circumstance: Robert Boyle's Literary Technology." <i>Social Studies of Science</i> . Vol 12 (4): 481-520 Read remainder  [2] Share #3  [3] Laboratory observation complete	Quiz: matter of fact, material, social, literary technologies  Group project: Social  Mini-lecture: styles of reasoning  Share #3
<b>11</b>	<b>Tue Mar 19</b>	Unit 2 Wrap	[1] Laboratory study presentation  [2] Laboratory study essay due Sunday 3 March	Presentations of Lab Studies  Unit 2 Check-in
	<b>Thu Mar 21</b>	Controversy	[1] Sisondo, Sergio. <i>An introduction to science and technology studies</i> . John Wiley & Sons, 2011. Read "Controversies"	Mini-lecture: Controversy analysis  Erik M. Conway, Robert Kenner, Naomi Oreskes, and Kim Roberts, <i>Merchants of Doubt</i> , directed by Robert Kenner (Culver City, CA: Sony Pictures Home Entertainment, 2015), DVD. [video]
<b>12</b>	<b>Tue Mar 26</b>	Responsibility	[1] Crash Course. Epistemic Responsibility. <a href="https://www.youtube.com/watch?v=AYkhIXronNk&amp;list=PL8dPuuaLjXtNgK6MZucdYldNkMybYIHKR&amp;index=14">https://www.youtube.com/watch?v=AYkhIXronNk&amp;list=PL8dPuuaLjXtNgK6MZucdYldNkMybYIHKR&amp;index=14</a> [video]  [2] Controversy proposal	Discussion: Choosing controversies
	<b>Thu Mar 28</b>		[1] Controversy Worksheet	MEET AT LIBRARY
<b>13</b>	<b>Tue Apr 2</b>	Value of Diversity	[1] Sisondo, Sergio. <i>An introduction to science and technology studies</i> . John Wiley & Sons, 2011. Read "Feminist Epistemologies of Science"	
	<b>Thu Apr 4</b>	Values in Science	Kevin Elliot (2017) "Rather than being free of values, good science is transparent about them." <i>The Conversation</i> . <a href="https://theconversation.com/rather-than-being-free-of-values-good-science-is-transparent-about-them-84946">https://theconversation.com/rather-than-being-free-of-values-good-science-is-transparent-about-them-84946</a>	Dungeons and Dragons  Discussion: controversies  Share #4
<b>14</b>	<b>Tue Apr 9</b>	Authority and Expertise	[1] Collins, Harry M., and Trevor Pinch. <i>The golem: What you should know about science</i> . Cambridge University Press, 1998. Read "Science of the Lambs"	
	<b>Thu Apr 11</b>	Authority and Expertise	[2] Collins, Harry M., and Trevor Pinch. <i>The golem: What you should know about science</i> . Cambridge University Press, 1998. Read "ACTING Up"	Workshop

Week	DATE	Topic	Work to complete PRIOR to class	In class activities:
<b>15</b>	<b>Tue Apr 16</b>	Resistance	[1] Mark Navin. Values and Vaccine Refusal. <a href="http://newbooksnetwork.com/mark-navin-values-and-vaccine-refusal-hard-questions-in-epistemology-ethics-and-health-care-routledge-2016/">http://newbooksnetwork.com/mark-navin-values-and-vaccine-refusal-hard-questions-in-epistemology-ethics-and-health-care-routledge-2016/</a> [podcast]  [2] Maya Goldenberg. Public Misunderstanding of Science.	
	<b>Thu Apr 18</b>	Presentations	Complete presentations	Presentations of Controversy Archives
<b>16</b>	<b>Tue Apr 23</b>	Unit 3 Wrap	Controversy Essay Thesis and Outline or Draft	Peer review and conferences with Dr. Record: Controversy Essay
	<b>Thu Apr 25</b>	Charge	None	Course debrief  Share #5
<b>17</b>	<b>Tue Apr 30</b>		Controversy Essay Due	---- Finals Week, no meeting ----