

Applying Critical Thinking to Chemistry Capstone CH4500 by using Controversial Topics



TANIA HOUJEIRY, PH.D.

SENIOR LECTURER

DEPARTMENT OF CHEMISTRY, COLLEGE OF SCIENCE

Course Objectives

The main objectives for this course is to introduce students to the tools that help them :

- (1) synthesize knowledge of all of their experiences in the chemistry curriculum;
 - (2) develop critical thinking to improve their creativity and problem solving skills;
- and
- (3) develop literacy in some of the major scientific and technological challenges of the 21st century.

“ Throughout this course I learned about the different research topics in Chemistry Department. I also learned to critically think. I think this was a great time in my college life to learn this” ~ Elyse (spring 2018)

“Thanks for a great semester of lecturers and thought-provoking projects!” ~ Luke (Spring 2019)

Course Syllabus

CHEMISTRY CAPSTONE CH4500 – SPRING 2019



DR. TANIA HOUEJIRY

Email: thoujei@clemson.edu

Office hours: M,T,Th&F 10:00 am – 11:30 am and by appointment

Office: 267 Hunter labs

COURSE INFORMATION

MEETING TIME

- I** This class meets every Wednesday at 5:45 pm in HTL 158. The class is 2 hours 45 minutes long.

COURSE OBJECTIVES

- I** CH4500 is the Chemistry Capstone course intended for Chemistry majors in their final year of study. This course is part of the Clemson Thinks² (CT²) quality enhancement plan that focuses on critical thinking, a skill very vital for your success in college and after your graduation. The main objectives for this course is to introduce students to the tools that help them (1) synthesize knowledge of all of their experiences in the chemistry curriculum; (2) develop critical thinking to improve their creativity and problem solving skills; and (3) develop literacy in some of the major scientific and technological challenges of the 21st century.

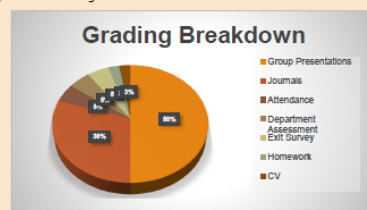
LEARNING OUTCOMES

- I** Students completing this course will demonstrate:
1. A strong background in chemical research fields.
 2. Self-directed learning skills.
 3. The ability to develop intrinsic interest in subject matter and, subsequently, motivation to learn how to think critically.
 4. Analyze problems from multi-disciplinary viewpoints, and integrate information from many different sources.
 5. Demonstrate collaborative learning practices.
 6. Construct cognitive and character skills which are important factors in creating critical thinking.

GRADING

- I** The class has total of 600 points. Grades will be assigned according to the following scale:

A	≥ 540 pts
B	≥ 480 pts
C	≥ 420 pts
D	≥ 240 pts
F	< 240 pts



CLASS ACTIVITIES

- I** **Attendance** is required for each class session. **Class participation has total of 30 points**, 2 points for active participation per week. Class participation is reflected in both group participation or/and individual participation. The instructor will inform you of the type of participation expected during the class meeting. The purpose of these discussions is to help develop meaningful interpretations of the course topics and readings. The discussions will be either facilitated by a set of study questions or individual questions prepared while reading articles and attending presentations.

Individual Journals: each class member is required to keep a journal during the term. The journal is meant to be a portfolio of ideas and should represent a continuing account of that which interests, confuses, or otherwise stimulates your critical thinking about course material.

Journal entries should address the topic of the reading material. You are encouraged to include your own experiences as practicing scientists and students of science. Each journal should:

- Indicate critical attitude toward the course material and the discussions held in class.
- Show learning as well as critical thinking about the topics covered.
- Show what you find problematic or hard to understand.
- Have questions you want to ask and answers to your questions.
- Show what points have come through as a major intellectual breakthrough either while reading or attending the class discussion.

Each journal entry is preferred not to exceed two pages. A copy of the journal entry should be turned in the week they are due using Turnitin on Canvas. Late submissions will receive a deduction penalty. The journals will be graded for breadth and depth; a rubric will be up for each journal entry. The journal entries are preferred to be typed.

There are total of nine individual journals assigned throughout the semester, each worth 20 points.

COURSE CALENDAR

This schedule is tentative and it is subject to change.

Date	Type of Activity	Assignment / Deadline
January 9 th 2019	Introduction	None
January 16 th 2019	Group Discussion/Reading Assignment	Journal / January 20 th
January 23 rd 2019	Guest Speaker	Journal / January 27 th
January 30 th 2019	Guest Speaker	Journal / February 3 rd
February 6 th 2019	Guest Speaker	Journal / February 10 th
February 13 th 2019	Group Presentation: Green Chemistry	PowerPoint Presentation / February 13 th
February 20 th 2019	Guest Speaker	Journal / February 24 th
February 27 th 2019	Guest Speaker	Journal / March 3 rd
March 6 th 2019	Group Presentation: Instrumentation	PowerPoint Presentation / March 6 th
March 13 th 2019	Guest Speaker	Journal / March 24 th
March 27 th 2019	Group Discussion/Reading Assignment	Journal / March 31 st
April 3 rd 2019	Group Discussion/Reading Assignment	Journal / April 7 th
April 10 th 2019	DUCK Exam	None
April 17 th 2019	Critical Thinking Assignment	PowerPoint Presentation / April 17 th
April 24 th 2019	ETS Proficiency Profile Test Exit Survey	None

Important notes:

- Assignments for every week will be available the week before.
- Group presentations' rubric and guidelines will be available 2 weeks before they are due.
- Journals are generally due end of the week of the activity, exceptions will apply.

Course Activities

Reading
Papers

Group
presentations

HW

CV

Group
Discussions

Visiting
lecturers

Course Assessments

personal
journals

Peer
Evaluations

Tests

Guest
Evaluations

Applying Critical Thinking

Applying Critical thinking
in CH4500 was mainly
through group
presentations about
controversial Topics

Spring 2018:

Introduction

Clear expectations of the presentations

Objective

Grading rubric

Students evaluated their peer's presentations:
Few comments:

- *Almost convinced*
- *10/10 solid arguments*
- *Great engagement*
- *Very well researched*
- *Awesome!!*

Critical Thinking Assignment (April 11 2018)

Anti-vaccination movement has increased in the United States towards the end of the 19th century. Despite scientific agreement that vaccinations are safe and healthy, many people (including some scientists) believe that vaccinations (some or all) are unnecessary. People also believe vaccinations should not be mandatory and such laws violate civil rights and some religious rights. (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1123944/>).

As a **final project** each group will present to the rest of the class (15–20 min presentation) a very compelling presentation about **either** the benefits of vaccination (you can pick any vaccination(s) you want to support) **or** the dangers of vaccinations (you can pick any example(s) you find). Both presentations should be supported by evidence (statistics, reports, YouTube videos, scientific articles, journal articles, and pseudoscience papers... anything you can logically use to defend your argument). Every presentation (10-15 slides) should use a critical thinking approach as prompted below:

- Gather, analyze and interpret relevant data presented in your resources to support your argument (vaccinations are important or not).
- Identify key problems (associated with using vaccines or not using vaccines).
- The possible alternatives.

The objective of this project is to establish a healthy discussion about a widely controversial topic as vaccination.

Grading Rubric

	Capstone	Milestone	Benchmark
Organization (specific introduction and conclusion, sequenced material within the body)	Excellent Clear and consistently observable, content is cohesive	Very good Clear and consistently observable	Is not observable in the presentation
Language	Compelling, imaginative, and memorable. Enhances the effectiveness of the presentation	Thoughtful and supports the effectiveness of the presentation	Unclear and minimally supports the effectiveness of the presentation
Supporting material (examples, explanations, statistics, analogies, illustrations, quotations)	Variety of types, make appropriate reference to information or analysis that supports the presentation	Two to three supporting material to establish the credibility of the presentation	Insufficient supporting material that minimally supports the presentation
Delivery (posture, eye contact, gesture, vocal expressiveness)	Compelling presentation and speakers appear polished and confident	Interesting presentation speakers appear confident	Detract from the understanding of the topic, speakers appear uncomfortable
Total	35	25	15

Spring 2019:

Clemson University – Department of Chemistry
CH4500 – Capstone Course – Spring 2019
Instructor: T. Houjeiry, Ph.D.

Critical Thinking Assignment (April 17, 2019)

Introduction

Prescription drug prices in the United States are exceptionally higher than the drugs in most of the countries of the world. Furthermore, the United States government does not regulate or negotiate the prescription drug prices when they come into market. However, if the United States started regulating the prices of drugs, medications would become cheaper, which means Americans have more access to drugs but would also result in a decline in research and development of new drugs, since less money will be invested in drug discovery.

Introducing the Dilemma

Here is the dilemma: *Are you with lowering the prices of drugs knowing the risk of losing more of our innovation? or are you willing to keep the drug prices high for the sake of drug discovery and innovation?*

Dr. Dominy (Guest)
evaluated the presentations

Clear expectations of the presentations

As a **final project** each group will present to the rest of the class (15–20 min presentation) a very compelling presentation about **either** the benefits of keeping the prices of the drugs high and the freedom companies have over those prices **or** benefits of lowering the prescription drug prices, and the importance of the government control over those prices.

Both presentations should be supported by evidence (statistics, reports, YouTube videos, scientific articles, journal articles, and pseudoscience papers... anything you can logically use to defend your argument).

Every presentation (10-15 slides) should use a critical thinking approach as prompted below:

- Gather, analyze and interpret relevant data presented in your resources to support your argument.
- Identify key problems (associated with either increasing or lowering the prices).
- The possible alternatives.

Objective

The objective of this project is to establish a healthy discussion about a controversial topic.

Sample of 2018 Presentations

ANTI

[HTTPS://WWW.YOUTUBE.COM/WATCH?V=U8LVMTYHNL4&FEATURE=Youtu.be](https://www.youtube.com/watch?v=U8LVMTYHNL4&FEATURE=Youtu.be)

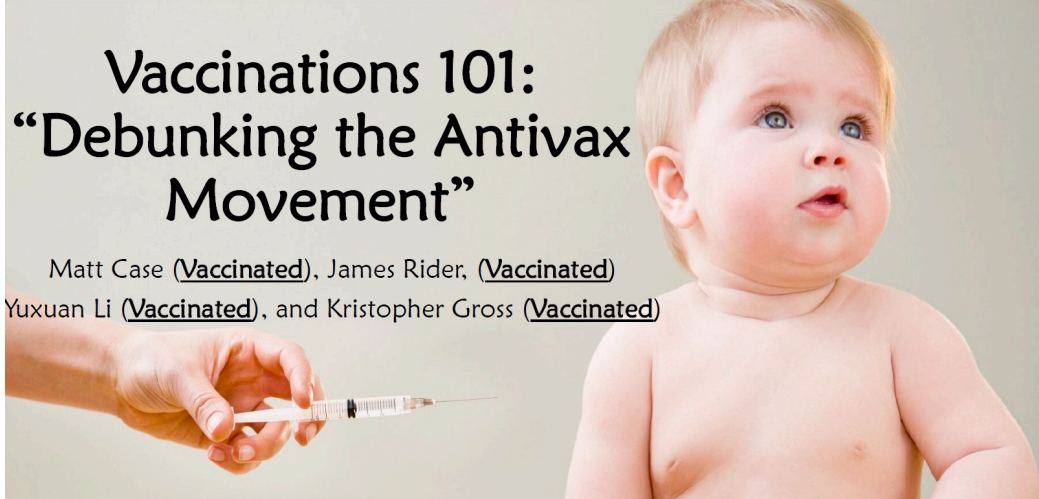


Say No to Vaccines

James Scheuer, Javier Martinez, Shelby Hill, Mia Bowman

PRO

[HTTPS://WWW.YOUTUBE.COM/WATCH?V=NNCPTXLCPRE](https://www.youtube.com/watch?v=NNCPTXLCPRE)



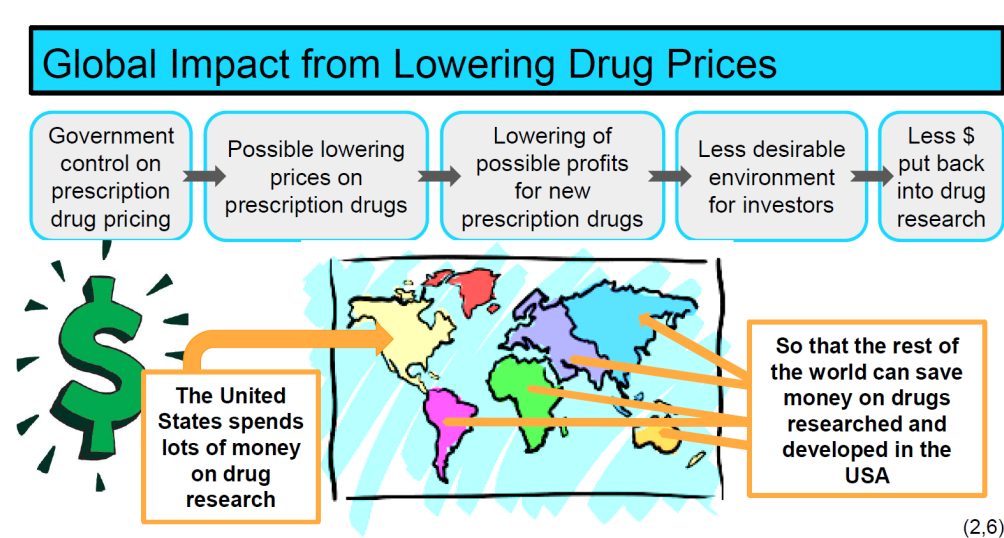
**Vaccinations 101:
“Debunking the Antivax
Movement”**

Matt Case (Vaccinated), James Rider, (Vaccinated)
Yuxuan Li (Vaccinated), and Kristopher Gross (Vaccinated)

Sample of 2019 Presentations

WITH KEEPING PRICES HIGH

WITH LOWERING PRICES



Why do companies charge so much?

“The price of medicines is not determined by their research costs. Instead, it is determined by their value in preventing and treating disease.”

-Raymond Gilmartin, former CEO of Merck

- **Make profit**

- Excuses:

- Cost of research and development
- Advertisement
- Subsidize pharmaceutical costs in other countries

THANK YOU

Suggestions?

Comments?

Questions?

Feedback?