

Supplemental Material

CBE—Life Sciences Education

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SUPPLEMENTAL MATERIALS A-C

A. Essay prompts for assignments

***COURSE A1+ and A2:**

Background: The President of the United States approved the construction of the 4th *Keystone XL Pipeline* upon taking office. Keystone XL (KXL) is the 4th phase of construction of the larger Keystone Pipeline System. KXL construction has previously been blocked due to multiple concerns, mostly environmental. Construction is now projected to start in 2020.

Your Assignment: As a lead environmental scientist working in the State of Nebraska office of the Environmental Protection Agency (EPA), you have been assigned to lead a taskforce to identify key issues that may result from the construction of KXL. You are not necessarily an energy expert, but are expected to develop an initial plan for managing and offsetting potential impacts of the pipeline. You have no control over the fact the construction is slated to begin.

How will you approach your task, and who should be involved (e.g. tools, techniques, procedures, individuals, groups)? Craft a proposal for the Nebraska state representatives in congress, informing them of your team's overall perspective and initial plan of action. **Make sure to use the RUBRIC below when writing your essay!!**

***COURSE B**

Background: The original paper that linked autism and the measles, mumps and rubella (MMR) vaccine was published 20 years ago in *The Lancet* by Wakefield *et al.* It is now known that the subjects in this study were fabricated by the authors, and *The Lancet* has since retracted this article. Despite the lack of evidence for this link between Autism and vaccines in the scientific community, the misconception is pervasive, and a decline in MMR vaccines remains a significant health concern.

Your Assignment: You are an immunologist working for the Centers for Disease Control & Prevention (CDC). You have been tasked to work to solve the problem of public misinformation and mistrust surrounding vaccines. You have been given funding for five years. How will you design a platform to inform the public that current research does not support a link between Autism and vaccines? Your mission is to construct a program for the dissemination of reliable information that the public can understand & trust. You will be pitching your program to the CDC, the World Health Organization (WHO), and a board of citizen scientists & private equity firms eager to invest in a new program. You are not an expert in education or science communication, however, you can form your team as you see appropriate in order to effectively tackle this problem. This essay will describe your proposed 5-year program.

What information will be needed to develop and disseminate the program? What team will you need to effectively carry out the plan to best educate the general public? Craft your essay as a proposal to the board described above, outlining your program and the team that will help you best accomplish this during and after the 5 years. **Make sure to use the RUBRIC below when writing your essay!!**

***COURSE C**

Background: A coastal town in Louisiana would like to clean up a contaminated waterfront area and make it a park with a large portion dedicated to community vegetable gardens. The site has a long history of contamination due to industrial run-off and to make matters worse it is now also contaminated with light, sweet crude oil from the BP oil spill. To begin the clean-up process they analyzed soil samples from various locations in the park and along the shoreline. Not only did they find that soil samples still have a great deal of the oil from the spill, but also substantial amounts of alkyl halides. Committee members who have been hired to oversee the project would like to apply “green” methods for cleaning up the site and by reducing the concentrations and/or the toxicity of chemical compounds and restoring natural conditions.

Your Assignment: The city hires you, a lead environmental scientist with a Ph.D. in Microbiology, to craft a long-term plan for cleaning up the site. Craft a plan for the city and be sure to be specific regarding the science used to address the problems. Also be sure to include how you will approach your task and who should be involved (e.g. tools, techniques, procedures, individuals, groups).

What information will be needed to develop your plan? What team will you need to effectively carry out your plan? Craft your essay as a proposal to the city, outlining your program and the team that will help you best accomplish the task. **Make sure to use the RUBRIC below when writing your essay!!**

***COURSE D**

Background: Since 2013 there has been a 67% increase in reported cases of gonorrhea and a 76% increase in reported cases of syphilis. Left unchecked, the rise of these STDs can result in a public health crisis with profound ramifications.

Your Assignment: You are part of a team tasked with fully understanding the drivers of this rise in reported STD cases, as well as determining an appropriate solution that leads toward a reduction in STD incidence. Based on all that you have come to appreciate and understand about ‘No Boundary Thinking’, craft a proposal to an audience that includes government officials and potential funders outlining how your team would approach arriving at a possible solution. Your essay need not be ‘the solution’. I am more interested how you will approach your task, and who should be involved (e.g. tools, techniques, procedures, individuals, groups).

What information will be needed to develop and disseminate information? What team will you need to effectively carry out your plan? Craft your essay as a proposal to the officials described above, outlining your program and the team that will help you best accomplish the task. **Make sure to use the RUBRIC below when writing your essay!!**

***Each prompt was followed by the directions below (+Except course A1, which was provided a previous version):**

Please follow the rubric below. Feel free to pull on all sources in developing your essay. Make sure your paper is in APA format: Times New Roman font, 1” margins, single-spaced, proper APA referencing, etc. Please limit your essay to **two pages but make sure it is at least one page long**. Include appropriate scientific writing and remember who your audience is (the USFS). Include at least two primary, peer-reviewed journal articles. Be sure to address this essay from a creative, holistic but realistic viewpoint. Pay close attention to your thesis statement, support your position, and be cognizant of paragraph transitions, grammar, and spelling.

RUBRIC

Category	Rubric Criteria	Score
OBJECTIVE	1.1 Purpose: What is the problem and task? Provide background information to introduce and frame the problem/ task.	/3
	1.2 Approach: How will you approach the problem/task? Formulate a plan that <i>clearly</i> outlines your approach (steps/procedures).	/3
	1.3 Credibility: What sources will you include? Use peer-reviewed articles and/or other supporting information that are relevant to the problem/task.	/3
	Average Objective Score	/3
DISCIPLINARY GROUNDING	2.1 Disciplines/Experts: What disciplines and/or experts will be involved? Include <i>two or more disciplines and/or experts</i> in your approach to the problem/task.	/3
	2.2 Disciplinary Reasoning: Why are you including <i>each</i> discipline and/or expert? <i>Meaningfully</i> explain the reasoning behind the use of each discipline and/or expert.	/3
	2.3 Methods & Tools: What methods will each discipline and/or expert use? Include techniques/procedures/tools from contributing disciplines and/or experts.	/3
	Average Disciplinary Grounding Score	/3
INTEGRATION	3.1 Leveraging Disciplines/Experts: How will each contributing discipline and/or expert <i>build off</i> one another to effectively address the problem/task in a way that one contributor cannot? Specifically address how each discipline’s and/or expert’s contribution (<i>knowledge/methods</i>) will be useful for the other disciplines and/or experts.	/3
	3.2 Collaboration: How will you foster successful partnerships? Include and <i>explain</i> two or more ways to build community and respect among different disciplinary team members (e.g., establishing common ground and language, overcoming different perspectives, etc.).	/3
	Average Integration Score	/3
BROADER AWARENESS	4.1 Societal Impact: How does your proposed solution impact society? Include <i>why</i> your solution is locally and more broadly relevant to society and what/who will be affected (e.g., economics, politics, social, health, etc.).	/3
	4.2 Limitations: What are the potential limitations to your plan and how will you overcome these barriers? Forecast possible limitations of your plan and provide resolutions.	/3
	Average Broader Awareness Score	/3
FORMAT	4.1 Format, Grammar, Structure: Have you followed all formatting guidelines? Does your proposal have an introduction, body, and conclusion?	/3
TOTAL SCORE		/15

B. Student Interview Questions

Introduction

To get started:

1. What is your major at **[insert institution]**?
2. How long have you been at **[insert institution]**?
3. When do you anticipate graduating?
4. Have you ever done research as an undergraduate in a research lab?
 - a. If so, what does/did that look like?
5. What attracted you to the **[insert course]** course that you took this winter term?
6. How would you describe a **discipline**?
7. How would you describe **interdisciplinary science**?

Assignment and Rubric

1. How did you decide how to **approach** your essay? (What did you do to decide what they were going to write?) → change to process
2. What was your feeling about the **overall level of difficulty or ease** of the assignment?
3. Could you rank this assignment on a scale of 1-10—1 being the easiest and 10 being the hardest?
4. Was anything **unclear** about the assignment?
5. Was it **clear** to you how to apply the rubric to the assignment?

Rubric Interpretation

6. Can you please explain how you interpreted these points under the theme *purposefulness*?
7. Can you please explain how you interpreted these points under the theme *disciplinary grounding*?

8. Can you please explain how you interpreted these points under the theme *integration*?
9. Can you please explain how you interpreted these points under the theme *critical awareness*?
10. Was the rubric useful in guiding your understanding of **expectations** for the assignment?
11. What was the most challenging part of the assignment?
12. What was the most challenging part of the rubric?

General Questions

13. Did the assignment **have any impact on your understanding** of what it means to think like a scientist?
14. Do you think interdisciplinary science is **important**?
 - If so, why?
 - If not, why not?
15. Is there anything else you would like to add?

C. Instructor Interview Questions

Introduction

1. What institution do you hold a faculty position at?
2. How many years have you been in this position?
3. Tell me a little bit about what you do in this position.
4. Is your expertise centralized around research, teaching, or both?

Interdisciplinary Science

5. What prior experience do you have working interdisciplinarily?
6. How do you define interdisciplinary science?

Rubric

7. Can you please explain how you interpreted the instructor rubric category *purposefulness* and the associated criteria?
 - a. What was clear about these criteria?
 - b. What was unclear?
8. Can you please explain how you interpreted the instructor rubric category *disciplinary grounding* and the associated criteria?
 - a. What was clear about these criteria?
 - b. What was unclear?
9. Can you please explain how you interpreted the instructor rubric category *integration* and the associated criteria?
 - a. What was clear about these criteria?
 - b. What was unclear?
10. Can you please explain how you interpreted the instructor rubric category *critical awareness* and the associated criteria?
 - a. What was clear about these criteria?
 - b. What was unclear?
11. Are there any other parts of interdisciplinary science understanding that you feel are **missing** from the rubric?
12. What **improvements** could be made to the instructor rubric to make it more user friendly?

13. Were there categories or sub-categories of the rubric that you thought were not appropriate for the level of your students? If so, do you have suggestions or recommendations?

14. What level of course do you feel this assignment might be best suited to?

15. Is there anything else you would like to share about this assignment/rubric?

D. Descriptive statistics for IDSR scores on five upper-division courses

Course (n)	Mean	SD
A1 (17)	12.2	1.85
A2 (15)	11.5	2.78
B (23)	11.9	2.66
C (34)	11.5	2.78
D (13)	10.7	3.46