

Course Syllabus
The Science Blender – Honors 389

GE Area(s): Natural Science (7NI); Quantitative (7QI)

Instructor: Professor Andrew Lyon

Time and Place: TuTh 1:00PM - 2:15PM; AF 205

Contact: lyon@chapman.edu

Office Hours: by appointment

Course Overview

In the *Science Blender*, teams composed of ~4-5 students from disparate majors coalesce around "grand challenge" projects, where they learn to leverage their growing individual (disciplinary) knowledge bases, skill sets, and problem-solving abilities to work towards feasible solutions to these challenges. As the teams delve deeply into their projects, identify the current knowledge gaps, and then develop strategies to address those gaps, students will become more conversant in the languages of different scientific disciplines and will develop a highly sophisticated appreciation for how team-based problem solving can have a maximal impact on a specific scientific pursuit.

3 Credits

"we're now 100% dependent on science and engineering for our future for food, medicine, clean water and air..."
- J. Craig Venter, Founder, J. Craig Venter Institute

"DARPA's model of innovation does not conform to the conventional linear model: from basic science, to applied science, to product commercialization. Rather, DARPA's projects are a powerful blending of deep, big science and an urgent driving application."
- Dr. Regina E. Dugan, former Director of the United States Defense Advanced Research Projects Agency (DARPA)

"We should take the basic needs and make sure the innovation agenda focuses on these."
- Bill Gates, Co-Founder, Microsoft

"Schools often fail to simultaneously train students how to be skeptical of claims & how to embrace the weight of evidence."
- Neil deGrasse Tyson

GE Outcomes

- Natural Science (7NI):
 - Students will learn the foundational scientific principles and reasoning needed to understand complex, interdisciplinary, and multidimensional challenges facing humankind. Students will obtain the tools necessary to

Course Syllabus
The Science Blender – Honors 389

distinguish science from non-science.

- Quantitative (7QI):
 - Students will use quantitative methods to help analyze problems in particular academic or social contexts; develop in-depth arguments supported by quantitative evidence; and communicate those arguments in both verbal form and quantitative displays (e.g., tables, graphs, mathematical equations, or other relevant format).

Student Learning Outcomes

- SLO 1: Use of the Literature
 - Students will be able to employ the scientific literature to discover and understand the knowledge gaps associated with grand challenges. Students will also research and assess the validity of any number of different sources of evidence, including the primary literature.
- SLO 2: Critical Thinking
 - Students will be able to analyze scientific results, critically evaluate those data, and draw conclusions based on their assessments.
- SLO 3: Conceptual Synthesis
 - Students will be able to combine disparate knowledge sets into a cohesive understanding of complex, multicomponent problems.
- SLO 4: Scientific Communication
 - Students will be able to communicate scientific concepts to a number of different audiences through oral, visual, and written means.

Texts

Much of the course reading will be in the form of handouts and documents posted to Blackboard. Students are expected to complete the assigned reading prior to each class meeting time.

Essential Facility

- Blackboard or whiteboard
- Projector or flat-screen TV for computer projection

Course Itinerary

Initially, the course discussion will surround introductory theories/philosophies of science, critical reasoning, and experimental design. The students will be assembled into small teams, which will be expected to act as small companies or consultancies tasked by the “client” (the instructor) to solve a selected “grand challenge”.

Teams will be expected to dissect the assigned challenge using the primary literature in order to understand the roots and complexities of the problem, the knowledge gaps that exist, and eventually be able to propose initial strategies to fill those knowledge gaps. Project progress will be evaluated via project updates, client evaluations, and responses to those evaluations.

The semester will conclude with a final project designed to present the status of each

Course Syllabus
The Science Blender – Honors 389

group's "solutions" to the challenge, along with a discussion of proposed next steps.

Methods of Evaluation**

1. (50%) Individual and Team writing assignments and oral presentations. Writing assignments are limited to one page, 1" margins, 12pt Arial, single-spaced and should be uploaded to Turnitin (via Blackboard) in MSWord format.

Key Components:

- appropriate and extensive use and referencing of primary literature
- critical analysis of sources
- evidence for marshaling a diversity of approaches to solve problems
- engaging, focused, and specific writing/storytelling to support arguments
- grammatical and editorial accuracy
- original writing (as opposed to simple distillation/regurgitation of the work of others)

2. (50%) Final Project

Key Components:

- authoritative source of knowledge regarding the challenge
- evidence of interdisciplinary and integrative thinking
- evidence of critical evaluation/thinking
- evidence of team-based problem solving
- clear vision of next steps/future approaches
- strong evidence of critical, extensive, and appropriate use of primary literature
- ability to understand how the new ideas and solutions fit within the context of the problem
- creative and innovative dissemination of their findings

**Note that students are evaluated individually for their work within the team environment.

Course Components and Detailed Itinerary

'Grand' Challenges: *See Master List on Blackboard*

Tentative Discussion Schedule:

Date	Topic	Agenda
8/30/16	What does it mean to be a scientist?	Read and Discuss: <u>Langmuir-Pathological Science</u>
9/1/16	What does it mean to be a scientist?	Read and Discuss: <u>Thinking Scientifically and Silver-Nonsense Science</u>

Course Syllabus
The Science Blender – Honors 389

9/6/16	Reading and Disseminating Science	<p>Read: <u>JPAI-False Research Findings 2005</u></p> <p>Assignment: Bring to class one scientific article published in a <u>reputable journal</u> in 2016.</p> <p>Discussion: Be prepared to summarize and discuss the article for the class.</p>
9/8/16	Mining and Identifying "Quality" Knowledge	<p>Read: <u>Academic Urban Legends and Myths</u></p> <p>Library Trip: Dr. Douglas Dechow (Room LL305)</p>
9/13/16	Conventional Wisdom	<p>Individual Writing Assignment: Research and summarize (1 page) an example of our evolving scientific knowledge. For example, how has society's scientifically-driven "conventional wisdom" on a topic evolved as new scientific knowledge has come to light?</p> <p>Discussion: Be prepared to discuss what you wrote.</p>
9/15/16	Team Work Day	<p>Teams will be assembled and assigned challenges. Brainstorming session on team grand challenges. Planning/Organization for the Individually (written)/Team (researched) Writing Assignment.</p>
9/20/16	Storytelling in Science	<p>Visitor: Professor Anna Leahy</p>
9/22/16	Breakthroughs	<p>Individual Writing Assignment: Research and summarize (1 page) a recent (within the last 12 months) example of an interdisciplinary breakthrough.</p> <p>Discussion: Be prepared to discuss what you wrote.</p>
9/27/16	Team Work Day	<p>Brainstorming session on team grand challenges. Planning/Organization for the Individually (written)/Team (researched) Writing Assignment.</p>
9/29/16	The Importance of Teams	<p>Visitor: Bill Carpou, President and CEO, OCTANe</p>

Course Syllabus
The Science Blender – Honors 389

10/4/16	Historical Challenges	<p>Individually (written)/Team (researched) Writing Assignment: Research and summarize (1 page) a historical 'grand challenge'. Describe the breakthroughs that led to its eventual solution. Each member of the team should write an independent piece based on the collective research of the team. The team must plan and strategize so that the independent works mesh together into a more authoritative and complete discussion of the topic.</p> <p>Discussion: Be prepared to discuss what you wrote.</p>
10/6/16	Knowledge Gaps	<p>Discussion: How do we define "knowledge gaps" in grand challenges?</p>
10/11/16	Team Work Day	<p>Brainstorming session on team grand challenges. Planning/Organization for first Team Writing Assignment.</p>
10/13/16	Team Work Day	<p>Plan/Work on Final Project.</p>
10/18/16	Ignorance	<p>Discussion: How do we know what we do not know?</p>
10/20/16	Knowledge Gaps	<p>Team Writing Assignment: Define and summarize (1 page) the knowledge gaps associated with your grand challenge.</p> <p>Discussion: Be prepared to discuss what you wrote.</p>
10/25/16	Current Context/Disciplinary Interfaces	<p>Discussion: How do we understand the state of the art as it relates to a problem? How does the context of a particular discipline relate to the challenge of the whole?</p>
10/27/16	Team Status Day	<p>Team Planning Session Oral Report on team status</p>
11/1/16	Current Context	<p>Team Writing Assignment: Define and summarize (1 page) the most promising approaches currently being pursued with respect to your grand challenge.</p> <p>Discussion: Be prepared to discuss what you wrote.</p>
11/3/16	Team Work Day	<p>Brainstorm/Work on Final Project. Planning/Organization for third Team Writing Assignment.</p>
11/8/16	Team Status Day	<p>Oral Report on team status and proposed Final Project framework</p>

Course Syllabus
The Science Blender – Honors 389

11/10/16	Disciplinary Interfaces	Team Writing Assignment: Define and summarize (1 page) the relevant interfaces between disciplines that exist in your challenge. Discussion: Be prepared to discuss what you wrote.
11/15/16	Team Status Day	Oral report on <i>revised</i> Final Project framework
11/17/16	Team Status Day	Oral report on <i>revised</i> Final Project framework
11/22/16	No Class	<i>Thanksgiving Break</i>
11/24/16	No Class	<i>Thanksgiving Break</i>
11/29/16	Team Work Day	Work on Final Project
12/1/16	Team Work Day	Work on Final Project
12/6/16	Team Work Day	Work on Final Project
12/8/16	Team Work Day	Work on Final Project
12/16/16	Final Projects due by midnight	

Chapman University’s Students with Disabilities Policy. In compliance with ADA guidelines, students who have any condition, either permanent or temporary, that might affect their ability to perform in this class are encouraged to contact the Office of Disability Services. If you will need to utilize your approved accommodations in this class, please follow the proper notification procedure for informing your professor(s). This notification process must occur more than a week before any accommodation can be utilized. Please contact Disability Services at (714) 516-4520 if you have questions regarding this procedure, or for information and to make an appointment to discuss and/or request potential accommodations based on documentation of your disability. Once formal approval of your need for an accommodation has been granted, you are encouraged to talk with your professor(s) about your accommodation options. The granting of any accommodation will not be retroactive and cannot jeopardize the academic standards or integrity of the course.

Equity and Diversity Statement. Chapman University is committed to ensuring equality and valuing diversity. Students and professors are reminded to show respect at all times as outlined in Chapman’s Harassment and Discrimination Policy. Any violations of this policy should be discussed with the professor, the Dean of Students and/or otherwise reported in accordance with this policy.

Chapman University Academic Integrity Policy. Chapman University is a community of scholars that emphasizes the mutual responsibility of all members to seek knowledge honestly and in good faith. Students are responsible for doing their own work, and academic dishonesty of any kind will not be tolerated anywhere in the university.

Student Support at Chapman University. Over the course of the semester, you may experience a range of challenges that interfere with your learning, such as problems with friend, family, and or significant other relationships; substance use; concerns about

Course Syllabus

The Science Blender – Honors 389

personal adequacy; feeling overwhelmed; or feeling sad or anxious without knowing why. These mental health concerns or stressful events may diminish your academic performance and/or reduce your ability to participate in daily activities. You can learn more about the resources available through Chapman University's Student Psychological Counseling Services here:

<https://www.chapman.edu/students/health-and-safety/psychological-counseling/>

Fostering a community of care that supports the success of students is essential to the values of Chapman University. Occasionally, you may come across a student whose personal behavior concerns or worries you, either for the student's well-being or yours. In these instances, you are encouraged to contact the Chapman University Student Concern Intervention Team who can respond to these concerns and offer assistance:

<https://www.chapman.edu/students/health-and-safety/student-concern/index.aspx>

While it is preferred that you include your contact information so this team can follow up with you, you can submit a report anonymously. 24-hour emergency help is also available through Public Safety at 714-997-6763.