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Making Meaningfulness in the Classroom: Inter-disciplinary Science in Liberal Education

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Abstract

The teaching of science has long been a cornerstone in the Liberal Education Program at our research-based undergraduate university. This paper discusses the role of science teaching in the curriculum requirements of our flagship course, Liberal Education 4000, which functions as a capstone course both for our program and the Bachelor's Degree at our University in general.

This course is a team taught course in which two professors from different fields engage students whose majors stem from every corner of the undergraduate degree. Currently myself and a colleague represent science and the humanities in this course as an interdisciplinary synthesis. We encourage the students to investigate the interconnections and present key questions focusing on the value of knowledge that functions socially beyond the disciplinary rigidity entrenched in the traditional fields of study.[1] This approach enhances conceptual rigor (thinking outside the box) that can receive short shrift in many domain specific accreditation processes. Of course, it is precisely these skills that have become very much in demand among the eventual employers of our students. The paper will discuss reasons why this course has been consistently successful both in terms of student expectations and pedagogically speaking. The paper will refer specifically to how the seminar has responded over three years to three challenging texts that treat new or controversial ideas in science.[2]he text of the abstract should be a maximum of 500 words and written in italicized text, using Arial 10-point. The paragraph should be fully justified. Leave two blank lines after the abstract, then begin the main text.

[1] Charlene M. Czerniak and Carla C. Johnson. Interdisciplinary Science Teaching. Handbook of Research in Science Education, Volume 2. Routledge. 2014. 395-412.
[2] Eugenie C. Scott. Evolution vs. Creationism: An Introduction. University of California Press. 2009.
Brian Cox and Jeff Forshaw. Why Does E=mc2?: (And Why Should We Care?). Da Capo Press. 2010.
Marcelo Gleiser. The Island of Knowledge: The Limits of Science and the Search for Meaning. Basic Books. 2014.

1. Introduction

The teaching of science has long been a cornerstone in the Liberal Education Program at our research-based undergraduate university, The University of Lethbridge, in Southern Alberta, Canada. This paper discusses the role of science teaching in the curriculum requirements of our flagship course, Liberal Education 4000, which functions as a capstone course both for our program and the Bachelor's Degree at our University in general. This paper will be anecdotal in nature and intended not so much to drill down into a cache of science teaching data as on the other hand to create bridges or conversational links between different branches of university sudy including and with a primary focus on science.

2. Methods

In the seminar itself, the basic approach that Dr. Mackay and I use can be said to be a version of the Bohmian Dialogue, a cognitive strategy for groups that theoretical physicist (and Buddhist) David Bohm articulated back in the 1990s, though neither of us are particularly religious. As Bohm says, this is a kind of group problem-solving that "is really aimed at going into the whole thought process and changing the way the thought process occurs collectively."[5] We do not assign themes or mini-master narrative structures that may contain the thinking of any one class or the seminar as a whole, but rather require the students to develop their own themes and narratives over the duration of the course. Remember, this is an exit-level capstone course, and, as such, it is meant to be a jumping off point for graduate studies and the inevitable graduate thesis.

For each seminar, the teaching team (Dr. Mackay and myself in this case) selects four current texts from four different majors or departments within the Arts and Science Faculty. We usually search for a

new book in one of the Science majors and match that with a Humanities text. Then repeat the process for a total of four new books—that are not obviously inter-connected. We choose texts that are interdisciplinary or multi-disciplinary in content, and we usually try to choose one text that treats Canadian national issues. The students are asked to write short interpretive papers on these texts each week, and produce a term paper at the end to the course which is a synthesis of their own devising.

This term paper, upon which the greater part of the final grade depends, must be a product of original critical thinking and propose a synthesis of the four works under study. It is made clear in the course outline that the students are free to adopt whatever interpretive strategy they prefer, and this choice is usually determined by the majors in which they are enrolled. Thus the Bohmian dialogue that characterizes the seminar's weekly conversations does have an ultimate goal and integrative purpose. The term paper is not a mere mushing together of ideas and data, but a critical synthesis that reflects independent integrative thought. The term papers generally present an organizing theme that the students have identified running through the semester, in readings, writings, and discussion. The course outline stipulates that the term papers may not merely reiterate the arguments from the books and those offered in class but should use these as a jumping off point for original and worthwhile thought. Thus, by the end of the semester, the disparate silos of knowledge represented by the two professors and the seminar students (whose majors are various) are fitted out with interpretive bridges spanning differences of outlook and philosophy.

3. Results

I want to turn now to some of the outcomes that we as interdisciplinary teachers have appreciated in three semesters of Liberal Education 4000. My focus in these remarks is on how the students' learning was affected by three challenging texts that contain new or controversial ideas in science. While it is often true that we do learn a great deal from our students, here one wants to ask the question, What have the students learned from the group's contributions, conversations, dialogue and independent study?

In 2012, we chose Eugenie C. Scott's *Evolution vs. Creationism: An Introduction* partly for its workmanlike prose but mainly for the book's presentation of mixed issues relating to Education, Biology, Religion, and the Law—which is to say the legal ramifications of Creationism vs. the educational system in the southern United States.[6] This text was placed against a work of history that we believed would generate fruitful discussions on the subjects of historical meaning, international politics, and cultural difference: Michael Reynolds' *Shattering Empires: The Clash and Collapse of the Ottoman and Russian Empires*.[7] Then we matched Canadian journalist Adam Gopnik's *Winter: Five Windows on the Season*[8] with Muriel Dimen's *With Culture in Mind: Psychoanalytic Stories*.[9] The journalistic text was a meditation on the theme of winter as expressed historically in literature, the Fine Arts, and popular culture. The psychoanalytic text was a collection of case studies by young, practicing psychoanalysts who were moreover self-consciously postmodern in their outlook. In this last text, there was an interesting tension between academic or theoretical debates and the challenges that professional people face when they leave school to encounter the real world.

In 2014, Brian Cox and Jeff Forshaw. *Why Does E=mc2? (And Why Should We Care?)*[10] was matched against a science fiction novel, *Lexicon*, by Max Barry.[12] And Napoleon Chagnon's *Noble Savages: My Life Among Two Dangerous Tribes -- the Yanomamo and the Anthropologists*[12] was paired with Canadian historian Modris Eksteins's *Solar Dance: Van Gogh, Forgery, and the Eclipse of Certainty*.[13] In this seminar, we discussed Einstein's relativity and quantum physics alongside the idea of bare words in Chomskian linguistics as presented as the premise of a sci-fi story. We also discussed the anthropological text in terms of the limits of the anthropological researcher and cultural difference. To this we added conversations about the cultural vortext of 1920s Berlin and the crisis in authority in the art world surrounding van Gogh's celebrity and art. Here, a famous case of van Gogh forgery set up nicely against the role of Heisenbergian uncertainty vis a vis the particle physics text.

In this seminar, students were struck by the behind-the-scenes stories in the Cox and Chagnon texts. We found that *Why does E=mc2* was a narativized version of a graduate course in particle physics that Jeff Forshaw actually teaches, and we noted that Brian Cox's name seemed to be on the book's cover primarily in order to bolster saleability due Cox's celebrity status as a one-time rockstar turned theoretical physicist. The Chagnon text was as much about the in-fighting among anthropologists on the issues of whether or not cultural differences in human societies may originate in human biology (Chagnon's view) or in culture (the view of his adversaries in the academy).

This year, 2015, the seminar is still under way of course. So far, we have discussed *The Island of Knowledge* by Marcelo Gleiser[14] and *Hatred of Democracy* by Jacques Ranciere.[15] Just now we

are in the midst of *Enforcing Order: An Ethnography of Urban Policing* by Didier Fassin.[16] We will turn to Canadian novelist Wayne Grady's *Emancipation Day* when I get back to frozen Alberta.[17]

We found that Marcelo Gleiser's book on quantum mechanics and particle physics worked quite well as a vehicle for finding interdisciplinary common ground in such areas the role of mathematics in science, the history of science from the ancient Greeks to string-theory, the Higgs boson, and beyond, the touchy subject of the possible relationships between science and religion, and the traditional mind/brain debate. Gleiser, who has won awards for science writing, also writes in an impressively emotive or poetic manner in this book. This style worked well to foster debates in the seminar between the Humanities and Science students, and these debates did manage to bridge some of the gaps in knowledge and understanding between these two constituencies on the difficult ideas in physics that the author attempts to explain. The students (all of whom are majoring in different areas) reacted quite negatively to the philosopher Ranciere's arguments regarding what he calls "Hatred of Democracy"—the idea that our current understanding of the concept behind democracy contains elements that are locked in a love-hate relationship. Canada is a very young democracy and one might say that our political theatre is even a tad tepid in comparison to some European counties. But Ranciere's deployment of Jean-Claude Milner's 2003 argument in *Les Penchants criminels de lEurope democratique*—that today's democracy ought to lead logically to the extermination of the Jews particularly rankled. Nonetheless, this small book afforded some very spirited conversations bridging the domains of philosophy, political science, the influence of Platonism in modern thought, and Parisian cultural theory.

Thus the seminar has been successful in integrating seemingly disparate bits of knowledge in a manner that resists the current trend toward academic fragmentation on university campuses. The last two texts that the seminar will be addressing, Fassin's masterful *Enforcing Order*—on the policing of opportunity-challenged *banlieues* in Paris—and the Canadian novel about a 'white man' who accidentally discovers that his grandparents were black but passed for white during the Jazz age—will undoubtedly foster rousing discussions surrounding issues in the areas of social science, ethnography, activism, the role of the public intellectual in modern life, as well as ethnicity and cultural appropriation, music, Jazz, and novel-writing. My colleague and I expect that the final essays that our students submit in April will yet again highlight the sort of bridges between silos of concentrated subject matter and data that this multidisciplinary course has been designed to facilitate.

4. Discussion

In this way, Liberal Education 4000 at The University of Lethbridge has responded over the past few years to several highly challenging texts that treat new or controversial ideas in science. We believe that the approach described here succeeds in enhancing a form of conceptual rigor (thinking outside the box) that can receive short shrift in many domain specific accreditation processes. As such, we find that this approach is a viable one compared to other worthwhile methods of teaching science in today's universities. Finally, it goes without saying that it is precisely the synthesing and creative skills outlined herein that have become in recent years very much in demand among the eventual employers of our students.

At The University of Lethbridge, we tend to speak of the Liberal Education Program as a closed system with many moving parts, which is to say a dynamic system with many probes and linkages to the universality of knowledge. In this we do not merely include science, but deploy science as a tool for deepening and validating our students' understanding of how other disciplines interact with their own. To us, science in tandem with humanities subjects is essential in our attempt to foster connection with the real world and responsibility toward the community.

References

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