

## ARTICLE

# Building Neural Networks Within the Academy: Connecting Neuroscience to Other Disciplines

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Never before in human history has there been a more exciting time to be studying neuroscience. By extension, the opportunities have never been greater to examine how contemporary findings in neuroscience might relate to other areas of human inquiry. Over the last two decades I have participated in a number of formal and informal

attempts to connect neuroscience and psychology to other academic disciplines in the context of interdisciplinary courses. Herein lies a brief overview of my experiences with these undertakings.

*Key words: neuroscience; interdisciplinary courses; undergraduate education*

A little over a decade ago several of us faculty at Carleton embarked on an unusual interdisciplinary teaching experiment, one that none of us had undertaken before, at least not in the form we eventually adopted. Four of us co-taught a thematic course entitled *Emotion and Intellect*, which had four separate sections of first-year undergraduate students, each one led by a different faculty member. The four faculty were Dean Liz Ciner (Associate Dean of Carleton and Professor of English), Professor Pamela Feldman-Savelsberg (Anthropology), Professor Rick Salafia (Studio Art), and the author (Psychology-Neuroscience). The course sections shared a common curriculum. Sometimes we met as individual sections (15 students per section), but much of the time we met as one large group (60 total).

The overarching goal of the course was to examine how emotion and intellect were related to each other from several different perspectives. Some sub-goals included: (1) to better appreciate the values and limitations of rationality; (2) to better appreciate the values and limitations of emotion; (3) to understand how reason and emotion are related at the neural and psychological levels; and (4) to gain experience writing and analyzing along an emotion-intellect continuum. Toward this end, we read works of literature that explored this tension, we examined the topic cross-culturally, we studied it from the perspectives of psychology and neuroscience, and we both studied and *did* emotion and intellect using the vehicle of studio art.

Each participating faculty member received a modest stipend for course development. We met several times during the summer prior to prepare our syllabus.

## ULTERIOR MOTIVES

My own subversive motive for teaching this course was in part to confront the failure of many of my colleagues within the academy and the scientific community at large to recognize the role that emotion plays in their own intellectual work. The history of human thought is permeated with examples of thinkers resisting new ideas for emotional reasons while convincing themselves that their objections were purely rational; or alternatively,

people adopting new ideas for largely emotional reasons, while persuading themselves that their positions were primarily if not solely based on intellectual grounds. As Antonio Damasio and others have shown, cognitive processes underlying intellectual thought constantly interact with emotion (Damasio, 1994). In short, thinking requires emotion. An even broader perspective emphasizes the role that non-symbolic mental tools play across a disparate range of fields (Root-Bernstein & Root-Bernstein, 2000). As intellectuals, I believe it's essential that we become aware of both the positive and negative roles that emotion plays in intellectual pursuits. Moreover, I think it's vital that we be able to understand the distinction between the *feeling* of knowing something versus actually knowing something (Burton 2008).

## SOME FLAVORS OF THE COURSE

For the literature component of the course we read Richard Wright's *Black Boy*, Charlotte Perkins Gilman's *The Yellow Wallpaper and Other Writings*, and excerpts from Tim O'Brien's *The Things They Carried*.

For the anthropology component of the course, we read excerpts from Unni Wikan's *Managing Turbulent Hearts: A Balinese Formula for Living*, Renato Rosaldo's *Knowledge and Passion* and Steven Jay Gould's *Measuring Heads*.

For the studio art section of the course, students drew a self-portrait and undertook exercises from *Drawing on the Right Side of the Brain*. They also read Jane Kramer's *Whose Art is It?* and John Berger's *Ways of Seeing*.

As a class activity we also attended a performance entitled "Eracism" by William Pope L, after which we had an opportunity for Q and A with the artist himself.

Besides *Descartes' Error*, for the neuroscience and psychology components of the course we read Oliver Sacks ("*Prodigies*"), Sigmund Freud (*The Five Lectures on Psychoanalysis*) and excerpts from William Styron's memoir on depression, *Darkness Visible*.

Students wrote a number of papers for the class, many of which required that they explicitly address tensions between reason and emotion in their own work and in the work of others; for the most part each faculty member

graded the papers written by students in his or her own section.

## LOGISTICS

The course required that we (1) all teach at the same time, (2) find five rooms on campus available during that time, including one room large enough to hold 60 students and four faculty, and (3) have space in our teaching schedule to permit us this opportunity. For most faculty (3) turns out to be the most daunting challenge.

Also, it's crucial to point out that this course was a Pass/Fail seminar, permitting a level of risk-taking---for both faculty and students---that might not otherwise happen. I hasten to add that its Pass/Fail status did not appear to diminish the seriousness with which students approached this course.

The course was listed as an interdisciplinary course, IDSC 100 in the Carleton catalog.

## THE ROLE OF NEUROSCIENCE WITHIN THE COURSE

For this class all of us read significant portions of Antonio Damasio's book *Descartes' Error*. In the context of large group meetings I gave overviews of brain anatomy and spent considerable time reviewing the primary and secondary emotion systems identified by Damasio in his book. We spent a fair amount of time discussing disorders of emotion as well.

## THE STUDENTS RISE TO THE OCCASION

One writing assignment stands out in my memory to this day. Students were required to write an analytical composition concerning a piece of art they had examined (Magritte's "Ceci n'est pas une pipe."). The students explored what the artist was trying to achieve, and how emotion and intellect suffused his work. The papers that this assignment generated were among the best pieces of thought and exposition I've ever encountered as a professor. The writing was consistently and uniformly both intellectually and emotionally powerful. The assignment culminated in a lecture given by Professor Salafia in which he excerpted portions of student papers to highlight points he was trying to make. This public recognition of student writing was among the most satisfying classroom moments I've ever experienced. One of the reasons this method worked so well, I think, is because Professor Salafia was citing the work of all students in the course, not just those in his individual section. It gave an aura of validation that would not otherwise have occurred.

## UNEXPECTED BENEFITS

Perhaps the most satisfying aspect of teaching this course was the joy of collaborating with several other faculty, reading the same books, discussing the same issues before, during, and after the course. Although our students were (and are) collaborators, few academic undertakings can match the exhilaration of a concentrated block of time working with faculty peers on a topic of

common interest.

## EMOTION AND INTELLECT—TAKE 2

Dean Ciner and I co-taught another edition of the course four years later, this time just the two of us. Although we both felt that the course was highly successful, it lacked some of the wow factor that we experienced when four of us co-taught the course. Having four faculty participate in co-teaching lends a course like this an "event status" not found in the more typical dual co-teaching arrangement. Also, the inclusion of an experiential component---one that pushes the boundaries of students' comfort zones---struck Dean Ciner and me as a critical piece.

## THE PREQUEL AND THE SEQUEL

I have been involved in two other interdisciplinary courses as a faculty member. Several years before the *Emotion and Intellect* course, I co-taught a course called *Eye, Brain, and Mind* with Professor Steve Durbin, from Carleton's Physics and Astronomy Department. This course, also a Pass/Fail seminar with only first year students, covered the physics of light and color, brain and nervous system basics, and some elementary philosophy concerning the relationship between mind and brain. One element of the course that stands out in my mind is a particularly energetic discussion we had one day on the relationship between brain and mind. The students were highly engaged, vocal, and opinionated. Their remarks were substantive and thoughtful. It was one of the best class discussions I've ever witnessed. In part, I think it succeeded because the topic was not so close and personal that students feared they would say something that was possibly offensive or inappropriate---a chronic problem, it seems, in the modern classroom, especially at liberal arts institutions.

Four years ago I co-taught a course with Professor Trish Ferrett of Chemistry, entitled *Paradigm Shifts*. This course was structured a bit differently. Trish's class examined the topic of abrupt climate change, while my section explored some contemporary views on the mind-brain relationship. The Carleton term for this kind of teaching arrangement is "linked courses." Each section had its own reading list, but we also had several works in common, including Thomas Kuhn's *The Structures of Scientific Revolutions* and excerpts from Jared Diamond's book *Collapse*. We also examined the concept of quantum entanglement as a case study of experimental work that challenges an existing paradigm. We explored resistance and openness to new ideas. We examined the role that human emotion plays in both promoting and preventing paradigm shifts. Logistically, our classes met at the same time and occupied two fairly large adjacent classrooms, which permitted us to share space on those common days. Again, this collaborative experience proved to be richly gratifying.

## ASSESSMENT

Unfortunately, we performed no quantitative pre-post evaluations of any of the courses mentioned above. However, some of the students who participated in the

*Paradigm Shifts* courses are enrolled in a longitudinal study for which data have been, and continue to be collected. My hope is to one day report on those findings.

### ADMINISTRATIVE SUPPORT IS KEY

One critical piece for interdisciplinary success is administrative support. It's extremely helpful to have a Dean who favors these kinds of collaborative experiments. *Emotion and Intellect* would not have been possible without the interest and investment of Dean Ciner on our own campus. Additionally, one cannot undertake such teaching experiments without the support of one's own department. I have been fortunate to be in a department that readily accommodates such educational forays as these. Even though Carleton College requires that each department offer a seminar designed for first-year students, some make it a priority whereas others do not. However, even in cases where administrative and faculty support are weak, one can undertake more streamlined versions of interdisciplinary teaching along the lines I've mentioned above.

### PRACTICAL COMPROMISES

In practice, it turns out to be almost impossible to find four interested faculty who have concurrent openings in their teaching schedules--unless they teach an overload. Even if one can identify willing participants, one may well encounter obstacles outside or within one's own department. A practical compromise is to take the courses you're already teaching, find out who on campus is teaching at the same time, and try to build a thematic course-within-a-course that can incorporate the expertise of interested faculty members. It might mean meeting as one large group on just one or two days to explore a topic of common interest. As an example, one might examine recent findings in the neuroscience of the frontal lobe to evaluate current legal views of insanity and diminished responsibility. Another exciting development resides within new fMRI technology that attempts to discern when a subject is lying. One could collaborate with faculty in philosophy, law, criminology, political science, etc. to explore the implications of these new technologies. Alternatively, one could examine the effects of intellectual and social deprivation on brain development, combining neuroscience with fields such as sociology, education, economics, and ethics. Even if it's not practical to combine classes, one can always invite faculty members to one's class on a given day to be discussants and to provide their own expertise on a topic of common interest. As an example, I taught an introductory course this past academic year entitled *Brain, Mind, and Behavior*. One section of the course dealt with politics and the brain. Toward this end we read a chapter from Drew Westen's book *The Political Brain*. I invited a colleague from political science, Professor Rich Keiser, to provide his perspective in the context of our class discussion, especially as it pertained to the 2008 presidential election. We had a vigorous and stimulating discussion that would not have been possible had I led it by myself. That class turned out to be, in my opinion, one of the most successful

of the year.

### FINAL THOUGHTS

For those intrigued by the idea of teaching neuroscience in combination with other academic disciplines, the potential rewards—I am delighted to report—are immense.

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Received April 02, 2009; revised June 08, 2009; accepted June 09, 2009.

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