

Reconstructing the Paradigm: Teaching Across the Disciplines

Caroline Brown¹ & Alexia Pollack²

¹English Department & ²Biology Department, University of Massachusetts-Boston, Boston, MA 02125

In this article, Caroline Brown, a literature professor who focuses on American and African Diasporic writing, and Alexia Pollack, a biology professor with expertise in neuropharmacology, recount their experiences teaching across the disciplines in one another's respective classrooms, finding points of intersection and divergence, and creating classroom dialogues from the resultant encounters. Central to this process is permitting students to enter discipline-specific discourses from other disciplinary perspectives. In Caroline Brown's first year general education seminar, Examining Consciousness, a course constructed around the study of the representation of the brain through the reading of scientific writings, popular essays, personal narratives, fiction, and poetry, Alexia Pollack presented scientific lectures on neurotransmission, brain organization and structure, with an emphasis on how the brain is affected by drug addiction and organic disease. In Alexia Pollack's undergraduate and graduate courses, Neurobiology and Biology of

Learning and Memory, Caroline Brown lectured on the intersection of artistry and science in American literature, tracing the depiction of learning and memory in Realistic, Modern, and Post-Modern novels, and how scientific developments influenced their representation. During these encounters the students were introduced to discipline-specific approaches, which were distinct from the perspectives of their respective classrooms. As a result, larger classroom discussions were created, allowing students to perceive intersecting dimensions of very different disciplines. This conceptual flexibility permitted students to "think outside the box" in order to develop a more complete appreciation of their particular discipline and to recognize its place in the world at large.

Key words: cross disciplinary learning; interdisciplinary classrooms; teaching strategies; non-hierarchical pedagogy; neuroscience classroom; diversity in education; intersection in science and humanities

Interdisciplinary teaching can provide a powerful model of academic engagement for both instructors and students. It allows the exchange of new information, a shift in intellectual paradigms formerly based on ownership of knowledge, and the pleasure of a collaborative effort. Or as stated by Fabillar and Jones (2002), "It moves teachers away from working in isolation into a valuable relationship where they learn from each other and advance their own understandings." Yet, interdisciplinary teaching is not a panacea to the challenges of designing a course, of working in the classroom, of interacting with one's own students, and of addressing the often very specific needs of one's department. Collaborative efforts can, in fact, make the larger process of teaching more complex, requiring greater organization, patience, and flexibility.

Despite the challenges, cross-curricular instruction, especially between the sciences and the humanities, is of special import, particularly at this juncture in time. Advances in the sciences are moving us into a brave new world where our society must learn to struggle with the ethical questions it raises. Yet, a significant gap exists between current scientific and technological developments and our ability to respond to them as a society. Taught within strictly disciplinary-specific frames of reference, students are too often educated so that they are not able to transcend the gap between different disciplines. When applied to scientific forms of discourse, particularly at the primary and secondary levels, this can translate to the passive retention of information as opposed to engaging that information as actively created knowledge. In the classroom scientific knowledge is often presented as

objective, hermetic, and outside of either debate or social influence. Moreover, that which is learned in the humanities, particularly the literature classroom, is frequently perceived as lacking relevance. In this essay, we will examine how an interdisciplinary approach to learning that is simultaneous with traditional forms of discipline-specific inquiry allows fuller student participation in bridging the gap between specific disciplines. This, in turn, encourages not only the development of greater conceptual flexibility but also has the potential to nurture more active and fully engaged learners in our rapidly changing world.

The Origin of Our Interdisciplinary Approach

We teach at the University of Massachusetts-Boston (UMass-Boston), a large, commuter school that is the only public university in the Boston metropolitan area. UMass-Boston is a vibrant and exciting place to work that has its origin in a commitment to the surrounding urban community. It possesses a diverse student body that reflects the shifting demographics of the city and the nation, whether in relation to race, ethnicity, country of origin, religion, language use, or educational background. UMass-Boston has a dedicated faculty and innovative programs and institutes, including the Center for the Improvement of Teaching (CIT), a faculty developed and led initiative that provides opportunities for full- and part-time faculty to meet, discuss, and work through teaching issues across departments, disciplines, and colleges. It was as participants in a CIT seminar for non-tenured faculty in the spring semester of 2001 that the two of us

met. Coming from radically different disciplinary perspectives, a neurobiologist and an English professor, we were two of eight junior faculty members, evenly divided between Math and Science and the Humanities, who took part. Yet we realized that despite our very real differences, we shared a passion for teaching and a commitment to examining our disciplines from altered perspectives, if only to enable students to rethink the meaning of the discipline itself and its relationship to social transformation. We developed a working friendship, nurtured in part by our participation at the CIT conference in January 2002, where we were joint panelists with two other colleagues, including our CIT seminar leader, Esther Kingston-Mann, a tenured professor who was also the Director of CIT. As a result of our participation in CIT we had each other as references even when our departments, formerly joined under the College of Arts and Sciences, separated into two distinct colleges in 2003. Although the creation of the College of Sciences and Mathematics and the College of Liberal Arts came about mainly due to administrative and fiscal considerations, it did reflect what we perceived as the widening gap between the humanities and the sciences. Therefore, even as the need for interdisciplinary teaching and dialogue increased, the intersections that would normally allow for them to occur at our university were being eroded. However, this official division of the two colleges has forced the creation of more inventive interactions across disciplines. It became a rich opportunity for each of us to invite the other to her classroom. We thus offered a series of limited, self-contained lectures aimed at redefining our disciplines in the classroom setting.

The Reconceptualized Literature Classroom: Caroline Brown

My collaboration with Alexia Pollack in interdisciplinary teaching began as a fluke. I was preparing my course, *Examining Consciousness: Scientific Study, Personal Reflection, and Artistic Representation*, for our university's General Education Program. I am an English professor who teaches comparative literature, particularly of 20th century American literature and the literature of the African Diaspora. What I envisioned was an English literature course that would interrogate the construction of the mind as an ongoing narrative. *Examining Consciousness* would rely on a range of interdisciplinary readings, including scientific articles, popular science essays, personal narratives, fiction, and poetry. Fundamental to this, as a first year seminar, it would permit entering undergraduates to be introduced to the university, an often overwhelmingly impersonal space.

In the first portion of the course, we discussed the evolution of the study of the brain/mind, particularly the shift in methods of observation from scrutinizing behavior and making empirical assumptions to surgical/microscopic procedures to non-invasive technologies that allow brain scanning, particularly on live subjects. In this manner, we were able to perceive how much was actually known about the brain itself, and how much was a narrative that arose

from specific historical and cultural contexts. In the second portion of the course, we discussed human personality and life functions, including sleep and the five senses. The bulk of the course was dedicated to what would be labeled psychopathological states, including addiction, mood disorders, schizophrenia, brain damage, Tourette's syndrome, autism, learning disorders, and Alzheimer's Disease.

I wanted *Examining Consciousness* to provide a way for students to participate actively in emerging ethical discussions, including around what makes us human and the technological developments influencing its redefinition. At the same time, I wanted to acknowledge the necessity of scrutinizing the meaning of diversity in a heterogeneous society where race too often becomes a lazy label for difference, and is thus either not unpacked in its astonishing multiplicity or obscures other social divisions and tensions that remain unrecognized. Within this framework, students could begin meaningful dialogues about what it means to be human, their shared and divergent values, their vision of our ever-mutating society, and how these narratives around the brain/mind as a social and scientific construction affected it. Rather than particular answers, I was more interested in the development of the questions themselves and the conversations they would engender.

In order to engage these questions, I pursued a variety of strategies, including essays, journal entries, in-class response papers, oral presentations with self-assessments, and small and large discussion groups. Students were therefore allowed access to various modes of pondering difficult issues. In each situation, however, I tried to find comfortable intersections between science and the humanities, as well as an entry into ethical and sociocultural dimensions in which I wanted to ground the conversation. For example, when we discussed depression, we were able to contextualize it by reading a clinical description from DSM-IV and a short popular science article offering a hypothetical case description. We also read Charlotte Perkins Gilman's *The Yellow Wallpaper*, a nineteenth century novella describing a case of hysteria, and excerpts from *Willow Weep for Me*, a recent memoir by Meri Nana-Ama Danquah, a young Ghanaian-American writer detailing her experiences with depression. Students were thus able to compare different forms of writings on depression and weigh their uses for research. They also attained both a historical and contemporary perspective of the disease; contemplated specific gender aspects of depression; and considered the role of race and ethnicity in its causation and treatment. Danquah's text was particularly resonant for many UMass-Boston students, who are either themselves immigrants or the children of immigrants. Interestingly, students inevitably returned to concerns regarding medication, its potential uses and dangers. Foremost was the push to alter personality to fit a preconceived notion of the normal and socially acceptable.

As I prepared my course, I understood that I could not do this alone. I realized that important perspectives

were missing from the curriculum I was developing in the form of experts who could speak with clarity and authority from a disciplinary approach distinct from my own. I felt it imperative that my first year students, many of whom had not yet taken college-level science courses, work with a science professor. In addition to providing information on the same topic I would be covering, my colleague would inevitably engage this body of knowledge from a radically different ontological, epistemological, and pedagogical perspective. In doing so, we would permit students to participate in and actively create these discussions I was beginning to envision. In contemplating this process, I knew immediately that Alexia Pollack was someone I needed to approach.

Addiction: Alexia Pollack's Presentation

I presented two scientific lectures in Caroline's first year general education seminar, *Examining Consciousness*. In my first lecture, early in the semester, I described how the brain functions by discussing the neuronal membrane, synaptic transmission, and different neural systems. My aim in this presentation was to give the students a sense of the biological underpinnings of normal sensory perception and the biological bases of psychiatric and neurological diseases. My second lecture, one month later, focused on the neurobiology of drug addiction. Here, I reviewed the important concepts I had presented earlier, that the brain is composed of cells called neurons, which communicate with one another by releasing chemicals called neurotransmitters. The key point that I wanted to get across to Caroline's students was that psychoactive drugs do not do anything mysterious in the brain/body. They simply alter *normal* synaptic transmission, with each drug affecting a specific subset of neurochemicals. I underscored this point by focusing our discussion on several different drugs of abuse (amphetamine, cocaine, morphine, nicotine, caffeine) and described their specific mechanisms of action. I explained that particular areas in the brain, which play a role in "reward," are especially vulnerable to repeated exposure to drugs of abuse. It is drug-induced changes (sensitization) in these "reward" neurons which is thought fundamental to driving *drug addiction* (Robinson & Berridge, 1993), defined as compulsive drug-taking and drug-seeking behavior. Addiction was contrasted with the adaptive physiological processes of drug tolerance and drug dependence, terms that are often (and wrongly) used interchangeably with addiction. I presented several theories of addiction with a focus on the Incentive – Sensitization Theory (Robinson & Berridge, 1993), which suggests that drug craving drives drug addiction and that drug-taking, which sensitizes the brain's "reward" neurons, in turn, mediates drug craving. I felt it important for the students to realize that addictive behavior is not simply a *human* behavior, but that it can be modeled in experimental animals using paradigms such as drug self-administration (Gardner, 2000) and conditioned place-preference (Schechter & Calcagnetti, 1998). I ended my presentation by discussing the limited therapeutic

approaches to treating drug addiction, focusing on treatments for addiction to alcohol and opiates. I made certain to point out that the current therapeutic interventions fall short of a "cure" for addiction, as they do not reverse the underlying sensitization in the brain's "reward" neurons, which is thought responsible for the high rate of relapse following drug cessation (Robinson & Berridge, 1993).

Examining Consciousness: What was Accomplished? Caroline Brown's Response

Addiction is a loaded topic, in no small measure because responses to the disease are so profoundly interwoven with moral judgments, which in turn are often underpinned by insidious racial and class assumptions around criminality. I invited Alexia to lecture in *Examining Consciousness* because I knew she would offer my students a very concrete sense of brain organization and function as well as of addiction as a neurobiological process. This they received, thanks to her lucid and thorough lecture accompanied by PowerPoint technology. Her sophisticated visuals both illustrated the nervous system and highlighted concepts that simultaneously reinforced orally communicated information. Most strikingly, my students now had access to concepts elucidating addiction as a biological process. Alexia lectured over three consecutive semesters; she visited twice per semester. Each group of students responded very differently to her talks. Student responses were influenced by several factors, including class size, students' ages, personalities, interest in the subject matter, and prior exposure to related concepts and reading material. However, for each class, one factor remained constant: students were forced to separate what could be reprehensible behavior from the biological impulses mobilizing it. A new space with appropriate terminology was created that most students acknowledged and respected. Thus, when we read James Baldwin's *Sonny's Blues*, Sonny's addictive behavior was understood as resulting from social factors (for example, racism, limited opportunities arising from urban poverty, adolescent rebellion and attraction to danger, and familial stressors), biological adaptation in the form of physical craving, and environmental reinforcement. Although some students continued to refer to addiction as "moral weakness," this perception was challenged. For instance, one student, coming from a neighborhood devastated by drug use, spoke eloquently of Baldwin's granting humanity to those who were otherwise anonymous, supporting her claim with evidence of what an addiction meant. On the other hand, Alexia provided a sense of the difficulty of treating an addiction in that it was necessary to handle it both as a biological and psychological condition. Students discussed how this tension was acknowledged in the text, not only analyzing Sonny's music as a symbol of redemption but weighing its power to serve as a buffer. Moreover, these conversations often extended to questions and insights related to social oppression, appropriate forms of

treatment, and the efficacy of the criminalization of drug use.

Alexia's visits to my courses significantly influenced my teaching style and goals. On a very basic level, I was impressed by the organization of Alexia's lectures, their compression and clarity. It reinforced my own belief in setting an agenda for the day. I am much more inclined to chart the day's goals consciously on the board, letting students know of my expectations, and sticking to them, even if I later allow the discussion to flow in unanticipated directions. This applies to larger aims as well, including reading lists, written assignments, and group projects. I try to respect students' time constraints and academic goals even as I am conscious of my own course objectives, which are often oriented toward the much more abstract concept of improving critical thinking and writing skills. In addition, the excitement generated by Alexia's visits convinced me of the wisdom of inviting guest speakers from other disciplines to contribute their specialized knowledge to other conversations. As a result, for a later Examining Consciousness seminar, I invited a medical ethicist to discuss the shifting status of melancholia as a way of historicizing the concept of depression. For an upper level literature course, a political philosopher lectured on a controversial novel by an African-born feminist writer, placing it within a radically different disciplinary tradition. Both presentations were also very well received, contributing to the quality of in-class discussion and creating a more expansive perspective on the information.

Other Perspectives in the Neurobiology Classroom: *Alexia Pollack*

When I joined the faculty at UMass-Boston in 2000, I assumed responsibility for teaching an undergraduate course called Neurobiology, which serves as an intermediate-level elective within the Biology Department. This class is offered every fall semester and can be taken for four credits with laboratory or for three credits as lecture-only. In the spring semester I typically teach a graduate course called Seminar in Neurobiology, which is populated by both undergraduate and graduate students. However, in the spring semester of 2003 I developed a new course called the Biology of Learning and Memory. My motivation to create this course was two-fold: to read more broadly and deeply in a field outside of my own, and to become familiar with literature about the role of the basal ganglia in learning and memory, as this research is relevant for my own work on the neuropharmacology of the basal ganglia and its role in motor behavior. In organizing the content of my course, I began to consider how memory is portrayed outside of the scientific domain. My thoughts led me to recall a passage from a novel I had read years earlier called *Invisible Cities* by Italo Calvino. In the book the character of Marco Polo describes the fanciful and imaginary cities that he visits to Kublai Khan. At one point in the middle of the book Kublai Khan asks Marco Polo about the one city of which he has never spoken: Venice. "You should then begin each tale of your travels

from the departure, describing Venice as it is, all of it, not omitting anything you remember of it" (Calvino, 1974). Marco Polo replies: "Memory's images, once they are fixed in words, are erased....Perhaps I am afraid of losing Venice all at once, if I speak of it. Or perhaps, speaking of other cities, I have already lost it, little by little" (Calvino, 1974). I was particularly struck by this passage and its implication regarding the vulnerability of memory during recall. The ideas expressed by Calvino reminded me of a study by Nader et al. (2000) that demonstrated that new protein synthesis is necessary for the *reconsolidation* of fear memory in the amygdala once this memory is recalled, suggesting that each time a memory is *retrieved* that it is sensitive to disruption prior to reconsolidation. Putting Calvino's insights together with these scientific data, I began to wonder how memory is represented in non-scientific literature and if recent scientific data could explain a biological basis for particular types of memory described in this literature. It was at this point that I decided to ask Caroline to visit my classroom to provide a literary perspective to my students in the hope of creating a bridge between the disciplines of biology and literature; I scheduled Caroline's presentation for midway into the semester, immediately following my own formal coverage of the biological data about memory systems.

Representations of Learning and Memory in Literature: *Caroline Brown's Presentation*

I was not quite certain what I wanted to do when Alexia invited me to lecture in her course. Nor was I sure about what she expected of me. However, I did know that I could not resist the opportunity. Before designing my lesson plan, I decided to visit Alexia's course. I was immediately impressed by how incredibly well organized she was—structured lecture, PowerPoint presentation, lecture notes with space for student comments. I also noticed the obvious comfort and enthusiasm of her students, as well as how dependent current learning was on previous reading and discussion. I felt intimidated in that I do not work with elaborate visuals, rely on questions more than lecture, and depend on student input and interpretations for building discussion. My entire approach suddenly felt very arbitrary. I was no longer certain of the reliability of my knowledge base nor of the source of my authority. But on further reflection, I realized how important an opportunity this was, both for the students I would be lecturing and for me.

For my presentation I decided to illustrate these neurological forms of learning and memory in the "real" time and space of the literary text. I focused on intersections in these representations in different American literary movements, from Realism to Modernism to Post-Modernism. The authors I chose were Edith Wharton, William Faulkner, and Toni Morrison. I selected short excerpts from their works, which we discussed in relation to literary techniques and plot development. In Edith Wharton's *The House of Mirth*, we examined Lily Bart's depression as she ponders her ostracism and increasing social isolation. Wharton's writing is elegant but the

descriptions are static. "Reality," whether in relation to memory or the environment, reflects the aesthetic techniques used in the fine arts of that era. The perspective is of an omniscient narrator, linear and flawless, with little room for narrative uncertainty or rupture. The images are vivid, detailed, and concrete and the reader is directed to very specific emotional and intellectual responses. For both Faulkner and Morrison (who studied Faulkner as a student) literary techniques are much more experimental and unpredictable. Characters unselfconsciously ponder their fates and work through ideas, seeming to speak boldly to the reading audience. Memories come and go, forcing the reader to question their reliability, to understand the tenuous nature of recollection, interwoven as it is with need, desire, and complex emotional responses. There are frequent ruptures in narrative, and voices, perspectives, and tone shift with sometimes alarming rapidity. The transformation of the representation of psychological states therefore becomes very nicely illustrated by the writers themselves. In my lecture, I also mapped the increasing sophistication in the portrayal of memory; the role of scientific discoveries in these depictions, particularly in the works of William James, his "streams of consciousness" (James, 1983), and Sigmund Freud; and cultural developments influencing perceptual shifts in Western artistry (photography; colonialism and exposure to indigenous art forms; the trauma of World War I with its bodily mutilation and psychic fragmentation; the alienation of urban life). In this way, I tried to give a fuller perspective on consciousness and the complexity of its depiction in various art forms. I also wanted to show that artistic creation did not exist in a vacuum, but rather was catalyzed by intersecting events in the larger world, which themselves needed to be contextualized. Conversely, I hoped to provide concrete illustrations of how this might occur outside of a science book or laboratory experiment, tying it to the everyday processes that all of us experience.

Mediating Disciplinary Perspectives on Learning and Memory: Alexia Pollack's Response

The students in my Biology of Learning and Memory class, all of whom were either undergraduate or graduate science majors, were intrigued and very receptive to Caroline's presentation. The small class size and the 80 minutes allotted to us meant that there was a lot of time for student participation. One of the things that my students and I found intriguing was the amount of time Caroline devoted to having us each take turns reading the excerpts of the text aloud. This exercise made us appreciate the insight into character and place that can be gained from a close examination of the text; it also underscored Caroline's point about the differences in how each author represented memory – from linear clarity (Wharton) to the fractured, wandering associations (Faulkner, Morrison) which seem to represent more accurately how the mind functions. On a pedagogical level, this exercise also made me reflect on my own teaching and the comparatively quick pace that I rely on in order to cover scientific content.

However, I realized that an equivalently thoughtful experience for science students is having them examine scientific data first hand and allowing them to draw their own conclusions based on these data – an exercise that I use in my classes.

During Caroline's presentation I was particularly impressed by the care she took to weave into her discussion a historical perspective about how scientific developments in psychology influenced memory's representation in literature. This different perspective allowed my students and I to see how advances in scientific knowledge were reflected in the culture at large, in how writers and artists portrayed humanity. As we read the excerpts of the texts that Caroline provided, I also tried to point out the biological bases of certain representations of memory by bringing up neural systems and experimental paradigms we had discussed in class. It was a truly inspiring class session, as Caroline's perspective and insights served to enhance the students' thoughts, as well as my own, about the biology of memory systems. Her presentation provided exactly the intellectual synergy I had hoped it would create.

Since Caroline's visit to my Biology of Learning and Memory class was so successful, I invited her to present the same material, in an abbreviated form (50 minutes), to my undergraduate Neurobiology class in the fall semester of 2003, immediately following my coverage of learning and memory. Directly after Caroline's presentation I had my Neurobiology students complete an evaluation form where I asked them: (1) to describe how Caroline's perspective affected their understanding of learning and memory, (2) what they found most thought provoking about her presentation, and (3) to supply any additional comments on their experience. Most of the students responded very positively to Caroline's visit, citing that they were pleased to be exposed to a "different" or a "historical" perspective or to see "an association between disciplines." Other students noted that they appreciated seeing how science was influenced by the era in which it was conducted or how science related to the "real world." While the student responses were by and large positive, there were a handful of individuals who remarked that they did not understand her presentation or that they had trouble seeing how it related to neurobiology. Since the 50-minute class period in Neurobiology did not allow for the same level of student participation (or my own participation) as in the Biology of Learning and Memory, this may explain, in part, why the impact of Caroline's visit was not felt by all of my Neurobiology students. In fact, many students noted on their evaluations that they wished that there had been either more time or another class devoted to Caroline's presentation.

In the end, witnessing Caroline's methodical and thoughtful approach in the classroom has made me more cognizant of giving my students opportunities during class to digest the material we cover. As a result I have noticed that I cover slightly less scientific content in my courses than I have in the past, and when possible, that I try to illustrate important biological concepts by using select

examples instead of a laundry list of minute details. In this way, my collaboration with Caroline has shown me the value of covering less material with an eye toward more reflection on the significance of the content that I do cover.

Conclusion

Interdisciplinary teaching, whether in the form of limited classroom visits or ongoing, shared courses, can be a rewarding experience for faculty members. It permits teachers to create a community of educators who share their interests and offers them the opportunity to adopt sometimes different but useful pedagogical strategies in the classroom. For science teachers, who must often rely on lecture-based formats to communicate important conceptual information, incorporating the cooperative learning strategies and class discussion of other disciplines can be an effective method for increasing student engagement in the classroom. In our world of English as a second language (ESL) students, students from varied cultural and socioeconomic backgrounds, and students with specific learning difficulties, new modes of teaching can address the varied needs of a multiplicity of students entering the halls of academia. On the other hand, in humanities classrooms, technology is often seen as unimaginative and dangerous to the free-flow exchange of ideas. Nevertheless, for humanities faculty, innovative technology in the classroom, including effective visuals and handouts, the use of information technology to disseminate information and communicate as a class, and the inclusion of scientific discourses can be an important part of making the classroom more pertinent, accessible, and contemporary. This greater applicability often increases student interest and enthusiasm.

In addition to the growth allowed faculty, there are definite benefits that come with interdisciplinary collaboration for students. Students often perceive science as “hard” and overly abstract. This is because of the theoretical complexity of the concepts on which the discipline is built. Also, learning in a science classroom is fundamentally cumulative. This means that science classes for non-majors are often restricted to special courses that are required and are regarded as a chore. Similarly, for science majors, the task of learning scientific information is all consuming. This creates a situation in which they do not have a chance to think creatively about the meaning of the scientific knowledge that they are acquiring. Therefore, general education seminars and introductory science courses are the ideal settings to bring together the sciences and the humanities. It can help science majors begin their rigorous education with a perspective of the larger context of culture and the humanities. For instance, in Caroline’s Examining Consciousness courses, pre-med and psychology students often remarked that the course materials and discussions complemented what they had learned or were learning in science/social science courses. This shift in disciplinary orientation permitted them to engage what could be abstract information in very practical and provocative ways. They, in turn, often brought exuberance, solid research

skills, and unique perspectives to classroom interactions, making conversations both more sophisticated and intellectually accessible. Science students in Alexia’s Neurobiology class also appreciated an interdisciplinary approach to the topic of learning and memory, which in the words of one biology major, “...went beyond synapses and anatomy.” In addition, the need to address the relationship between science and the world at large was expressed by another biology major in Alexia’s class who commented after Caroline’s presentation that, “the effects of society on science are often overlooked or in the least underrated.”

On the other hand, interdisciplinary courses can help non-science majors approach their science requirements with a better understanding of the potential meaning of science in their culture and in their own lives. These discourses could also attract to science students who might be hesitant, intimidated, or alienated, particularly those from underserved communities. And it is often these students, racial and ethnic minorities or members of the working class, who are most likely to return to work within these very communities. Finally, for students who have some exposure to science, whether or not they choose to work within their field, there is a greater appreciation of and comfort with these disciplines. As Luz Claudio (2001) quite pointedly explains in relation to science projects that incorporate professionals, students, and community members: “Even when they do not pursue science as a career, participants become more vocal in issues regarding science, health, and governmental regulatory processes because they can understand scientific concepts and have gained access to information that may have previously been incomprehensible.” This most powerfully translates to allowing children and young adults to take more direct control of their own health, an effective form of preventative medicine (Claudio, 2001).

In the end, however, interdisciplinary learning permits something even more fundamental to the mission of the educational process itself, as Noam Shpancer argues: “To the extent that we are selling a product—to use a problematic but probably necessary metaphor—the product we are selling is not just the knowledge base of our discipline but also the metaskills that underlie knowledge acquisition and application *across* disciplines: immersion, curiosity, resilience, critical thinking, the embrace of complexity, the persistent quest for converging evidence. Students will have little memory of—and little use for—much of the specific course content, but they will remember the dominant class processes, because these processes apply across a broad range of circumstances and life paths. In the long run, internalizing the fundamental mechanics of the discovery process—as well as its thrill and challenge—is more important than any particular discovery” (Shpancer, 2004).

Applying an Interdisciplinary Approach to your Classroom

Thus far, we have led two workshops on interdisciplinary collaboration, describing our particular approaches and experiences (Brown & Pollack, 2003;

2004). These have been important opportunities for us. Not only have we been able to share our experiences with others, but we have gained insights into what interdisciplinary learning means in relation to the variable needs of collaborative processes.

Towards the end of our workshops, we handed out a worksheet that we created; it contains a series of questions that can help educators develop an interdisciplinary approach in their own classrooms. We have included this worksheet below. Before reading through the worksheet, you should first think about a topic within your discipline that seems to (naturally) bridge between your discipline and another discipline. What would each of the two disciplines bring to this particular topic? How would the two disciplines approach this topic and how would these different approaches compliment one another? In the end, you may find that it makes sense to develop an interdisciplinary approach in your classroom that is limited to a single class or, depending on the topic, one that extends across an entire semester.

WORKSHEET

Interdisciplinary Teaching in a College Classroom

- (1) What is the goal of your interdisciplinary endeavor?
- (2) What is your discipline?
 - a. How does it intersect with another discipline or fields of interest?
 - b. What can you accomplish with an interdisciplinary approach that you cannot accomplish otherwise?
 - c. Will this be a collaborative effort?
- (3) Have you identified your collaborators?
 - a. Worked with him/her/them in the past?
 - b. Will this be an ongoing project of a limited encounter?
 - c. Have you determined your individual responsibilities?
- (4) Who are your students?
 - a. What is their college year or skill level?
 - b. How will their preparation/background influence your presentation?
 - c. What techniques will you use in the classroom to permit the students to gain particular skills or engage in a specific discourse?
- (5) What materials could be useful in supporting your goals?
 - a. Do you have ready access to them?
 - b. Where will you find them, if not?

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Received July 30, 2004; revised October 03, 2004; accepted October 07, 2004

The authors wish to thank Brian White, Esther Kingston-Mann, and Sally Bould for reading and providing invaluable feedback on our manuscript; the Center for the Improvement of Teaching for giving us the time and space to nurture our ideas; and the organizers of conferences at Rhode Island College and UMass-Boston for providing us with a forum to present our work.

Address correspondence to: Dr. Alexia Pollack, Biology Department, University of Massachusetts-Boston, 100 Morrissey Blvd., Boston, MA 02125 Email: alexia.pollack@umb.edu