



## Using Science and Creativity in Interdisciplinary Liberal Education

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### Abstract

*The Liberal Education Program at the University of Lethbridge, Alberta, Canada, has a long history of interdisciplinary science teaching. Recently, however, our Program has expanded into a School of Liberal Education serving all students regardless of major. The School is now under the Vice-President's Office whereas previously it was a program in Arts and Science. This paper discusses the role of science teaching in our Creativity and Innovation Across Disciplines course, Liberal Education 3300. In this third-year course, the instructor engages 60 students per semester in an interdisciplinary exploration of thinking outside of the box. The students represent all majors and minors of study. The course is grounded in the Humanities and has a humanitarian base. But all of the main tools that the students use to think creatively are based in the logical and empirical foundations of the scientific method. This course in creativity and innovation represents a teleological synthesis of the Humanities' and Scientific orientations.[1]*

*Our School of Liberal Education believes in creating innovative learning environments within which all students can inquire into both new and settled interconnections between various silos of knowledge. In this course, students train in logical, step-by-step critical thinking and then present solutions to real world problems. This methodology combines conceptual rigor with genuine innovation. This is attested by the years of accumulated final projects of very high quality as well as the overall popularity of the course. Moreover, it is precisely these skills that employers of our graduates are primarily looking for in today's market. The paper will discuss methods and findings related to interdisciplinary teaching and learning, creativity and innovation, and the grounding benefit of the scientific method in such pedagogy. Though this paper is primarily experienced based, relevant research on science teaching and creativity is addressed.[2]*

Keywords: *Science teaching, creativity, innovation, pedagogy, social benefit.*

### 1. Introduction

I joined the Liberal Education Program at the University of Lethbridge some years ago because the domain specific area of my research and teaching (English, Canadian Literature) had become ingrown and out-of-touch with what I felt my students learning needs actually were. As a graduate student back in the 1990s, I had attended seminars in Semiotics at the International Summer Institute of Semiotics Studies in Toronto. There I developed an interest in interdisciplinary studies while learning from scholars like Michel Foucault, Karl Pribram, Jacques Derrida and others. These studies proved invaluable when I came to develop Liberal Education courses whose content includes texts of a multi-disciplinary and cross-disciplinary nature. My Literature survey courses used to begin with *The Odyssey* and end with *The Waste Land*. Now the same surveys begin with discussions of Newton's *Principia*, Hobbes' *Leviathan*, Descartes' *Discourse on Method*, ending with Einstein, Heisenberg, and Schrodinger's cat. Or, if I had been pulled over for speeding at the beginning of my career, and the police officer said 'Do you realize that you were going 130 kilometers per hour,' I might have argued that as a professor of literature, a privileged doyen of high culture, I should expect a certain degree of leniency and be let off with a warning. Now, if I am pulled over and the officer tells me I was speeding at 130 kilometers per hour, I might say, 'Great. Now I'm lost.'

Generally, we see Liberal Education as both an alternative to and a value added to domain-specific programs that students (and parents) regard as being aimed primarily at eventual gainful employment. Our philosophy has been discussed recently in *Liberal Education and the Idea of the University: Arguments and Reflections*.<sup>[1]</sup> Here Kareem and Magid Youssef argue that the traditional dichotomy between creativity and science needs to be unpinned from the concept of utility. Without creativity, science would be "denuded of imagination and creativity of expression." Rather the goal should be to teach Liberal Education as "both as an art and a science... equivalent and complimentary forms of production of knowledge" (247-8).



## 2. Methods

The course-outcomes of each Liberal Education course and the Program in general have an immediate, an accreditation, and a life-long learning description: (a) learning-continuity across the various undergraduate and graduate degrees enhanced by cohort ambience among the students, (b) the proper asset of our degrees as avenues to meaningful employment and engaged living, and (c) the sort of long term feedback that psychologist and libertarian educational reformer Roger Schank has been writing about for decades, most recently in *Teaching Minds*.<sup>[2]</sup> In Schank's long experience as a science educator, it is the cognitive strategies that he modelled and facilitated in his teaching that students most productively responded to months and even many years later. It was not the content-based instruction that inspired them and gave them tools with which to succeed, but what Schank calls cognitive-based learning. Schank is an iconoclast, but he does have a point. The teaching of science in 21st Century schools must respond to student dissatisfaction with the quality and direction of their tertiary educational experiences. This is where creativity comes in. This is where a creative framework (cognitive-based learning) in science courses comes in.

At the University of Lethbridge, we decided not to attempt to replace status quo silos of knowledge, which is not a realistic goal due to the high cost of retooling the professoriate, but to use the structural materials of Liberal Education that already existed in our institutional history to create bridges between the silos. We hope to foster a more coherent degree-long learning experience and ultimately prepare graduates for the rapidly changing world that they will encounter after their studies. In this commitment, we hope to cultivate interaction, cohort ambience and subject-world continuity for students. In this we try to promote what is called a "Bohman dialog" between instructors and students and between students themselves.<sup>[3]</sup>

I turn now to Liberal Education 3300, Creativity Across Disciplines, in which the values and method of science are taught in a creative framework. This course is offered every year in the Fall and is extremely popular among students from all majors across campus. Science students especially seem to appreciate learning how to think creatively in the logical, step-by-step terms that they know from their other courses. I brought a set of pedagogies for Creative Writing courses with me when I came into The School of Liberal Education at The University of Lethbridge. In order to create a multi-disciplinary course in creative thinking per se, I availed myself of methods used in Innovation-themed courses often offered in the field of Business and Management. The course *Harnessing Creativity for Organizational Growth* at the UBC Sauder School of Business, is just one example. I turned then to the literature on creativity in the fields of education and psychology. From these studies, my main take away was an appreciation that there exists a plethora of tools available to the instructor of creativity and innovation.<sup>[4]</sup> Enumerating these tools is beyond the scope of this paper. In psychology, I found particularly useful the cognitive anatomy of creative cognition that the influential positive psychologist Mihaly Csikszentmihalyi has famously dubbed *flow*.<sup>[5]</sup> The course assembled from these studies is divided into two parts. The first consists of training in a schema of creative problem-solving. The main textbook for the course is Roberta Ness's *Innovation Generation: How to Produce Creative and Useful Scientific Ideas*.<sup>[6]</sup> Ness is a practicing researcher in women's health and the Dean of The University of Texas School of Public Health, I adapted her practical tools for teaching science creatively into a course that teaches science-based creative schema to students from all majors, thereby forming a merger between the humanitarian and the empirical. The first part of the course consists of training in the use of these tools.<sup>[7]</sup> There is also an accompanying exercise workbook.<sup>[8]</sup> The second part consists of usually 7-8 groups of students who have self-selected to use the skills learned through practice to mount a final presentation of an innovative idea that has a humanitarian component.<sup>[9]</sup> Group-work is a prominent teaching and learning strategy in almost every creatively-motivated course aimed at helping "a zone of proximal development" among instructors and students of all majors.<sup>[9]</sup> This presentation is weighted at the lion's share of the final grade and is the final measure of how well the students have internalized the skills and tools practiced and tested.

## 3. Results

Our School of Liberal Education is still a young entity and we have much to learn. The course I describe herein has been, due to its continuing popularity, a positive element in the School's institutional recognition. Students from all majors continue to be enthusiastic about the final presentations, and the quality of the work the student do is outstanding. This course adapts creativity training to the scientific method. Conversely, it adapts scientific methodology to creative pursuits. Following on Csikszentmihalyi's



*flow* experience, teachers and students develop “an enthusiasm for and sense of empowerment around novel ideation”.[10] The final group presentation grounds the student in the sense of a problem-solving task well done and prepares them to be creative employees and entrepreneurs in the future.

#### 4. Discussion

Ness emphasizes the urgency of using creativity in health science teaching, “Whether innovation training occurs in premedical curricula, medical/health sciences schools, or postdoctoral training programs, I believe it is worth implementing.”[11] I agree with Ness that creativity instruction is already a valuable means of “enhancing scientific innovation.” As teachers, we all have courses that go swimmingly and others that sink to the bottom. I was lucky this time. More work needs to be done in evaluating, testing, and disseminating the results of teaching science creatively. In our small, fledgling School of Liberal Education we already need more sections with new and different instructors, not only to meet the demand, but to help us all move toward a more diverse and interactive future.

#### 5. References

- [1] Dharamsi, K., and Zimmer, J. W. *Liberal Education and the Idea of the University: Arguments and Reflections*, Delaware, Vernon Press, 2019, 247-8.
- [2] Schank, R. *Teaching Minds: How Cognitive Science Can Save Our Schools*, New York, Teachers College Press, 2011.
- [3] 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.” Bohm, D. *On Dialogue*, Road Hove UK, Psychology Press, 2004, 10.
- [4] For example, books of tools for teaching creatively such as any of the works of Edward de Bono, the grandfather of creative thinking techniques, or newer works like Michael M. *Thinkertoys: A Handbook of Creative-Thinking Techniques*, New York, Ten Speed Press, 2006. See also the popular online course by Puccio, G. “The Creative Thinker’s Toolkit,” The Great Courses, Chantilly, Virginia, 2014.
- [5] Csikszentmihalyi, M. *Flow: The Psychology of Optimal Experience*, New York, Harper, 2008.
- [6] Ness, R. B. *Innovation Generation: How to Produce Creative and Useful Scientific Ideas*, Oxford, OUP, 2012.
- [7] Goodman, M. L. and Dickerson. A. *Creativity in The Sciences: A Workbook Companion to Innovation Generation*, Oxford, OUP, 2012.
- [8] See note 4.
- [9] Liversidge, T. “Creativity and Innovation in Science Teaching and Learning,” in Liversidge, T. et al. *Teaching Science*, London, Sage, 2009, 160-85, 170.
- [10] Ness, R. B. “Teaching Creativity and Innovative Thinking in Medicine and the Health Sciences.” *Academic Medicine*, Vol. 86, No. 10 / October 2011, 1201-03. 1003.
- [11] Ibid.