Language and Learning Across the Disciplines

A forum for debates concerning interdisciplinarity, situated discourse communities, and writing across the curriculum programs.

Writing, Religion, and
the Complex Spiritual Site of Evolution

Speaking in Tongues:
Coordinating Multiliterate Work of Tutors
and Students Across Disciplines

It's About the Science:
Students Writing and Thinking About
Data In a Scientific Writing Course

A Critical Thinking/Discipline Specific
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Language and Learning Across the Disciplines

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Letter from the Editor

Sharon Quiroz
Illinois Institute of Technology

This issue of *Language and Learning Across the Disciplines* takes up ethos and disciplinarity in a variety of ways. What all these articles have in common is an appeal to an ethos that includes but is not defined by a disciplinary ethos. The first article "Writing, Religion, and the Complex Spiritual Site of Evolution," by Lynell Edwards, addresses the question of how students at a small religious school negotiate an ethos that more, or sometimes less, reconciles their religion and their science, under the tutelage of a teacher who models that ethos.

Jason Swarts's, "Speaking in Tongues," deals with disciplinary difference in the writing center. It provides a new tool which may ultimately prove as useful as the think aloud protocol, for addressing disciplinary practice and the dynamic nature of composing text. This method opens up the composition process so as to reveal disciplinary assumptions that may be hidden from the writing center consultant by what appears to be completed text. Even the newcomer to a field of specialization may have already acquired tacit assumptions which characterize that ethos.

In contrast with Swarts's effort to capture technical expertise, "It's the Science," by Harrison Carpenter and Margie Krest, discusses an approach to using scientific information that is squarely set in the disciplinary assumptions of a humanistic and literary approach to critical thinking. Many science instructors despair of getting students to address the larger meanings of their work, to address issues with a technical dimension while keeping the focus on the meaning to a larger audience. Krest and Carpenter hold students to that task.

Writing, Religion, and the Complex Spiritual Site of Evolution

Lynell Edwards
Concordia University

The teachers told us tales of Christian students being persecuted in their colleges for the conservative views they held. We were told that the false theory of evolution would be crammed into our heads in secular colleges.
—Student in Biology 426, Evolution

…being able to admit that I'm not quite so sure to someone was a big step, and then having them look at you like 'you evil sinner, you've gone to the dark side…
— Student in Biology 426, Evolution

Grim as academia can sometimes be, few of us would own up to being in alliance with the "dark side," or confess to having encouraged students to engage in heretical behaviors. But the comments above from students enrolled in a seminar on evolution taught at a small, private religious college suggest that, in fact, there are considerable moral consequences associated with certain disciplinary practices. We know that what students may vaguely refer to as their "values" or their "belief systems" likely contributes to their reluctance to engage in Marxist and feminist critiques of capitalist culture. We know that students sometimes use the word "sin" when confronted with questions about homosexuality and gay rights. But the ways in which students' religious values guide their participation in disciplinary discourse needs further investigation if we are to understand why a student, when enrolled in a course on evolution, would refer to academic practice as "the dark side." Further, what pedagogical practices best help students navigate these difficult sites for composing? What role do instructors play in modeling character and the habits of ethical discursive practice?

Recent research on spirituality in writing, particularly that which discusses how writers draw from the spiritual during the invention process of writing, has been useful in illuminating this powerful role extra-academic forces play in shaping writers' perceptions about their work. In a *CCC's* "Interchange" on "Spiritual Sites of Composing," Ann Berthoff suggests that religion can serve as a "binding force" that "offers a powerful antidote to the new positivism, which is called 'antifoundationalism,' a variant of context-free ideology." She proposes that "[S]pirit is a very powerful speculative instrument for this enterprise" (238). In this same forum, Beth Daniell argues that "the dismissal of the spiritual and the religious" is a "troubling" feature of academic work (239). In her own research investigating how six women, all members of Al-Anon, "use literacy in their spiritual lives" (240), she discovered that "spirituality and literacy intertwine in rich and complex ways" (241).

Furthermore, a revived interest in the intersections of rhetoric and religion suggests that there are numerous sites in the history of rhetoric that bear investigation. Grant Boswell and Cheryl Glenn have proposed both specific texts, such as Augustine's *De Doctrina,* as well as historical sites, such as the abolitionist movement of the nineteenth-century, for considerations of how religious rhetoric shapes community. Glenn suggests that we consider "rhetorics that fuse religious conviction with self-consciously persuasive language and social action." She asserts that "Ahead of us are more (not new) rhetorics, each of which illuminates a rhetorical practitioner's ethical-moral-political-spiritual-religious purpose" (33). Certainly Elizabeth Vander Lei's and Keith Miller's careful analysis of Martin Luther King Jr.'s "I Have a Dream" and its participation in a tradition of the African-American jeremiad is an excellent example of how precisely such a historical site illuminates the persuasive dimensions of religion and rhetoric.

Contemporary writing across the curriculum theory must also consider that some students might view the habits of disciplinary inquiry offensive, or even heretical to their religious sensibilities if we are to understand fully how students may successfully negotiate a problematic spiritual site of composing, such as a course on evolution. Critical to this understanding must also be the role of the instructor as mentor and model for students. We know, as Lucy McCarthy has pointed out in early writing across the curriculum research, that "teachers do have a good deal of influence over the nature of

the community." She further explains that "[O]ne of the ways they exercise this influence is through the role they assume and expectations they project as audience" (120). Historically, however, the public university setting has made it difficult for instructors to address explicitly and to meet fully some students' need for spiritual guidance. In a private college context, however, it is possible that not only may this dimension of a student's disciplinary identity be addressed, it may in fact be foregrounded. This essay describes students' process of self-examination and moral self-fashioning in just such a context: a Biology seminar on evolution at a small, private Christian college. In this class, students were expressly charged with the difficult task of confronting the truth of their fundamentalist faith with the scientific truths for Evolution. Students' ability to construct a persuasive ethos in the final paper was the consequence of negotiating that complex spiritual site and finding an ethical position to inhabit. I argue that in this specific context, the process depends first on the instructor's ability to both articulate and model the ethical dimension to disciplinary behavior, and second, on students' perceptions of and trust in the strength of the instructor's Christian character.

The choice to construct or acknowledge an ethical subjectivity in particular ways is certainly a function of disciplinary identity. Richard Rorty refers to the "solidarity of science" as that set of implicit agreements about pragmatic discourse and behavior within a disciplinary community. Writing across the curriculum theory has typically argued that a discipline's coherence is due to these kinds of shared, implicit, and negotiated epistemological assumptions that make themselves manifest in the discourse activity of a discipline. Consequently, early research described the rhetorical choices individual writers made to define a role for themselves within the community. Important early work by Greg Myers (1985), Charles Bazerman (1981) and Michael Halloran (1984) all investigated questions about the writer's ethos or self-representation in scientific discourse to make inferences about the ways written knowledge is both shaped by and shapes a discipline. However this early work, examining as it does examples of professional writing, does not look closely at the role that instructors or mentors play in shaping disciplinary identity.

More recent work has focused on the students' process of self-negotiation as they begin initiation into the disciplinary

classroom. And, in some cases, the ethos or character of the instructor has been acknowledged as a significant shaping factor. For students entering as novices, the disciplinary classroom is the scene of tremendous challenge to their identity. In her ethnographic study of one first year writer as he "traveled" across the curriculum, Lucille McCarthy points out that the experiences of writing and speaking may be so diverse that "the courses may be for the student writer like so many foreign countries" (151). Her examination of Dave's journey from one class to the next is marked by intense re-evaluation of himself as a writer in each setting. In one class, for instance, he learned that "writing is a process that can be talked about, managed, and controlled" (147), while in another he perceived that "he had the right ideas, the teacher just did not like the way he wrote about them" (148). McCarthy's research implies that for Dave, success or failure is contingent on the perceived character of the instructor.

Later work by Berkenkotter, Huckin, and Ackerman (1995) investigated the changing identity and emerging ethos of a writer as he moved from "outside" to "inside" the disciplinary community of composition studies. "Nate's" successful transformation from novice to professional writer resulted from considerable self-reflection and a difficult time of "butting heads" (125) with an academic discourse that seemed to compromise his own foundations for agency and ethical writing. Significantly, in his own reflections on the experience Nate worries about losing his own identity and the prospects for successfully inhabiting alternative discursive positions. In a response to reading he had done for the course, he considers the ways in which his own ethos comes in conflict with the purported ethos of the discipline: "I am a teacher-writer-researcher who has a history of discounting, if not ridiculing universalities...Because of my liberal, literary background, I should rejoice" (125). In a later passage he abdicates his authority to critique entirely, seeing himself still as an outsider: "I am not a social scientist nor a historian or philosopher of science so I cannot asail his criticisms of those disciplines" (126). Nate's final response clearly belies his despair at the consequences of joining a discourse community: "All of this is exciting for me. And troublesome…I don't have the language to capture what is going on…My thoughts and the writing I've used to capture them are shallow…I lost, if you will, my voice — or never had it from the start" (127).

Nate's move from disciplinary outsider to insider depended on his direct examination of how he perceived that his "own" voice or ethos might be compromised if he adopted the voice or ethos of the discipline. That Nate goes on to be successful in his academic projects does not necessarily reflect a betrayal to some primary or truer "voice." However, it does suggest that the transition involved a difficult process of ethical examination, which seemed to present extraordinary challenges to the self and the positions from which Nate had typically assumed authority. Significant also is John Ackerman's "Postscript" to the research based on his writings as "Nate." It is clear from his reflections that as a graduate student he too responded to the character of the instructor:

> The exterior qualities of the three papers I wrote mask, to some degree, the ongoing epistemological quest of a student who, like all other students in graduate school, simultaneously tries to satisfy the demands and constraints of each professor and class while at the same time seeks a separate scholarly identity. (147)

And further he writes, "I recall the generative aspect of my graduate school writing as partly the necessary tactics of making do with someone else's conventional practice that at times I admired and other times resisted (as I suspect all student do)" (148). The implication in each of these situations is that Nate/John is acutely aware that success depends on accurately assessing and modeling the conventions of "good" writing as valued by particular instructors. Ackerman is less explicit than Dave about attributing personality as the source for the evaluations of his writing, but nevertheless he recognizes the character of the instructor as one worth emulating or not.

Stephen Fishman and Lucille McCarthy (1995) also recognize that classes are "made up of student 'experts,' people speaking from somewhere, standing for something, and thereby contributing uniquely to the common project" (72). Their articulation of the disciplinary classroom suggests that it is the site of intersection for "gemeinschaft" and "gesellschaft" notions of community. Because these two models of community present conflicting standards for authority and responsibility, constructing a coherent and persuasive disciplinary ethos becomes a complex process of negotiation and self-reflection

about ethical, or ethos-based, commitments to the community. Though the initial atmosphere in Fishman's Introduction to Philosophy class was supportive, accommodating, and vital, there were ultimately conflicts and problems because students misunderstood how responsibility and authority were being constructed in the classroom. Ultimately though, they observed "as students developed their classroom roles, their differences were positioned and valued as if they were vital parts of an organism working toward a common goal" (79). The recognition of a "common goal," a common good, indicates that there emerged, finally, an ethical position all students in the classroom felt comfortable inhabiting.

The disciplinary classroom may also present conflicting articulations of ethos when the discipline itself is in explicit flux. Jim Henry, in his narratological analysis of writing in a landscape architecture class uses Foucault's concept of a "discursive scene, a site in which discourse groups emerge, converge, and diverge" (813) to describe the ways competing discursive agendas emerge in this class. He discovered that students struggled with the conflicting models of ethos that emerged in this complex and conflicted disciplinary site. Henry remarks that while landscape architecture as a discipline did have a history and tradition in design, the instructor was particularly concerned to "elaborate an emerging theoretical tradition in landscape architecture, an endeavor that would raise the discipline's status" (813-4). Particularly difficult was the students' goal of reconciling the goals of a personal, expressivist rhetoric with the demands of a theoretically rigorous discourse. His analysis of the students' writing revealed that "nearly *all* students had difficulty meeting the scene's mandate to embrace the personal as both theoretically valid and discursively valid" (817). He concludes that:

> Clearly some [of the difficulty] stems from the approach for appropriate articulation in this interdisciplinary scene. Some difficulty derives as well from the positions students were attempting to construct amid the philosophically clashing views of designer as visionary and designer as advocate. (817)

One student, Sherry, who was able to successfully negotiate a discursive position, does so because she recognizes the fundamental "discourse of ethics" (821) that characterizes the discourse model her instructor ultimately privileges.

Henry hints at the notion that a writer's sense of ethics and the choices about self-representation in a text contribute substantially to the ability to create persuasive disciplinary discourse. I propose that disciplinary success, this kind of movement from "outsider" to "insider" status may rely initially on critical reflection about ethics and the particular "good" to which one aspires. Rather than simple facility with discourse conventions, students' ability to write persuasive disciplinary discourse hinges on their ability to experience fundamental changes in their ethical orientation. Nate, Sherry, Dave, and the students in Stephen Fishman's philosophy class all confronted substantial ethical challenges in their choices to adopt or negotiate the habits of disciplinary discourse. These arguments all suggest that thinking like a scientist or a philosopher or an architect depends on, initially, understanding and consciously identifying with the sense of self and inquiry that disciplinary paradigms necessarily construct for individuals. This research also suggests that the character of the instructor plays an important role in students' processes of constructing a disciplinary ethos. Writing across the curriculum theory must include methods for articulating this ethical dimension to disciplinary identity, including a rich understanding of how students' perceptions about their own ethical action and moral consequences come in contact with those of their chosen discipline.

The later work of Michel Foucault is primarily concerned with this problem of articulating and constructing ethical subjectivity and moral identity, and in his late work, "On the Genealogy of Ethics: An Overview of a Work in Progress," he outlines a broad process for describing ethical subjectivity. Foucault suggests that individuals constitute themselves as "moral beings" by aligning themselves along four culturally determined "axes of ethics." In this framework, ethics is a process, a continual mode of self-definition and improvement that is grounded in the culture and the individual's position in it. We see certain kinds of writing and behavior as ethical or not according to a culture's "axes" of ethics[1]. The moral person is thus distinguished by his adherence to or deviance from these axes. Fundamentally, we are presented with the question of *teleologie,* "the kind of being to which we aspire when we behave in a moral way" ("Genealogy" 353-5). In the case of the evolution class under discussion in this essay students must ask themselves: "How finally, do we act on and respond to the knowledge about creation?"

In a disciplinary community, if we consider Rorty's notion of solidarity, we would expect clear delineation of these axes by examining the practices and ends exercised by, for instance, scientists. However, in a culture or a site of writing where there are either conflicting or no clear ethical axes, and so it is unclear what constitutes "right" action or even what the "highest" good might be, we might infer that students would have difficulty negotiating an ethical position from which to speak. They consequently would have difficulty establishing coherent ethical communication. Thus, it becomes crucial that ethical subjectivity is either modeled or made explicit in discourse practices if students are expected to reflect critically on their ethical commitments and make informed choices about rhetorical conventions. The Biology course on evolution that I wish to discuss presents exactly this kind of conflicted scene. In the context of a religious school, if there is not a clear model of how to be both religious and scientific, to put it broadly, students will not be able to write ethically sound, and consequently persuasive, papers. An instructor who is able to model successfully this process can better guide students through a process of moral self-examination that may strengthen their ethical commitment to disciplinary practice.

Students enrolled in Biology 426, Evolution, immediately find themselves in a disciplinary Scylla and Charibdis. It is a course that seems to pit science against religion with no easy passage. The course also has a complicated and politically charged history at Religious University because the official position of the governing church body states that we are to understand Creation as it is described, literally, in the Genesis account. To go so far as to teach evolution as a valid scientific theory with explanatory power would, and in fact has, amounted to charges of heresy for the instructor. For most students, success in this course meant confronting their fundamentalist beliefs in a literal interpretation of Genesis with the body of scientific evidence that points to an evolutionary interpretation of life and natural phenomena. The course is rigorously scientific, consistent with Dr. K's own position on evolution. It is not, according to him a case of "fence walking," that is, never giving students enough information about either explanation of origins to allow them to examine critically what they believe. Importantly as well, is Dr. K's own commitment to Christian education. As a long-time member of the faculty, past chair of Biology and now Dean of the College of Arts and Sciences[2], Dr. K wields con-

siderable authority not only within the school, but also among students whom he has personally mentored and for whom he has provided a model of academic integrity and Christian character. An active participant in the faith life of the campus as well as an academic leader, Dr. K's role on this small campus is significant and well established. Students who enter his class eagerly anticipate the controversy and challenge of his courses.

Consequently, for many students engaging in the rhetoric of their discipline involved a serious examination of the moral consequences for the rhetorical choices they made. Simply choosing a paper topic and writing a thesis statement became substantial commitments to an ethical position on this subject. Further, because science and fundamentalist religion have fundamentally different paradigms for establishing authority, establishing coherence in the paper became very difficult. Students who tried to apply scientific processes of induction and logic to the kerygmatic appeal of the gospel message became increasingly frustrated. Likewise, the otherwise fully scientific paper became disjointed when a "Sunday school lesson" suddenly was tacked onto the end in an attempt to add a "moral" dimension to the paper. An examination of the *teleologie* at work in the students' and the professor's own writing suggests, however, that there was an ethical position to be constructed that required compromising neither scientific rigor nor faith-based interpretations of Creation. Students who could inhabit this position were able not only to argue effectively the case for evolution but also they were able to assess critically their own beliefs. That emerging position, though not fully articulated in the class along Foucault's genealogical axes, was one of Christian reverence and humility, "a way of being" (*teleologie*) that resonated with Darwin's own rhetoric and the emerging ethos in the *Origins of Species.*[3]

This ethical position emerged most clearly in the syllabus and in the draft of the textbook Professor K. was writing on evolution and which he used as the primary text for the semester. The course goals that students received in the syllabus stated that they would "treat others with respect when stating their own positions about the origins of life," and "develop humility in stating their own position with regard to the origin of life." Students read drafts of the successive chapters as Professor K. completed them. The original goal was that students would provide useful responses about the direc-

tion of the work and that the class might engage in a vital, working dialogue about the question of origins. The emerging ethos in the draft of his textbook[4] also suggested that the best student of evolution approached the question of origins with humility and reverence. Students who could construct an ethical position in their writing that showed solidarity with Professor K.'s "theology of humility," as outlined in his class materials, were able to establish coherence in their papers and were able to assess critically their own belief systems.

In Chapter One, "The Search for Origins," Professor K. introduces the work that needs to be done in examining the scientific and faith-based arguments for the origins of life. In his summary of the moderate and fundamentalist Christian positions on creation he introduces the idea of human imperfection, and hence the need for humility. Professor K. suggests that the cardinal sin of fundamentalists is not bad science, but rather, hubris, which distorts the process of inquiry. He writes:

> For more moderate Christian denominations, the need to be correct in interpretation is ameliorated by the need to share the love of God with others. It is to these groups understandable that difference should appear in interpretation of Scripture since we are all a part of imperfect humanity. To imagine we, as imperfect creatures, could actually understand God's writing perfectly is, to the moderate, the height of hubris.

> For the fundamentalist groups, on the other hand, the need to be right is of paramount importance. Their view is that they are the defenders of the truth against the onslaughts of the devil as incarnated in the remainder of humanity. Truth is seen as an absolute value that they, and they alone, have received by divine revelation. Therefore, any attack on this absolute truth is totally unacceptable and reprehensible. The truth is to be defended at all costs.

In Chapter Two, titled "Types of Explanation" Professor K. traces in more detail the history of the evolving scientific and religious explanations and concludes explicitly with a call for a "theology of humility" as he adopts it from Sir John

Templeton's remarks on the reconciliation of science and religion:

> The 'new story' should be written reverently and flexibly… It must be a humility theology that provides a true perspective on the infinity of God [provided by science] and causes us to 'kneel down in humility and worship the awesome, infinite, omniscient, eternal Creator.'

Prof. K comments, "The idea of a theology of humility coupled to a science imbued with humility, offers the best hope for progress in bringing these two polar ways of understanding the universe in closer proximity to each other as they seek the truth."

In the closing paragraph of Chapter Two he offers a series of rhetorical questions aimed at a process for reconciling the aims of science and religion and concludes the chapter stating: "A humble approach by all parties to the discussion will at least allow the discussion to continue. Perhaps this is the best approach to the truth." In Chapter Six, following a discussion of extinctions, our stewardship of the environment, and the question of an evolutionary model he writes:

> In the long run the result may not just mean the end of many different species that are of great intrinsic as well as extrinsic value to the world, it may, in fact call into question the ability of humans to survive as well, at least in the form in which we now find ourselves. And while the debate on this issue is far from over, does it not make sense to approach the question with great humility? Should we not strive to limit our impact on the world about us?

He closes the chapter, shortly after this paragraph, with the final sentence of Darwin's *Origin of Species*, which is thoroughly reverent:

> There is grandeur in this view of life, with its several powers, having been originally breathed by the Creator into new forms or into one; and that, whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms

most beautiful and most wonderful have been, and
are being evolved. (Darwin 131)

His use of Darwin at this point is critical in beginning to
identify a position of humility and reverence in the context of
the scientific discussion. Whether Prof. K's theology (or
Darwin's for that matter) is or is not independently useful is
not under discussion at this point. Rather, all this is offered
as evidence of how Prof. K constructs an ethical position, a
teleologie, in the emerging conversation about evolution in
his classroom. This emerging "theology of humility" would
somehow reconcile the process of science with faith in divine
revelation and provide a discursive position from which stu-
dents could articulate their ethical commitments to both sci-
ence and religion. Broadly, the *teleologie* of this theology of
humility suggests that ethical Christians are guided by their
love for God and desire to be perfected through that love. It is
because they love God and want to seek the truth that they
seek honest answers to these questions. Because they do not
presume that they can understand God's word, they are
obliged to continue the journey through science, also under-
stood as part of God's work in our world. In word, manner,
and deed, students are to be humble and reverent, whether
in their application of scientific logic or in their prayerful
assertions of faith. "Salvation" of the religious and scientific
soul comes through this new process of humility. The per-
suasive paper, one that is finally ethical, and as a result co-
herent, will demonstrate these same characteristics.

The students' own primary writing project was a final
paper on a question about evolution of their own choosing.
The assignment did not preclude discussing questions within
the scientific community about the nature of evolution. One
student, for instance, did choose to evaluate the bird versus
reptile debate about the origins of the dinosaurs. However
most chose to pit creation science directly against evolution-
ary science on a question of some substantial breadth, such
as the "missing link" or plate tectonics versus "catastrophism"
(the theory of a Great Flood). The papers were only moder-
ately successful as either strictly scientific evaluations of a
debate or as inspired responses to the question of faith and
evolution. Most students had attempted to investigate a ques-
tion far beyond the scope of an 8-10 page undergraduate re-
search paper and so drowned in the complexity of the issue.

Most, too, seemed to not really manifest any apparent or emerging scientific ethos, though this was not strictly mandated by the assignment or the value-based context for the course. For some students, any new articulation of their fundamental sense of *teleologie,* specifically any interpretation of Genesis other than a literal one, compromised one's chances for Christian salvation. The two papers I will discuss represented clear choices about ethical commitments to a position on the question of origins. In the first, "A" was unable to inhabit any new position offered by the conversation, implying instead that there was no ethical position that subsumed the teleologie of both science and religion. The paper was technically competent, but it was finally incoherent as it contained multiple self-contradictions. The second, though a strange hybrid of personal narrative and objective analysis, was finally coherent and persuasive because the writer was able to inhabit the position of humility and reverence offered in the context of the course.

A's paper was a discussion of the commonality of creation stories across cultures as proof of a one-time, divine act. Her approach to the topic suggested that she interpreted the assignment to be a reconciliation of science and religion, a fundamentally ethical project that presupposed a compromise of her own religious position. Her arguments about the possibility and value of doing this imply a commitment to a tradition of Christian rhetoric that relies on three features, according to George Kennedy: "grace, authority, and the message "proclaimed" to mankind" (129). Kennedy writes, "Christian preaching is not persuasion, but proclamation, and is based on authority and grace, not on proof" (127). He asserts that the truth of the message "must be apprehended by the listener, not proved by the speaker." He continues, "The reaction of a person in the audience to the kerygma is like his reaction to a miracle, the direct evidence of authority: he believes or he does not" (Kennedy 127).

A's discussion suggested that religious "proof" of divine creation rests on exactly this appeal to faith, and scientific logic is irrelevant to the discussion. In the space of a page, following comparisons between stories of creations found in different cultures (as proof there must be historical truth to the Genesis account) she makes numerous statements that indicate science and religion are mutually exclusive enterprises. For instance, in order to explain the common images of dust and mud as the material of creation she states: "It is

poetic, as well, and symbolic of death, which could be why the image is employed. Of course, there is no scientific stand that can be taken on that issue." Of the various differences in the stories of a single, one-time creation, she states: "That does not need to be expanded." She begins a paragraph later, stating: "As for scientific evidence to prove Genesis, little exists. Science cannot explain religion." Finally, in the concluding paragraph she writes:

> In conclusion, there is no way to prove or disprove a religion because it is based on believing things on faith; however, I feel that the diverse creation stories and the dates of origin of the stories do not diminish the validity of the Genesis story, and though I cannot explain away any doubts others or myself may have about its truth, I can still believe the Bible without ignoring science.

Professor K. notes at the end of the paper that this last sentence is an "important confession." His use of the term confession suggests this mode of discourse, the confession, is likely an important part of the emerging theology of humility.

However, in a later interview, A's responses to his comments point to a relatively unchanged conception of religious authority and scientific proof. She states: "When I was writing it, he kept telling me I needed proof with science, which I thought was impossible; it's impossible to prove religion with science." And additionally she remarks: "I didn't really change my views on it. I got more information on it, and I had already decided – I've come to conclusions about how creation works, about how it works for me." Not surprisingly, her comments finally turned toward the ethos of the instructor: "I thought he was kind of rude. I'd already talked to him about this stuff; he seemed okay with it. ... I didn't think he'd analyze it so much." Finally, a retreat to take his comments personally:

> I thought I'd finished off the question and he seemed to think I'd just started the process – and that wasn't giving me enough credit for already doing it. [It seemed like he was] making some comment 'at me', and I didn't think that showed in my paper – maybe that's just what he thought about me.

A was unable to inhabit the position offered in the course as an ethical position on the questions of origins and modeled by the instructor as part of his emerging "theology of humility." She maintained, even entrenched, in her own position about the irrelevance of "scientific proof" on questions of divine revelation. She had "come to conclusions about how creation works, about how it works for me." The result was a paper that existed in rhetorical limbo, alternately an appeal to the necessity of just believing what the Bible says without questioning it, and a semi-critical comparison of parallel accounts of creation. Though her responses seem to indicate that she understands what Professor K. wants in her dialogue about this question, she does not seem to have any useful process for getting there.

A second student, "H", though she came from a religious orientation to the question of origins similar to A, was able to construct able to construct a position from which to speak that did not fundamentally compromise her own "teleological" commitment. She chose to adopt the ethos of Christian humility and the rhetoric of questioning, discovery, and personal testimony of faith. Rhetorically, the paper suggests a "journey;" the writer is on a path of humble self-discovery. It opens with a testimonial that works in an unexpected way to establish coherence in the paper and to meet the goals of the course and the paper. The testimonial also may resonate in comforting ways with a rhetoric of personal salvation that characterizes fundamentalist belief. She begins:

> As a student in a Christian high school I was always taught that Creationism was truth. I never thought to question this because the Bible "proved" it. The teachers told us tales of Christian students being persecuted in their colleges for the conservative views they held. We were told that the false theory of evolution would be crammed into our heads in secular colleges.... At first we were offended at the audacity of the professor for even mentioning that evolution could have happened. However, I began to think that some of the tenets of evolution made sense....As I sat through more science classes, the evidences for evolution began to make more sense. A problem remained for me, however. Could I ever reconcile scientific fact with my religious beliefs?

H then states that her purpose in the paper will be to examine the case for continental drift by comparing the evidence provided by the theory of plate tectonics with the evidence provided by "geologic catastrophism," the theory that a Great Flood is responsible for most geological phenomena. She concludes in her introduction: "It is the purpose of this paper to explore which theory better *scientifically* explains the Earth's make-up today." This statement of purpose seems possible only after a long – in proportion to the rest of the paper – discussion of her personal involvement with the topic and her ethical stake in its resolution. The body of the paper unfolds as a dialogue between the scientific evidence for plate tectonics and the work of a creation scientist she located through a web page whose project she reports as being "to reconcile the most literal reading of Scripture with the most advanced science in existence." She also reviews, briefly, the main tenets of several other creationist justifications of a Great Flood. Her conclusion to this section is interesting, as she directly addresses these creationist authors in the form of rhetorical questions, thereby demonstrating a newly gained sense of empowerment in scientific inquiry. She poses first a series of scientific questions, echoing the rhetorical strategy her instructor often relied on in the closing arguments of his chapters. She writes:

> How can you explain the organization of the fossils? Wouldn't the Flood have randomly dispersed the animals? How can you account for organized layers of fossils with the oldest strata containing the simplest to the newest strata containing more complex organisms?

Her conclusions come back to the confession mode that is part of the testimony of her journey. She writes:

> I must admit that it has been difficult form me to wrestle with the issues I encountered through my research. I would *like* for there to have been a Genesis Flood. This would better fit my paradigm. However I did not write this paper to be a reflection of my ideas. I wrote this paper so that I may scientifically explore the proofs for the theory of plate tectonics and those for the Genesis Flood.

> Through the course of my research, I came upon many more scientific proofs for the theory of plate tectonics than I did for geologic catastrophism. Therefore, it is my belief that in light of scientific evidence, the theory of plate tectonics is better supported. This can be seen in the fossil record, glacial structures, magnetic crystals in the sea floor, and the various rock formations of the continents. This theory does not "struggle" to explain itself. It is all encompassing. Therefore, I support the theory of plate tectonics.

The final paragraph seems excessive, except as further testimony, articulated only for the sake of the writer, to a commitment to this stand on behalf of science. It implies, with her re-emphasis on how from a *scientific* standpoint plate tectonics makes more sense, that her faith is still intact. And in fact, while discussing her work on that paper and in that class she stated the following semester: "It's more important for me to hold to my religious beliefs; that's what I'm shaping my beliefs to and I'd rather be right in that aspect than wrong."

H's paper is the scene of enormous conflict, not all of it effectively negotiated, but a pedagogical success nonetheless because she was able to reflect critically on her beliefs, perhaps the only common goal across the curriculum. And so, arguably, the goals of the course are accomplished. By inhabiting this position of Christian humility she was able to effectively begin synthesizing the opposed "teleologies" of science and religion into a personally coherent, if not always intellectually persuasive, statement about the roles of divine and natural processes in the formation of the Earth's geology. She could still be a good Christian and not necessarily believe in a literal interpretation of Genesis.

Why was H able to inhabit this position and thereby successfully engage in a dialogue about the question of origins and write an effective, coherent paper, while A was not? H was not the only student who was able to examine critically her own religious beliefs. In fact, a review of informal pre- and post-test attitude surveys of students' beliefs about the questions of origins suggested that most students who started from a position of fundamentalist belief in biblical inerrancy moved to belief in the validity of a theory of evolution as responsible for the origin and shape of life. Though not all of them wrote papers that successfully communicated this move, it was clear

that there was critical reflection taking place in many of these spiritual sites for composing. Arguably, some students perhaps did critically reassess their beliefs just on the basis of the scientific information. But researchers in WAC such as Ann Herrington have also documented that "teachers do have a good deal of influence over the nature of the community…. One of the ways they exercise this influence is through the role they assume and expectations they project as audience" (120). Lucy McCarthy concurs that the role of the student in relation to the teachers is "a particularly important role relationship in any classroom because it tacitly shapes the writer-audience relation that students use as they attempt to communicate appropriately" (147).

I think it is fair to assume that Prof. K's own persona in and out of the classroom was in no small part responsible for student's "conversions." In the small college environment where many of the class members had studied with and been mentored both personally and professionally by Professor K., it is likely that strong bonds of trust and mutual good will developed. Professor K.'s concluding comments on their papers suggest that this mentoring role may also depend on "pastoral power" as described by Foucault, and so resonated with students' own experiences with intellectual and spiritual authority. This "pastoral power" is distinct from previous paradigms of "royal power" as a "form of power which does not look after just the whole community, but each individual in particular, during his entire life" ("Afterword" 214). Foucault argues that this power is "salvation oriented" and assumes that individuals cannot exercise this power "without knowing the insides of people's minds, without exploring their souls" ("Afterword" 214). This may seem an unusual and extreme position to assume as teacher, but in this particular classroom it seems to be the key to establishing trust and providing models for ethical discourse in this path of inquiry. Professor K's closing comments are particularly revealing in this aspect. He writes, in part, on A's paper: "Have a little more patience with those who disagree with you. And use the great brain God has given you. Don't be afraid….'Perfect love casts out fear'." And on H's paper he concludes, "I hope I have not diminished your confidence in the love of God for you but rather helped you see that God must be placed above the petty arguments we humans think we must make." There are certainly echoes of the emerging "theology of humility" he

has modeled in the draft of his textbook, and with these words he clearly demonstrates an ethos of Christian love and protection for his students. While these kinds of comments may seem entirely at odds with much academic conversation, they are crucial in modeling the *teleologie* that will serve these students best in their path of inquiry.

I believe H's and other students' critical reflections on the question of origins were possible because Professor K offered a way to construct an ethical position, thereby demonstrating awareness of the moral consequences that accompany rhetorical choices. A and H both knew very clearly that to give up their position on a literal interpretation of the Genesis account of Creation would be to lose hope for salvation through Christ. This is no small consequence. And in fact, on a post-test attitude assessment H responded that she did believe that a great flood as described in Genesis was responsible for most of the geologic phenomena we see today. Without the habits of discourse provided by the context of the classroom environment and beyond her discursive analysis of the evidence, she is able to inhabit the scientific position less certainly. The position of Christian humility that the instructor offered provided a way for one student to speak persuasively and compromise neither her faith nor her commitment to the process of science. Christian humility as a *teleologie* may or may not be useful to her ultimately as a scientist, but it allowed her to be successfully engage in this first, fruitful dialogue in the conflicted disciplinary site of evolution inquiry.

The thought that there are moral consequences involved with disciplinary choices across the curriculum may not always be obvious, but a course like Biology 426, Evolution clearly foregrounds the struggle. I have suggested that we begin to examine the moral self-fashioning students exercise as they negotiate subjectivity within the disciplines and that we model and make explicit the process of ethical subjectivity. We might propose that it is precisely a concern for moral consequences that keeps students in first year composition classes entrenched in their positions on homosexuality, civil rights, abortion, gun control, criminal justice, no-smoking laws, affirmative action and every other topic that somehow touches the question of morality. Deeply held beliefs about moral consequence in disciplinary communities may also be responsible for willingness and readiness to trust and therefore join in discourse. Instructors like Dr. K. who are able to

model and make explicit this process of moral self-fashioning provide their students with discursive habits that will allow them successful and safe passage into new disciplinary homes.

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[1] These axes are: the *substance ethique,* or the part of ourselves that is relevant for ethical judgment; the *mode d'assujettissement,* or "the way in which people are invited or incited to recognize their moral obligations" the *pratique de soi,* or "the means by which we can change ourselves to become ethical subjects;" and *teleologie,* "the kind of being to which we aspire when we behave in a moral way" ("Genealogy"353-5).

[2] At the time of this research, Dr. K occupied the position of Dean of the College of Arts and Sciences. Administrative changes in the structure of the school, primarily a consolidation of the College of Theological Studies with CAS have resulted in his being now Dean of the College or Theology, Arts, and Sciences, a strong commendation of his Christian character.

[3] I would also propose that though he moves much farther than Darwin from the acknowledgement of a divine

Creator, it is this sense of reverence and even humility in the face of a force greater than ourselves that has made the work of Stephen Jay Gould so appealing to a lay audience.

[4] The primary text for this class was a textbook in progress Dr. K was developing for potential publication. The purpose of the text was to offer students a comprehensive introduction to the basics of the theory of evolution while providing a context for Christian dialogue about the question of "Origins." While the text provided substantial documentation for the classroom context, it was not subsequently developed for publication and does not exist as a formal manuscript at this time.

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Speaking in Tongues: Coordinating Multiliterate Work of Tutors and Students Across Disciplines

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John Trimbur recently wrote that for writing centers, literacy has become redefined as "multiliteracy," referring to the "multimodal activity in which oral, written, and visual communication intertwine and interact" ("Multiliteracies" 29). At once, broadening the term "literacy" complicates the role of the writing center in a university while clarifying how it can fulfill cross-disciplinary responsibilities.

Writing centers have long grappled with the fact that texts reflect intersecting and sometimes unfamiliar literacies. The trouble is that how these multiple literacies "intertwine and interact" and how someone acquires those literacies is somewhat mysterious. Clearly, one's multiliterate expertise is built up through experience using genres, which embody the motivations and interests of practitioners in a field (Bamberg 12-13; Berkenkotter and Huckin 60-65; Miller). However, missing from this formula is a sense of the role that writing centers play in helping students acquire disciplinary multiliteracy, especially when that literate background is not shared by the tutor. Do practices exist that enable writing centers to engage students in "writing-to-learn" practices that help reveal the conventions of writing in their disciplines? I believe so, and by paying attention to genres and to texts as "tools" that reveal the routine activity those genres embody, tutors and students of different disciplinary backgrounds will find ways to share their expertise. To develop this position, we must first consider the role of genre in scaffolding a writer's progress toward disciplinary literacy. Following this discussion, I will focus on texts and why they are not adequate tools for talking about the multiliterate uses of genres across disci-

plines. By discussing the results of a case study, I will argue for a new tool that supplements text, making it a richer tool that is capable of crossing disciplinary boundaries.

Genre in the Writing Center

Irene Clark writes that one of the most important yet pedagogically difficult goals for writing centers is to "[h]elp students understand how the goals of academic writing are achieved through a text" (7). Clark suggests helping students become aware of the "functions" of text and how the genres from which they derive have historically determined social functions (26-27). Tutors help their students understand academic writing as a goal-driven, literate practice by highlighting the activity that the text supports (e.g., building credibility, articulating a position, defining a methodology). However, when tutors and students do not share a common disciplinary background, it becomes more difficult to invoke and sustain such a conversation because many goals in writing are discipline-specific.

One solution to the problem seems clear – delegate writing center duties to specialist tutors or graduate students within the various disciplines. However, it is important to remember that writing centers serve an indispensable function in their "willingness and ability to engage student writers sentence by sentence, phrase by phrase, word by word, comma by comma, one to one, face to face. No one else in the academy can or wants to do this work, but everyone wants it done – now" (Kail 25). Writing centers can help students from different disciplines, not just because of their hands-on, face to face work, but also because tutors understand how literacies "intertwine and interact" for a rhetorical effect. This rhetorical knowledge constitutes tutors' writing expertise.

How multiliteracies "intertwine and interact" can be discussed abstractly, at the level of the genre, but it is an issue more specifically addressed at the level of the text. The problem with texts, though, is that they do not easily reveal the rhetorical motivations that led to their creation. A text alone fails to provide grounds upon which the tutor and student can articulate the intersecting literacies that inform a piece of writing. As a result, it is more difficult for a tutor to understand how a student's ideas were shaped by his or her conceptualization of the genre. Our task is to develop tools to make this process easier.

Texts: The Tools of Mediation

The word "tool" has a varied meaning. Vygotsky defines tools as "language; various systems for counting; mnemonic techniques; algebraic symbol systems; works of art; writing; schemes, diagrams, maps, and mechanical drawings; all parts of directional signs" (Vygotsky, "Instrumental" 187). Tools work by mediating human activity, by extending and constraining a person's cognitive and physical activity (Cole and Engeström 9; Pea 57; Wertsch, *Voices* 12).

Tools can extend our physical abilities as a pole-vault does (Wertsch, *Mind* 27), our ability to perform complex cognitive tasks as a calculator or a map does (Hutchins 96-116) or by extending our sensory capabilities as a microscope does (Knorr Cetina 10, 15-20). Tools are also instrumental in teaching because they take an intrapersonal task (internalized) and externalize it, making it interpersonal (shared between people) (Vygotsky, *Mind* 74; Wertsch, *Mind* 36, 56-57).

In using a tool, a person externalizes his or her thinking by taking a normally internal activity (e.g. counting) and demonstrating it by using a tool (e.g. counting on one's fingers). In an environment where a person's motivations or job duties are clear (e.g. the navigator of a ship) people in the same environment may share an experience of what the tool user knows by interpreting his or her use of a tool in light of the motivations or job duties the tool user is known to fulfill. However, shared understanding depends on both an onlooker's ability to witness the tool in use and to understand how the tool's user is motivated to use the tool. These preconditions for shared understanding are not always met, often due to the nature of the tools used. Some tools invite shared understanding by revealing the expertise involved in their use - others do not. Texts are tools that hide the expertise involved in both their creation and use.

Texts also enhance and constrain activity though in less visible ways. For instance, questionnaires used by architects to establish a room design elicit input from clients that is turned into a design. However, the client does not see what expertise guides the design creation because it is not visible in the questionnaire, only in the architect's use of the answers (Ackerman and Oates 94-100). The questionnaire enables a working relationship between the architect and client without requiring them to share a way of interpreting the information.

The questionnaire is a tool designed to help architects make literate connections between data that clients provide. The means of interpretation are built into the format of the questionnaire, but the act of interpretation is still largely intrapersonal. Architects interpret the questionnaire data based on their literate way of "seeing" meaning in the data, an expertise that is rarely shared by the clients. Writers and tutors may have similar difficulties interpreting a text because they too rely on different expertise to "see" meaning. Since texts potentially hide the rhetorical motivations that give them meaning, a genre-based approach to cross-disciplinary work in the writing center is undermined because it relies on building an interpersonal, shared understanding of rhetorical motivation that a text cannot adequately support.

It is widely accepted that genres act as tools to scaffold a writer's literate development and enculturation into a community of practice (e.g. Gee, Hull and Lankshear 104-124; Geisler, *Academic* 157-167; Prior 76-96; Dias, Freedman, Medway and Paré). When these tools (genres) are shared and used by groups of people, they act as "conscription devices" (Henderson 456) in that their use trains users to see their work in similar ways. For instance, corporate letter templates are used to reinforce ways of thinking about how information is communicated to clients. Similarly, report boilerplate builds notions of what "sounds right" in a report (Katz 179).

Unlike in a corporation, writers at a university compose for a wider variety of unrelated purposes. As a result, writing centers see many texts that have a variety of situation-dependent uses though they share a generic family resemblance. Under such work conditions, tutors and students rarely begin with a shared understanding of the text's function, and therefore take longer to come to a mutual understanding of what the text does or should do. This disconnect partly arises out of a problem inherent in using a text as a symbolic tool across different disciplinary contexts of use, and is further exacerbated by the writing center's role in the university.

Inflexible Texts and Flexible Writing Centers

All objects used as tools to coordinate work practices (e.g. memos, sketches, texts) are comprised of tightly interlocking literacies and bodies of knowledge. In their shareable form (i.e. some physical form – not just ideas), the way in which these literacies and bodies of knowledge "intertwine and in-

teract" is unclear. In this regard, the tool is an inflexible object in that within these tightly interlocking points, it is difficult to decipher the exact motivation that brought the ideas together. The sum effect is that the tool remains the object of the creator's expertise, making it difficult for others to see where their knowledge can contribute to the mutual creation or use of that object. The writing center's institutional role amplifies this problem when it occurs between tutors and their students.

Tutors serve a dual and sometimes conflicting role: they are peers with whom students can discuss their writing, and experts to whom students should listen. In a tutoring session, this dynamic plays out in a peculiar manner because the text that is the focus of attention is an object simultaneously defined by two domains of expertise. The text is at once a disciplinary artifact (the student's expertise) and a grammatical artifact (the tutor's expertise) and each is eager to defer to the other's expertise in shaping that text.

Moreover, the fact that many "successful, publishing academic professionals do not think of themselves as writers, and consequently, doubt their own ability to comment on and respond effectively to student writing" (Pemberton 120) puts pressure on the tutors to be both "experts" and "peers" and to negotiate the tension between those roles (see Trimbur, "Peer"). This contradictory role often leads writers to defer to tutors' knowledge even though it may not be based in the same disciplinary tradition out of which the text was created. The fact that much undergraduate writing is based in recognizable genres makes finding common ground easier; however, text remains inflexible in so far as it is treated as an object exclusively defined by another's expertise.

I wish to demonstrate that one way to make texts more flexible is to break up the finality of their appearance. A text represents the end stage of a composing process, when all of the multiple literacies that shape it are so intertwined that it is difficult to separate them out and discuss their contributions. "Text" is a title reserved for writing that is finished and no longer subject to change (Geisler, "Accounting" par. 28, 29). Before its completion, the writing is pulled together from notes, pulled apart by reviewers, and reconstructed again. In these behind-the-scenes stages of writing, the text is a flexible object, a series of ideas building up to a final product. To make apparent the convergent, multiliterate activity that shapes

text, and thereby enable coordination between tutors and students, we need a tool that makes writing activity available for shared interpretation.

Visualizing Text: The Effects on Local Practice

To design a tool that makes texts flexible, we must make writing activity visible because writing activity is an enactment of the expertise that allows us to create meaningful texts. Research suggests that problem solving and expertise are associated with how one "sees" the task environment (see Gibson; Lave). Even in composition, the connection between visualization and effective writing is well documented (see Matsuhashi, Gillam, Conley and Moss; Matsuhashi and Gordon; Sirc).

The tool I propose focuses attention on the activity of writing, a more flexible medium through which tutors and students can negotiate their understanding of a text and thereby gain a better sense of the expertise implicit in its creation (Norgaard 50, 52). I will describe a tutoring session where a student's text appears to become more flexible by viewing her writing activity. I will demonstrate this flexibility by showing how parts of the tutoring session mediated by screen captures of the student's writing activity are associated with 1) more participatory interaction, and 2) greater coordinated discussion of the text across disciplinary boundaries. More importantly, I will show how knowledge about writing is more likely to be shared when drawn from observations of writing activity. The tool that supports this view is "textual replay."

Textual Replay Technology

Textual replays are computer videos comprised of successive screen shots taken of a writer's computer screen as they are composing. The textual replays are used to supplement discussion of a printed text by providing a glimpse of a writer's composing activity. The terminology (textual replay) has obvious roots in professional sports where recordings of an athlete's performance, from the athlete's perspective, are used to help coaches and athletes share an experiential perspective of the performance (Omodei, McLennan and Whitford 117).

The principal benefit of textual replay is that it creates a cross-temporal instructional site that coordinates even while it distributes both the student's and tutor's attention over the beginning, middle, and end points of a text's creation. At any

given point during the textual replay, the writer will be able to account for his or her activity in terms of how that action contributes to the "resolution shape" (Lave 19) of the completed text. The textual replay can be paused, rewound, and fast forwarded, making it possible to see multiple stages of writing activity in relationship to one another.

Testing Textual Replay

To examine the effects of textual replay, I asked three students to record their writing activities. Each student was asked to turn on the screen capture whenever they came to a point in their writing where, if I were there, they would ask for my opinion. We started the tutoring sessions by reading and talking about the texts, and used the textual replays only when they seemed appropriate and potentially useful. One student in particular, Rena[1], provides an illustrative case revealing the effects of textual replay. This student was studying for the TOFEL essay exam and had what she felt was a consistent problem with transitioning.

Data Preparation and Measures

The transcript of the tutoring session was separated into three progressively larger units to aid in the analysis of how texts and textual replays affect how tutors and students share ways of thinking about writing. The three units of analysis were clauses, interchanges, and mediation segments.

Clauses

To study the ways that the two technological tools (text and textual replay) may have enabled shared understanding, Rena's transcript was parsed into clauses. Each clause was coded for the knowledge that the speaker referenced. Previous research on mental models has supported the idea that verbalizations can be taken as representations of a speaker's knowledge (Carley and Palmquist 602). The clauses were coded using the following definitions:

· *Text* defines any reference to the text as a textual object. This category accounts for talk that described the text and its features. These references included talk about past or future versions of the text. They also included talk about the purpose of the text because discussions of purpose were often cited as evidence to support specific alterations to wording and formatting.

· *Process* defines any reference to the act of composing, past or present. The aim of this category was to find all references to the processes that shaped or would shape the text. Students often spoke about their texts in terms of what they did or planned to do. *Process* is here restricted to visible processes as well as those articulated in the tutoring session. The "writing process" in its entirety is far too complex to accurately code. Also included is discussion of strategies and specific actions taken in writing, as well as talk about writing resources (e.g. wizards, templates, guidebooks, etc.) used in the process.

· *Rhetorical Situation* defines any reference to the rhetorical situation into which the text fit. References to the local knowledge of the text's composition, publication, audience or distribution were coded as *Rhetorical Situation*. In addition to these macro-level rhetorical considerations, references to the rhetorical relationship between parts of the text (e.g. "this paragraph introduces your first argument") were also coded, as these comments are indirect indications of how the text will be used by the intended audience. Finally, references to an idealized form of the text (e.g. "as a proposal this text should clarify the problem") were also coded as *Rhetorical Situation*.

· *Content* defines any reference to the meaning of the text. This category was meant to find those statements that focused on what the text says. Any comment about the meaning or accuracy of a text's information was coded as *Content*.

The data were best analyzed in clausal form because clauses were large enough units to be clearly described as being a particular type of knowledge reference. Smaller data units were too ambiguous to code clearly and larger units were too broad to code distinctly. The analysis of clausal data is consistent with previous research using verbal data (see Haas, 1989; Flower and Hayes, 1980).

Interchanges

To show when the participants of the study shared a common way of understanding and talking about the text, the clauses were aggregated into interchanges. An interchange is a unit of conversation beginning with the initiation of a topic, and continuing so long as that topic is referenced nominally or pronominally. When participants make knowledge references of the same type, within the same interchange, it is easier to make an argument that such references indicate a shared understanding of the text.

Mediation Segments

To examine the mediating effect of tools (text and textual replay) on the ability of the participants to develop a shared understanding of the text, the interchanges were aggregated into mediation segments. Each segment designated a different focus of attention for the participants: on text or on textual replay. For instance, if in the first 10 interchanges the participants looked at and pointed to the text, those interchanges were collectively referred to as Segment 1 – Text Mediated. When the focus of attention shifted, a new segment began[2]. The following measures were used in the analysis of the data.

· *Level of Activity*: Henderson observed that when the engineers of different disciplines in her study were given inflexible objects to use, they would use them infrequently (464). The same effect is expected when participants use text (inflexible object). The number of interchanges and the number of clauses per interchange within a mediation segment will show if textual replays (flexible objects) are associated with more activity than text.

· *Level of Participation*: Henderson also observed that when work objects were flexible, the activity around them became more participatory and interactive compared to inflexible objects. An analysis of the average amount of speaker change per interchange in each mediation segment will indicate if more participation is associated with more flexible objects.

· *Level of Coordination*: One benefit of a tool is that it potentially enables one to share knowledge with others. To see shared experience, knowledge references will be tracked within interchanges. Coordinated referencing by both participants (references of the same type by each participant) will be taken as an indication of a shared understanding. Better coordination between participants on issues of text and process in textual replay mediated segments is expected. As textual issues are more often associated with a tutor's expertise and process with a writer's, coordinated discussion of this type of knowledge may indicate cross-disciplinary expertise sharing.

Quantitative Analysis Activity

In the segments of the session mediated by the text, there are more interchanges (40) compared to the textual replay

mediated segments (35), indicating that with text there were more shifts in the subject of conversation.

There were also more clauses in the text mediated segments (244) compared to the textual replay mediated segments (206) showing that there was more conversation. However, the amount of conversation per interchange was, on average, lower in the text mediated segments (7.10 clauses per interchange) than in the textual replay mediated segments (8.72 clauses per interchange)[3]. When Rena and I were focused on the textual replay, it appears that we were more likely to speak at greater length about the topics. This finding suggests that both Rena and I found more to talk about, and that we were not content to let one person control the conversation.

Participation

Though the differences appear slight, Table 1 shows a difference in speaker change between the mediation types favoring textual replay (2.69 per interchange) over text (2.03 per interchange).

Mediation	Speaker Changes per Interchange
Text	2.03
Textual Replay	2.69

Table 1 – Participation across Mediation

Textual replay mediation is associated with slightly better turn taking than with text mediation. Examined from another angle, the increase in speaker change is more prominent. Of the total number of speaker changes in the session (151), 54% occur in segments mediated by textual replay (81) and only 43% occur in those segments mediated by text (70). More frequent speaker change in the textual replay mediated segments suggests that both Rena and I were able to sustain conversation about the text. The finding also suggests that the knowledge referenced in the session was not treated as the exclusive expertise of one person, but was instead treated as a subject on which both could contribute. Together, increased activity and greater participation take on more prominence through an examination of the kinds of knowledge referenced.

Coordinated Knowledge Referencing

It is clear from Table 2 that in the segments mediated by text, Rena and I made fewer knowledge references (i.e. references to "text," "process," "rhetorical situation," or "content") per interchange (9.05) compared to those segments mediated by textual replay (11.88).

Mediation	Knowledge References per Interchange
Text	9.05
Textual Replay	11.88

Table 2 – Knowledge References per Interchange

While the segments mediated by textual replay appear to be associated with greater knowledge referencing, it is important to see this figure in relation to the total amount of coordinated referencing. Rena and I were coordinated when we both referenced the same type of knowledge within a single interchange. An analysis of coordination revealed a pattern along mediational lines.

Of the total number of coordinated references within all interchanges (46), those segments mediated by textual replay accounted for more coordinated references (59%) than those mediated by text (41%). As the data in Table 3 show, each mediation is strongly associated with certain types of knowledge referencing. Those segments mediated by text are strongly associated with coordinated references to Content (60% of all coordinated Content references) and Rhetorical Situation (67% of all coordinated Rhetorical Situation references). However, the references to Rhetorical Situation and Content were so few as to overstate the importance of the finding[4]. Segments mediated by textual replay are associated with stronger coordinated referencing to Text (68% of all coordinated Text references) and Process (58% of all coordinated Process references). As predicted, textual replay was associated with greater coordination in discussion about text that crosses lines of expertise.

Segments	Mediation	Content	Text	Rhetoric	Process
2,4,6,8,10,12,14	Text	3	6	2	8
%		60%	32%	67%	42%
1,3,5,7,9,11,13	Textual	2	13	1	11
%	Replay	40%	68%	33%	58%

Table 3 – Coordinated Knowledge References across Mediation

These foci on different types of knowledge references are similar to those found in other studies of mediation. Christina Haas, for instance, argues that when working with a text onscreen, students find it more difficult to "get a sense of their text" (185) and that they will do less work exploring, organizing, and elaborating than arranging text and deciding on wording (200-201). I too have found that the textual replay is associated with a focus on textual issues. However, unlike early research, the mediating artifact in this session is writing activity as opposed to another version of a static text, perhaps accounting for the strong number of coordinated references to Process. There are two points of significance in the findings summarized above.

The first finding is that Rena and I coordinated in a discussion of the text that crossed lines of attributed expertise. With textual replay, Rena and I coordinated in discussion about text issues – normally seen as the exclusive expertise of the tutors. In the same segments, we coordinated in discussion about process, which is more likely to be part of the writer's expertise. With text mediation, Rena and I were more strongly coordinated on issues of content, which might normally be seen as the student's discipline-specific expertise.

The second finding is that the types of knowledge references on which Rena and I were coordinated in textual replay indicate that the quality of that participation was especially well suited to the goals of writing centers and the canonical ideals of effective teacher response to student writing. I will explain by first setting these findings in the context of tool theory.

Henderson remarks that the engineers in her study were able to "move back from the weak structure of the layout drawing [inflexible object] to the strength of its building blocks, sketches [flexible object], to fill in the site-specific detail" (461). This observation suggests that people may combine uses of flexible and inflexible objects, make them speak to one another, and in doing so derive specific details on which they base future work. This activity appears to be paralleled in the tutoring session where Rena and I go back and forth between the text (inflexible object) and the textual replay (flexible object) coordinating our ways of thinking and speaking about the text in ways that reveal details to work on (revisions to the text).

This "interactive use of conscription devices" allows people of different disciplines to combine their expertise to accomplish a project (Henderson 461-462). Conscription devices represent a person's expertise in terms of how it contributes to the common work goal, thereby coordinating that contribution with those of other experts who jointly use the same object. Though the textual replay appears to increase the flexibility of Rena's text, allowing it to act as a conscription device, it is important to measure the value of textual replay in terms of how it can help produce better writers by allowing tutors to engage writers in a discussion of their texts. A crucial question is: What is the quality of response coming out of textual replay mediation?

Responding to writing is an evolving practice that has undergone much scrutiny over the past twenty years. Teachers of writing have concerned themselves with finding less antagonistic ways to respond to writing (Sommers 149-151) and to find new ways of understanding what students are trying to say through their writing (Brannon and Knoblauch 162-164) by creating opportunities for them to talk about their rhetorical motivations. What studies of response point to is the teacher's need to understand what the writer was trying to do and to find evidence of that motivation in the text. When a teacher demonstrates an understanding of the writer's intentions, the writer becomes more receptive to revision suggestions. That Rena and I coordinated in our discussion of text and process more often in textual replay mediation than in text only mediation (68% and 58%, respectively compared to 32% and 42%, respectively) suggests that we were able to sustain a conversation of these vital issues whereas under text mediation it was more difficult.

In the next section, I offer a narrative analysis of select portions of the tutoring session to illustrate how Rena and I moved between text and textual replay mediation and how these shifts were associated with changes in the way that we talked about the text. As the results on coordination suggest, each tool (text and textual replay) was associated with coordination on different types of knowledge about a text. As the earlier discussion of tools suggests, watching how a person uses a tool to accomplish a task creates an opportunity for two people to share the knowledge required for that task. Rena and I appeared to experience the same effect through our use of the available tools.

Narrative Analysis

At first, Rena and I focused our attention on a textual replay and used it to discuss the purpose of the initial paragraph of her text. The discussion, while coordinated in the sense that both Rena and I were talking about features of the text, was not focused on the reasons for including the paragraph. Toward the end of the first textual replay mediated segment, Rena and I spoke about issues of content, but not in a coordinated way. After we switched our attention to the text in the next segment, we were coordinated in our discussion. By switching to content, we were able to establish the meaning of the paper, which was necessary before considering text and process issues.

Rena# . . . I don't like my using the word "money" in this.

Jason# Okay, that's interesting. So, you don't even think that that is really a good argument? You think that there are better issues. What better issues do you think can come out of this … in ways that address the question?

Rena# I think performance is the most important thing,

Jason# Yeah

Rena# Because the topic itself is on performance and they're matching performance with money…and question performance and the education system.

Jason# Okay, so the reform of the educational system. So, that's interesting. So how did you use performance to address the issue of teachers being paid? Because the topic that they bring up is that people, teachers should not get paid if their students don't learn. How can you use performance to argue for or against that?

Throughout our session, Rena and I chose which tool to mediate our conversation. Realizing a need to establish content before moving to text and process issues, Rena and I chose a tool that best represented and afforded a discussion of content (see Norman 49). The words in a text are static, better affording discussion of what they mean as opposed to how they were selected.

After establishing a firm understanding of the argument, it was easier for me to share an understanding of Rena's writing process. As the textual replays showed how the text was built up, by revealing the activities that contributed to it, one might expect to find more coordination on issues of text and process in those segments. The segment excerpted below is typical of segments mediated by textual replay.

Jason# It is interesting that you are pausing here. What are you trying to figure out?

Rena# Uh-hmmm I'm thinking.

Jason# Are you looking for words, or are you …?

Rena# Words … how to start a paragraph. Like I knew that I'm going to write more about incentives and benefits … that argument that I made in the first paragraph, but how to start the paragraph properly? How to start it as nicely as the other paragraphs?

Jason# I see, you want it to be linked up … so it sounds like transition sentences are really something you want to work on. How do you see this as being related to the paragraph before it?

Rena# Like in the previous paragraph I'm talking about personal attention and more time for students …Here I'm trying to say that they should be encouraged to do a better job.

Rena and I use the writing activity preserved in the textual replay to talk about her writing process and strategy for approaching the topic. I related her motivations to the actual words on the page, and then showed how the words and arrangement of topics were an enactment of the expertise that she wanted to demonstrate. Together, we engaged in a discussion of transitioning that was both rhetorical (tutor's expertise) and process oriented (student's expertise).

Jason# So you didn't feel like talking about benefits and incentives was clear that you … why would you go there after talking about money? You didn't feel like these two were connected?

Rena# No, I thought that I need to put different thoughts on the issue, but they are related somehow, but I don't show the relation.

Jason# Oh, I see. You know that is probably why you are not comfortable with your transitions. That is what a transition does. It shows a relationship between different subtopics. Well, I'm glad you pointed that out . . . I mean that's what a transition is.

By jointly using the textual replay as a tool to talk about process and motivation, Rena shared my understanding of how her writing expertise was enacted in her writing. Through Rena's description of the motivations underlying the activity visible in the textual replay, I shared an experience of her rhetorical motivations for writing.

At this point in the conversation (segment 13 - T*extual Replay Mediated*), Rena and I concluded that we had different understandings of "transitioning." By coordinating our different ways of understanding "transition," in terms of its rhetorical function and the process for writing them effectively, Rena and I began to share an understanding of what her text should do.

One noticeable change in the session was that Rena and I switched between roles. I started by responding to Rena's text as a reader, trying to understand what her text was saying to me. This role was supported by the text, which affords a response as a reader. The textual replays, on the other hand, afforded me a more facilitative role, allowing me to respond to the writing as a writer. Because the textual replay allowed me to come closer to understanding Rena's motivations for writing, I was better able to help her produce effective writing for her intended audience.

Limitations and Suggestions - What to do about Tools

While the data above do suggest that textual replays can be used to negotiate expertise and coordinate ways of understanding writing across disciplinary boundaries, there are clear limitations to this analysis and to the adaptability of such a technique to the writing center.

First, consider the limitations of the study. This is a case study of one student and one tutor. I do not yet have data that compares the session described above to one where the only mediation available is a text[5]. Though the analysis of references across the different segments of the session indicate patterns of coordination and participation that may be associated with different forms of mediation, comparative data is clearly needed. Additionally, as I was a participant, the results may be unduly influenced by my preconceptions about how the textual replays could be used. However, a more recent study of textual replay use, involving other participants, has shown identical patterns of activity, participation and coordinated knowledge referencing.

The second limitation of this study deals with the applicability of textual replay as a tutoring technique. Many review sessions in writing centers are tightly constrained by time. Students have about 30 minutes to meet with a tutor, talk about their writing and get specific revision suggestions. Us-

ing textual replay requires more time. The writer must record his or her writing before a tutoring session, and the actual review takes upwards of an hour to complete. This problem is partly technological, and it underscores the implicit theme of this paper: We should be considering the kinds of technological mediation that we would like to develop and introduce to the writing center to better facilitate its cross-disciplinary, multiliterate work.

My point has been to show that in writing centers where work is increasingly becoming multiliterate and cross-disciplinary, tutors need to consider issues of mediation to determine how the tools available to us can work for or against our efforts to share writing expertise across disciplinary boundaries. What I offer is a new way to think about writing center work as well as a way to conceive of a new generation of tutoring tools that take advantage of the socio-cognitive properties of technology that is increasingly becoming a fixture in the academic landscape.

Notes

[1] A pseudonym.

[2] Mediation segments are all composed of complete interchanges.

[3] Many of the quantitative results reported here do not reach statistical significance. However, the descriptive statistics used to compare the two mediational technologies do show differences in the expected direction. These trends may reach statistical significance in a larger study.

[4] The fact that so few references to Rhetorical Situation occurred at all is interesting. In a related study, I tracked face-to-face segments in addition to those where participants were focused on text or textual replay. I found that segments where the participants spoke face to face accounted for a similar percentage of Rhetorical Situation knowledge references out of a much larger total. In the same study, a much larger number of coordinated Content references were associated strongly with text mediation.

[5] A comparative study is currently underway.

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It's About the Science: Students Writing and Thinking About Data In a Scientific Writing Course

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Introduction

Unquestionably, college writing courses ought to foster critical thinking. A quick glance through the pages of any issue of the major journals reveals writing teachers' assumptions that (given the correct pedagogical efforts) writing courses should enable students to come to a critical awareness of their positions as writers through learning to read critically. That is, students must learn to analyze texts in order to consider the roles writers might take to resolve issues of importance to themselves and their audiences. In so doing, students become more mature language users and better, more careful thinkers.

The problem for the teaching of discipline-specific writing is that disciplinary standards of style and form often trump writing teachers' concerns for fostering critical thinking; as a result, teachers overemphasize correctness and format. A cursory examination of several popular textbooks on scientific writing confirms that critical thinking is important to many teachers' ideas about scientific writing. Audience analysis and rhetorical purpose are frequent topics in these texts. Yet, in these same texts the discussions about critical thinking are often outnumbered by the details about correct form or appropriate style. For example, one popular textbook on writing in biology states, "bad scientific writing often reflects fuzzy thinking" and "questioning the writing, guides students toward a clearer understanding of the biology being written about" (Pechenik 1997 p. xiii). However, this same text later lists

"keys to success" including "remember the word data is plural" (p. 11), "say exactly what you mean" (p. 6), "always underline or italicize species names" (p. 10), and "don't plagiarize" (p. 9). Another (one with "critical thinking" in its title) makes a connection between clear thinking and effective scientific writing, yet spends a greater amount of time describing correctness of terminology, "true and correct language," and syllogistic form (Moriarty 1997, p.30). The problem with these and other texts that take the same approach is that they provide information about critical thinking only in the abstract and at a time when students are struggling with the meaning and interpretation of scientific data and concepts. When confronted with a morass of abstract information and an assignment due date, students understandably pay more attention to explicit instructions regarding form and style. Any idea that scientific writing is a means to participate in the intellectual life of science is buried.

For students, participation in the intellectual lives of their disciplines means moving past learning disciplinary content, although writing has been shown to help them in this regard—as evidence, consider the many studies of writing across the curriculum (WAC) programs. However, if students are to learn the rhetorical tools needed to become active participants in their fields (Bazerman 1992), WAC needs its counterpart, writing in the disciplines (WID). WID extends WAC in that both WID and WAC help students to think critically about disciplinary content; but WID also helps students to develop their writing skills as they articulate their understanding of content in genres appropriate to professional audiences. Understanding WID in this context has shaped our goals in the upper-division scientific writing course that we discuss below. Our goals for this course have been 1) to create a context in which students focus on learning about science and scientific data, 2) to demonstrate how scientific writers use genre to respond to rhetorical situations, and 3) to provide students with a set of rhetorical tools that they can apply as they articulate their own ideas. In reaching these goals, students are able to overcome the duality of academic expertise (Geisler 1994)—they are simultaneously able to learn disciplinary content and the rhetorical skills necessary to articulate that content to a professional audience. Such an approach can help to demistify the relationship between scientific language and the structure of scientific knowledge (Stockton 1994).

OUR APPROACH

Our approach is based on the belief that a generative view of genre can be the basis for students learning how to think critically about science. The generative view of genre is advanced by Coe (1994), who argues for recognition that writers' creative processes are influenced and socialized by their awareness of forms appropriate to the rhetorical situation in which they are writing. In this view, form is both constraining and generative; it effectively eliminates certain options from consideration, yet it provides opportunities for writers to engage in purposeful communication with their audiences in ways those audiences recognize as legitimate (Cooper 1999). A genre-based approach to teaching writing, then, goes beyond formalism. In moving past formalism, teachers of rhetorical genre enable students to see the larger social purposes behind language structure (Cope & Kalantzis 1993). By critically considering these purposes as well as their own for writing, students come to see their writing in the context of their roles as professionals.

This idea of genre as generative leads us to define *scientific* writing in the following way: specific types of documents that scientists typically write and read in their professional work. The definitive feature of these documents is not, as formalism would suggest, an abstract collection of conventions. Rather, for us, what defines scientific writing is that rhetorical situations, audiences and goals are directly related to scientific practices. Thus, the class emphasizes critical thinking tasks that scientists must perform in order to successfully participate in scientific fields; these tasks include working with data and interpreting the meaning of data, and framing scientific issues and understanding the complexity of those issues. In this way, the class fits into a larger process of learning what it means to think and act like a professional scientist.

In fact, a number of scholars have noted that learning professional genres is part of a larger developmental process in which students learn to understand and critically analyze data and issues as professionals. As Driskill, Lewis, Stearns, and Volz (1998) said, rhetorical knowledge influences students' abilities to reason critically and think about science. Writing teachers can facilitate this process by helping students think about data in legitimately scientific ways—that is, in ways

that will be useful to other scientists. As Haas (1990) pointed out and as Winsor (1996) confirmed, learning to write well for one's disciplinary colleagues comes from an understanding of the conditions under which one may participate in the discipline. In our course, we facilitate that understanding by exposing students to scientific literature and discussing with them the rhetorical options illustrated in that literature—in other words, about the possible means by which they may use genres to participate in their fields. In fact, Bazerman (1994) states that genres enable writers "to advance their own interests and shape... meanings in relation" to their fields, as well as to "grant value and consequence to the statements of others" (p. 79). With this in mind, our course provides students with the opportunity to see their writing as a means to agency (that is, to legitimate participation in science) and as a way of learning to assess the written contributions of others. In this way, we underscore the concept that genres are generative, for each genre provides scientific writers with a range of possibilities for agency, and scientific readers with a range of possibilities for response.

As generative, genres are seen not as restrictive collections of arbitrary "standards" but, as Miller (1984) has explained, "the rhetorical means for mediating private intentions and social exigency" (p. 163). This view leads us into conversations with students about scientific writing, in which we emphasize that "acceptable" scientific writing is always undergoing incremental change—since individual writers must deal with the fact that rhetorical situations resemble each other only superficially (Freedman & Adam 1996). In other words, we present genres to students as possibilities from which they must learn to generate texts that accommodate their individual goals while at the same time serve the needs of their field. As such, we help them to see "available patterns through which [they] might act" (Berkenkotter & Huckin 1996, p. 24) in their efforts to communicate science through writing.

Our Tools

Building on our generative approach to genre, we operate under three principles. First, like many writing teachers, we teach writing as a process of drafting and revision. Second, also like many others, we recognize that when students work with ideas in multiple contexts, they come to understand them

in more comprehensive ways. Finally, we acknowledge that writing assignments are most effective when they build on students' own interests, and follow a progressive course structure. In our course, we sequence assignments that 1) allow for multiple revisions throughout the semester; 2) are typical genres of scientific writing appropriate to different contexts (a literature review, a deliberative essay, an article critique, and a research proposal); and 3) are not rigidly formulaic, in that they leave room for individual variation in developing arguments.

While the success of the course does not necessarily depend upon the use of this sequence or these genres, our experience is that students show marked improvement in their understanding of scientific data when they follow this progression.

To facilitate this progression, we offer students multiple opportunities for feedback, both from their peers and their teachers. While our motivation for implementing these activities is mostly pragmatic—scientists often work in groups, and receive feedback from peers and superiors—it also allows students to read and respond to others' work from fields similar to their own. We feel this provides them additional insight into the academic work of science, for it exposes them to the review/response process that is a hallmark of scientific publishing. Furthermore, collaboration in document development contributes to students' engagement in their learning (Burnett, White & Duin 2000) and can help them to see additional perspectives on the content of their papers (Trimbur 1989). These activities are used throughout the sequence of assignments.

The sequence of assignments, we feel, maximizes students' abilities to see scientific data in multiple ways. Beginning with a literature review of a very specific issue within a scientific field gives them an opportunity to gather information, explore the complexity of an issue and encounter the chaos of initial research. It also allows them to identify relevant concepts, disagreements, and patterns within a body of research. We next move into a deliberative essay, in which the students use the literature from the review as a basis for understanding the data and their applications to different contexts. In their essays, the students must articulate ways of working with data to solve complex issues. After the deliberative essay, students critique a chosen article from the literature they have worked with in order to assess this particular article's

contribution to the debate articulated in the deliberative essay. This assignment also requires them to use additional sources from their previous assignments to support or reject the line of thinking reflected in the article. Finally, the students write a research proposal that advocates new work within their field. The proposals come about in a number of ways: from identifying areas in need of research in the literature review; from recognizing the implications of certain lines of research through writing the deliberative essay; and/or from assessing in the critique the strengths and weaknesses of previous research.

This sequence provides students with opportunities to read and address issues raised in the literature, and to use data in various contexts. In so doing, they begin to clarify for themselves the possible interpretations of the data and how those interpretations can be applied to various arguments. Although the data drive students' understanding of a topic, the particular genres generate a range of rhetorical possibilities for articulating that understanding. As students acquire knowledge of the genres and use them in the sequence, they develop their abilities to identify rhetorical possibilities embedded in each genre. This process helps them to engage data in meaningful ways.

By helping them to engage data meaningfully, our sequence of assignments makes our scientific writing course as much about *thinking* as it is about *writing* (see Stout 1997). As students draft and revise their assignments, we see their thinking and writing about the issues and the evidence developing along four different lines. These developments, or shifts in thinking, come about due to the multiple opportunities students have to critically evaluate and apply data from the literature in the sequenced assignments. First, students learn ways that scientists work with data to address questions of significance to their fields. Second, as they come to see how scientists interpret data, they also develop their own ways of thinking about scientific research and evidence. Third, they learn that multiple frames exist for scientific debate, and that data may be framed and reframed according to the requirements of various rhetorical situations. Finally, students are better able to articulate in writing the richness of scientific data and the complexity of scientific issues. Because we see a close connection between learning genres and understanding data, we believe that in order to acquire competence in writ-

ing the genres, students must shift their thinking about data in the above four ways. By making these shifts, students develop critical thinking skills needed by professional scientists as they participate in their fields.

CASE STUDIES

To illustrate how students may accomplish these four developments, we now present four case studies. In each of the case studies can be seen at least one of the above shifts. While we are not naïve enough to believe that all our students accomplish all of the shifts, we do contend that the assignments in sequence help students move through all four to some degree. As such, we present the case studies as illustrative, yet not perfect, examples. But while imperfect, the case studies do illustrate how four students came to think and write more critically about how available data influence scientific argumentation.

Sarah: Learning to work with data

Sarah, a third-year biology major, described herself as a "bad writer"; indeed, her writing showed many mechanical errors at the beginning of the semester. While Sarah's mechanics did improve—substantially—by semester's end, she learned a more significant lesson about the nature of validity and generalizability of scientific evidence.

Sarah chose to investigate the relationship between aspartame consumption and adverse reactions in phenylketonurics, that is, in people whose metabolisms cannot process phenylalanine. Phenylalinine is present in varying quantities in products sweetened with aspartame—and those who cannot process it typically suffer brain damage as a result of ingesting those products.

In her literature review, Sarah found a scientific issue within this topic—the lack of definitive studies—but she did not provide a valid criticism of those studies for her readers:

Most laboratory studies are examining the possibility that aspartame consumption provokes adverse neurological reactions in phenylketonurics. . . the problem with the current research is a lack of studies utilizing many human subjects...

Her argument for her literature review was that the small sample size prevents the data from being authoritative, and thus the studies could be discounted or invalidated; she contended that they were not generalizable.

Through written comments, the instructor pointed out that sample size alone is not a determinant of validity nor of generalizability and asked her to consider if there was something about the sample that would indicate it was not representative of the overall population.

Sarah had no answer; since her experience in science was limited, she couldn't find reason to discount the samples on anything but their small size. As she continued to comb the primary literature, Sarah found *no* study that satisfied her requirement of "adequate" sample size. Because of this perceived stumbling block and her own frustration, she chose to change her entire topic for her deliberative essay. However, as evident in her mid-semester conference, she continued to search the literature for studies on phenylketonurics. She told her instructor that one article mentioned the difficulty of finding large numbers of phenylketonurics—evidently, it's a rare disorder—and that she was changing her mind about the studies: perhaps they were valid.

Still, she continued to struggle, on paper, with generalizability and validity. As she began drafting her article critique, Sarah returned to her original topic and found a way to shape her criticism to a scientific audience. She aimed to make a methodological critique of a published study, but she knew she could not criticize the piece strictly for its sample size without risking having her arguments appear invalid. Her arguments in the draft were 1) the failure of the study to account for long-term effects; and 2) "only thirteen PKU [phenylketonuric] heterozygotes were examined."

Again, the instructor pointed out the problems with a critique based on number alone: "The study *is* valid—there is no reason to discount the methodological logic and design, which is what determines validity." The instructor further questioned if she was really talking about *generalizability* by referring to one sentence in the draft of her critique that appeared to make the distinction clear:

It may prove helpful to use the results of this study as a base for further research of PKU heterozygotes.

This one sentence indicated that Sara was beginning to shift her thinking about the evidence—she was no longer looking exclusively for this article to provide the definitive (that is, a clearly generalizable) study. In her revised critique, she made this point the focus of her paper, still mentioning sample

size but now viewing the study as a *beginning* or as a contribution to a conversation. Her thesis statement from her critique indicated a significant change in her thinking about what can be useful (that is, valid) about a study whose results are not necessarily generalizable:

> Because the explanatory power of the results is lessened by the small sample size and short duration of the study, it may be useful to construct new protocols in future work.

Notice that she immediately referred to future work, taking her idea of the "base" to its logical end and serving her field in a way that is quite scientific: encouraging more research when it appears necessary to do so. In her proposal, written soon after her article critique, Sarah responded to both of her earlier criticisms by designing a longitudinal study of phenylketonurics identified from previous studies—the meta-analysis needed, in her view, to solve the problem of generalizability. The proposal genre allowed Sarah to address the problem of nongeneralizable data because the proposal genre requires a response to past studies that problematizes, but does not reject, the data in those studies. Because of what she learned about how scientists work with data, Sarah came to see how scientists critically evaluate past data to identify opportunities for future research.

Elissa: Learning to interpret data

Elissa, a third year biology major whose father is a cancer specialist, was determined to address some medical issue in the course. Throughout her life, many family discussions focused on diagnosis of and treatments for various types of cancers. Even though she had heard that ovarian cancer was more rare than breast cancer, she wanted to research why the mortality rate for ovarian cancer was so high and why the medical community was not doing more to prevent deaths. Her perspective was that if the medical community simply screened women (like they do for breast and cervical cancer), women would not die from this disease at such a rate. Her understanding of scientific evidence was simplicity: it either provided treatments and cures for everyone or it didn't. The idea that multiple interpretations and applications of data exist was not apparent to her.

From her initial understanding of the literature for her literature review, she concluded that "the prognosis of ovarian cancer is low because of the limited use of the diagnostic tools and the insensitivity of current treatments." Although she cited data that demonstrated that one blood test (the CA125) provided an 80% accuracy and that the ultrasonogram showed estimated sizes and shapes of tumors, she could provide no analysis of when or for whom the data were applicable.

Her instructor suggested that she read the primary studies more closely and try to determine under what circumstances and for what population the test provided the results she cited. Her initial response was that she should change her topic because the data she read was too confusing. However, with some encouragement from the instructor to persevere by reading more studies and discussing those studies with others, she attempted in her deliberative essay to use those studies to support her argument that the general female population should be screened for ovarian cancer. Yet, when she tried to argue that perspective, her research left her increasingly frustrated.

In her mid-semester conference with the instructor, she noted that the research as well as subsequent discussions with two cancer specialists (one being her own Father) all contended that implementing diagnostic tools for the general public was only seen as appropriate if the diagnostic tool decreased the mortality rate. Because neither the blood test nor the ultrasonagram were found to decrease mortality (they only increased the survival by 3-6 months), these screening devices were not considered sensitive enough to use for the general population. Her frustration with her deliberative essay as well as her dissatisfying search for an article to critique for the next assignment motivated her to continue searching the literature.

With continued prompting, she began to investigate under what circumstances and for which populations a CA 125 might be accurate and an ultrasonogram might provide supporting evidence. She then began to focus more closely on the population most at risk for ovarian cancer and the population for whom diagnostic tools might be most accurate. By researching forward in the literature via the Web of Science (a science citation index) she found a number of articles, one that she chose to critique for her third essay, which focused on ovarian

cancer rates in postmenopausal women. She found the incidence of ovarian cancer increases rapidly after 50 with the peak incidence around 70-74 and that preliminary trials are using the CA 125 and ultrasonograms to set baselines for *postmenopausal* women. This critique was a turning point in her understanding of this issue, for when she realized the women most at risk were postmenopausal, she was able to reinterpret the data she had written about in the literature review and deliberative essay.

In light of her additional research, Elissa revised her literature review to provide insight regarding what researchers know and don't yet know about diagnostic tools, and she began to rethink her thesis for her deliberative essay. Finally, her proposal gave her the opportunity to consider the research to date and her new interpretation of it. Because preliminary trials were using the CA 125 and ultrasonograms to set baselines for postmenopausal women, she proposed studies be designed to track those women for 10-20 years, using this baseline (much like what is done with mammograms). By working through the full sequence of genres, Elissa was finally able to let go of her belief that "just better screening" would save lives.

She stated her final conclusions in the following way: A much more effective screening would result if only postmenopausal women were screened because 1) they are at highest risk 2) the diagnostic tools are more accurate for these women 3) if these tools detect the cancer early, the 5 year survival rate jumps to 80% (vs. 25%).

Elissa came to realize that diagnostic tools or treatments for diseases cannot always provide simple answers to illnesses: She learned that interpreting data is often very difficult; in order to do so correctly, she had to understand the precise ways which medical practitioners can and cannot apply specific research.

Zach: Learning to reframe issues

Zach, a fourth-year biology major, selected "medical marijuana" as his topic of interest. Not surprisingly, the first draft of Zach's literature review confirmed what his instructor had feared—he had absorbed a lot of the popular literature on the topic but did not seem to be familiar with the science surrounding the topic:

> Marijuana, pot, weed, cannabis; these are all differ-
> ent terms for the (partially) socially acceptable drug
> that fuels a great controversy... despite the pros and
> cons the evidence on both sides are compelling enough
> to warrant a reanalysis of the legality of the drug...

> Upon review of the research, the data on the effects of
> marijuana paint both a positive and negative picture of the
> drug. There is an inordinate amount of conflicting data and a
> serious prejudice that hinders the ability for proper research.

As these excerpts suggest, Zach saw medical marijuana
as a neat "controversy," with good and bad sides, and a clear
right and wrong, in order to justify his evident feelings that
marijuana should be legal for medical usage. Of course, the
legal/political issues about marijuana use are very different
than the scientific ones. However, Zach didn't know enough
about science, or the limitations of the genre, to know that he
shouldn't address a legal question in a review of the scientific
literature designed to be read by scientists. Furthermore, al-
though he claimed an "inordinate amount" of conflicting stud-
ies had been done, he cited only three primary articles—indi-
cating he did not yet see the need to base the review on certi-
fied, peer-reviewed science. He still saw the research as fuel-
ing a legal, not scientific, disagreement, and he wanted his
writing to bring it to a close—an inappropriate (if not impos-
sible) goal for a scientific literature review.

During the class workshop, Zach received comments from
his peers which discouraged him. Some of the comments writ-
ten on his draft seemed to show their confusion about his
topic and motivation: "Are you sure you want to get into this
question?" and "Is this a paper about medical uses or effects?"
These comments reflected some confusion, obviously, and they
pointed Zach to larger rhetorical questions: What *was* his
purpose for writing a scientific literature review? What was
the issue at stake? How would he address the conventions of
the genre, yet still use it to serve his rhetorical goals?

Zach's instructor attempted to prod him to clarification.
In response to one of Zach's drafts, the instructor offered:

> It's hard to see what the technical/medical signifi-
> cance is here. You spend 1 1/2 pages relating
> marijuana's therapeutic uses but there's no indica-
> tion of why your audience should have that informa-
> tion. It's hard to see because the sources from which
> you draw are not scientific—they are journalism—

and so, it's difficult for you to define what the *scientific* issue is here. Is it that scientists don't understand the effects? Is it being underutilized as therapy? Or what? Go to the primary literature and see what the research shows; then draw some meaningful conclusions to guide research (not law).

Zach's initial drafts of his literature review did not improve substantially; however, through writing the deliberative essay he learned how to define an issue of relevance (the need for marijuana policy reform) to his targeted audience (in his case, the Food and Drug Administration). By writing his deliberative essay, Zach was forced to separate political from scientific issues because he had to focus on policy in order to address the FDA. After assessing additional primary literature, largely in preparation for his article critique, Zach realized that scientists researching marijuana and its medical uses were not concerned so much with policy as they were with determining biochemical pathways.

Through preparing for his critique, he found a way to define an issue of interest to science: a lack of reliable information about marijuana's biochemistry on which to base policy decisions regarding medical marijuana use. Finally, in drafting his proposal, Zach was able to reframe the issue of medical marijuana in a way that showed his understanding of the differences between scientific and political questions. From the proposal's abstract, it's clear that Zach successfully reframed his topic without abandoning his original interest:

Marijuana (cannabis sativa) has been found to have a countereffect on the reward system of rats. This reveals that cannabinoids do not cause dependence in organisms ingesting tetrahydracannabinol-9 (THC-9). However, this evidence does not positively identify the effects on the human reward system. Thus, this experiment aims to identify how these endogenous chemicals affect human reward systems... If research could substantiate that the humans' counter-reward system is congruent with the rats', then the issue of dependence could be resolved. This issue is one of the most often heard in arguments that group cannabis with recreational narcotics.

Zach was finally able to reframe his thinking because he better understood the nature of a scientific issue. The proposal genre offered a chance to apply what he had learned about issues through writing the previous assignments. In

Zach's proposal, he was able to distinguish between the metabolism of cannabinoids in rats and humans, and to understand the problem the unanswered scientific question regarding metabolism in humans presented. In so doing, he made the point that lack of definitive evidence is the *scientific* issue in this case. What is more, by keeping his interest in politics intact, he defined for his readers the role of his research in resolving the larger legal question he originally wanted to answer.

Clarissa: Learning to appreciate the richness and complexity of data

Clarissa, a junior biology major, worked part-time for a consulting firm which worked on a number of asbestos related cases. She explained that what she was learning on the job fueled her interest to research asbestos removal and asbestos related diseases. Throughout the semester, her papers reflect a gradually more sophisticated understanding of the complexity of the data she uncovered and a better understanding of how to apply those data in the appropriate context.

As she drafted her literature review, her initial conclusion about asbestos was that it is still a health hazard. Some sources provided data that stated that "80% of malignant mesothelioma occurs in men exposed to high levels of asbestos"; other sources stated that the EPA claimed that "younger people are more likely to get mesothelioma." Because Clarissa generalized these context specific data to multiple and interchangeable contexts, one of the summary conclusions she reached on an initial draft of the literature review was that "we need to get this hazardous material out of schools."

Through written comments on her draft, her instructor prompted her to provide a more thorough understanding of the relationship among the data. Clarissa was asked, for instance, to make sense of the literature that discussed the effects of high levels of exposure on children as well as the literature that discussed asbestos related illness (mesothelioma) in men. Her interpretation of the data from these various sources was that just because young people are "more likely to get mesothelioma" they must be exposed to high levels. Her instructor questioned this assumption and commented:

Just because children are at higher risk does not necessarily mean that they are exposed to levels that can

lead to illness. Where and at what levels are children exposed to asbestos?

Clarissa continued to search for confirmation of her conclusion regarding children and asbestos to support her deliberative essay; however, she uncovered many conflicting opinions about the data and began to notice "other" pieces of information in the articles. The data continually referred to specialized workers, the general public and children, as well as low levels and high levels of exposure. In inventing the argument for her deliberative essay, she had to work through these complex data to determine their significance. In particular, if she was to argue successfully, she knew she had to distinguish between when and for whom different levels of exposure were problematic.

As she continued to search for clarification, she encountered data on management strategies and asbestos and found that the risk of disease was very small when asbestos management strategies were in place. As a result of her continued research and developing awareness of the data, she focused her deliberative essay on management strategies vs. removal. Her working thesis became:

> Maintaining rather than removing intact asbestos is preferable because the general public is not exposed to high-levels and rarely exposed to even low levels (and if so, for only short periods).

Although her deliberative essay helped her to better understand the effects of high and low exposure levels, she still could not distinguish between the effects of short and long term exposure. However, through writing her article critique, she realized this distinction. She critiqued an article that clarified the relationship between high levels and deadly diseases (the positive correlation) and long-term low levels and deadly diseases (an unknown correlation). She also realized at this point that school children are not exposed to high levels and are rarely exposed to low levels, and even then, only periodically. This article critique helped her see that she had to interpret and apply the evidence she was finding in terms of four factors: the level of exposure, the length of time of exposure, the type of exposure (specialized worker vs. general public), and the management strategy in place (maintaining vs. removing the asbestos). When she realized the complexity of

the issue and that she had to consider data that touched on all of these factors before she could present a convincing argument, she was finally ready to revise her earlier papers and present a proposal. For her proposal, Clarissa was able to use her newly acquired understanding of the relationship among these four factors to devise an appropriately complex study. She suggested a study that tracked, over long time periods (10-15-20 years), one set of specialized workers (school custodians), who are exposed to low levels of maintained asbestos in the schools.

Overall, as Clarissa began to appreciate the complexity and intricacies of the research, she also began to use data more appropriately and not to generalize context specific data to multiple contexts.

Comments on the Case Studies

As stated above, we do not wish to suggest that all students in our classes experience the shifts in thinking that Zach, Sarah, Elissa and Clarissa did—no teacher and no course can insure 100 percent success. However, we do argue that our course provides students with more and better opportunities to make those shifts than formalist instruction in scientific writing can. In addition, although the examples above focus on the development of specific areas, we also realize that these areas cannot be easily separated. That is, as students learn to use and interpret data, they reframe the issue; as they reframe the issue they come to more fully appreciate the complexity of their topics. Their learning is recursive and interconnected.

Finally, the four students whose work is described above were able to succeed by taking advantage of the opportunities presented by the structure of the course, but they also were enabled to act by certain contextual factors. Were these contextual factors not present, we contend that students would not be as able to complete the assignments; they also would not be as likely to see the relevance of the course's work to their major studies and to their field. Hence, courses such as ours cannot be a panacea for all problems that face writing in the disciplines. However, the course does illustrate how, if other factors are present, students can make significant shifts in their thinking about science and scientific data.

CONCLUSION

Of course, we also contend that these "other factors" cannot be ignored. At the curricular level, these factors include strong commitments to undergraduate education and research, including funding and mentoring programs. Our students enjoy an environment in which many faculty members share the responsibility for instruction in scientific writing (cf. Gottschalk 1997); biologists in our department accept and support the presence of writing as integral to the curriculum. What is more, our university supports undergraduate science majors through small research grants, which must be applied for through a proposal-review process. Many of our students use the course to develop proposals for those grants, offering them an immediate sense of rhetorical purpose. Because these research opportunities are present, students are legitimized as participants in the scientific work of the university—a kind of peripheral participation that allows them to see themselves as scientists. The net effect is to raise the students' expectations of themselves, which stimulates their efforts to think as scientists instead of students. Our students are affirmed in these efforts by the biology faculty, whose research projects often provide opportunities for undergraduate researchers.

Additionally, the writing courses are offered within the biology curriculum; as such, they create a context for writing for the students: Students see themselves as scientists learning how to write rather than students in a writing class in which they are permitted to write about science. Also, at the departmental level, our course is supported by the presence of other writing-intensive courses for biology majors. These courses—which are entitled "critical thinking" courses—are seminars in which scientific literature is read and reviewed collaboratively by faculty and students. The students write critical responses to what they read. In so doing, they come to learn how scientific readers understand and analyze the literature, just as they do in our classes. What is more, in the critical thinking courses, they have the opportunity to see their professors as scientific readers and writers—which may help to clarify the ways in which scientific writing is read, interpreted, and used. The courses create within the biology curriculum a strong position for writing and, accordingly, support for writing instruction among the biology faculty.

We hope the point of the above discussion is clear: In addition to moving beyond formalism, it is also important for a course in scientific writing to be located within an appropriate curriculum, and to have institutional and faculty support for students as scientists-in-training to realize its potential. If these factors are lacking, students will receive from other vectors messages contrary to what the best scientific writing course would emphasize. When no clear role is understood for writing in a science curriculum, more often than not the result is a formalistic emphasis on correctness. If no opportunities exist for students to make writing instruction relevant, they (understandably) will treat that instruction as an exercise with no application outside the completion of assignments. While writing in the disciplines can effect changes in students' thinking and can move them to a more professional relationship with technical language, it cannot overcome institutional factors that encourage a narrow formalism. If these factors and formalism are finally to be overcome, it is first necessary to cement a place for writing in science curricula.

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A Critical Thinking/ Discipline Specific Model for Teaching Writing through Service Learning

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I.   Introduction: The Problem of Institutionalization

Edward Zlotkowsi, writing in the journal *Change* in 1996, offers the following observation about the present state of service learning at universities across the nation:

> How is it possible for service-related activities to be enjoying record levels of acceptance on campuses across the country—acceptance among faculty and administrators as well as students—and at the same time, for the service movement to have made relatively little impact on the culture and consciousness of the academy in general, on the way in which its members define themselves and their work? (23).

Assuming real academic currency as a goal for service learning if it is to survive in any respectable manner, Zlotkowsi goes on to suggest that service learning's ability to achieve this goal depends upon its enacting "some important strategic adjustments" (24) by which service learning becomes academically rather than "moralistically" driven. In the context of the university today, where academic validity is primarily a function of disciplinary specialization, Zlotkowski sees little choice but for service learning to define its pedagogy in terms of "specific disciplinary and interdisciplinary goals" (25).

Certainly, operationalizing this goal seems relatively uncomplicated when teaching in fields that are, in fact, marked by a definable body of disciplinary knowledge—biology, political science, marketing, mechanical engineering, to

name a few. What becomes less easily discernible, however, is just how to dig in to disciplinary-focused teaching in fields that are, by virtue of their function in the academy, extra-disciplinary. No other field, we would venture to say, faces this challenge with more difficulty than the teaching of undergraduate writing. Whether housed by English departments or in independent programs, the teaching of writing has become, both academically and institutionally, essentially extra-disciplinary—underfunded, understaffed, and underprofessionalized. If service learning in the context of writing instruction is to gain the academic currency that seems more readily available to service learning in the context of specific disciplines, then we have to find approaches that allow, at least, an anchor in the notion of disciplinarity. It is certainly true that service learning taught in composition courses can take on the disciplinary focus of the field in which students are writing; this is most evident in courses that focus on engineering and business writing, for example. But this disciplinary focus is not always the case in more general writing courses and has not necessarily been the focus of service learning composition teachers to date, as we will show in our overview of service learning pedagogies in the next section of this paper.

Our newly-developed course in the University Writing Program at the University of Colorado at Boulder offers a model of teaching upper-division writing that helps move us towards the goal of establishing academic legitimacy through disciplinarity. To be sure, the course builds on previous pedagogical models of service learning that call for significant community and political involvement by students. And the course is careful to allow for an equitable dynamic between ivory tower and community—something to which Linda Flower has recently drawn attention. But, more important for the concern at hand, the course forms an alliance between a somewhat more traditional rhetorical strategies approach and a Writing in the Disciplines (or WID) approach to establish academic legitimacy through a discipline-specific model. It is somewhat obvious that one of the best allies that a service learning writing course has is a discipline-focussed approach to writing, such as WID or WAC, and we don't claim to be the first to point this out. We take our lead here from, amongst others, Tom Deans' preliminary comments regarding the relationship between service learning and WAC, which

suggest that an alliance between service learning and WID can ensure service learning's longevity within the academy.

However, it seems that too often WID can end up being taught with undue attention to format and other surface-level concerns of producing documents, to the detriment of developing students' critical consciousnesses needed to write effectively and responsibly within and about their chosen fields. Thus our fear is that without a strong critical thinking component to WID, discipline-specific writing may lose its potential to move students beyond a simple grasp of discipline-specific genres toward an ability to solve problems in necessary social and political contexts. And if one of the goals of service learning is to expose students to the real social and political contexts in which they must and will do their disciplinary work, then critical thinking is essential to any meaningful service experience. To give students this ability, teachers of service learning must consider carefully both what they mean by critical thinking and how they might teach such cognitive skills within particular fields of study. John Dewey, a founding figure of critical thinking as we know it today, still offers one of the most useful definitions of critical thinking. Dewey conceptualizes critical thinking as an "experimental method" of gaining knowledge. For Dewey, knowledge is not so much a stable body of ideas, as it is a set of hypothetical assumptions that we test and improve through creative and inquisitive thinking. Thus for Dewey, critical thinking is a vital step towards logic and problem solving. Dewey's ideas are particularly useful for our critical thinking/discipline-specific model because they remind us that knowledge, but perhaps especially disciplinary knowledge, despite its many fixed conventions, is simultaneously fluid; it is a product of ongoing inquiry for which critical thinking serves as a crucial catalyst.

Recently, more politically-situated scholars such as Henry Giroux and bell hooks have considered critical thinking in ways that are vital for service-learning. Both Giroux and hooks see education as a form of cultural politics whose mission is to prepare students for participation in democratic life; they argue that one of the teacher's indispensable roles is to develop students' critical voices so that they may inquire and challenge current social and political formations in developing their own critical consciousness. For Giroux, the failure of democracy in America has at its roots the "refusal

to grant public schooling a significant role in the ongoing process of educating people to be active and critical citizens capable of fighting for and reconstructing democratic public life" (199). For hooks, education is about the "practice of freedom" (4) whereby students learn to engage and critique systems of domination and discrimination; critical thinking, argues hooks, is the essential means for achieving these pedagogical goals. Like Dewey, then, Giroux and hooks do not see education as the simple acquisition of knowledge, but as something more active and dynamic that has real consequences for individual students, for disciplinary knowledge, and for society at large.

It seems, then, that critical thinking, as envisioned by these scholars, provides a pedagogical framework that would dovetail well with service learning's goals of civic awareness; in turn, service learning provides a fruitful context for teaching critical thinking because of the multi-faceted dynamic it presents to students as they step outside of the classroom into the larger community. Indeed, Janet Eyler and Dwight Giles's recent volume *Where's the Learning in Service Learning?* presents data from two national research projects to support the claim that service learning can teach critical thinking skills. However, they warn that courses have to be carefully designed so as to develop such skills. The course we discuss below is an attempt to develop students' high-order cognitive skills in the context of specific disciplinary knowledge. We believe that this approach not only gives students the critical consciousness they need to produce valuable academic work and to live as active citizens beyond the ivory tower, but also helps institutionalize service learning as a credible pedagogical approach. This paper, then, will outline the pedagogical basis of our course and will explain how that basis translates into a host of practical matters including pre-course project development and agency liaison, the nature of specific projects and the necessity of matching students with appropriate projects, actual classroom instruction, and agency-student-academy dynamics. Moreover, it will examine—in the contexts of classroom instruction and actual student work—the way in which the course encourages the development of knowledge as the product of critical inquiry within a student's particular field of study. Ultimately, the paper works towards articulating how this approach can further institutionalize service learning by prioritizing critical thinking in the context of disciplinarity.

II. The Evolution of Service Learning in the Writing Classroom

Early approaches to teaching writing through service learning conceived of writing assignments largely in terms of students' personal responses to service completed for an agency. One of the most popular venues for this approach was tutoring, most commonly in adult literacy centers, where students responded to the experience of tutoring and service functioned as a means for, primarily, students' personal growth. Responses to this largely journalistic approach have re-thought service learning in a variety of ways. For one, service learning is sometimes used as a way for students to gather research data for term papers. Another revisionist approach—sometimes called a "leadership" approach—uses service learning to provide students with "value-added" skills that will enhance their resumes and allow them to compete more successfully on the job market. Both of the latter approaches give service learning a more functional, rather than personal, exigency. Recent critics have responded to both the experiential and functional approaches with concerns regarding the possible absence of real social engagement and academic rigor. Susan Stroud, director of Campus Compact, has warned:

> If our community service efforts are not structured to raise the questions that result in critical analysis of the issues, then we are not involved in education and social change—we are involved in charity. (3)

As teachers of writing have heeded Stroud's caveat, they have revised previous models of service learning to enable students to analyze critically the complex social and political issues they encounter in service learning placements. Certainly, one noteworthy response is offered in Bruce Herzberg's much-cited "Community Service and Critical Teaching." Herzberg shares Stroud's concern that service learning writing courses nurture students' more private experiences in lieu of critical intellectual development and active participation in the public realm. As he notes, "Writing personal responses to community service experiences is an important part of processing the experience, but it is not sufficient to raise critical or cultural consciousness" (309). Herzberg adapts the literacy model of teaching writing through service learn-

ing by juxtaposing critical texts, such as Jonathon Kozol's *Savage Inequalities*, with student service in an adult literacy center. This adaptation enables his students to complete writing assignments that grapple with questions regarding inequitable social structures and ideologies surrounding adult literacy in the United States. Other writing courses and programs across the country have developed various permutations of this approach. For example, the Michigan State University Service Learning Writing Project has incorporated a similar kind of logic into writing classes that focus on issues of democracy and civil society.

The above-mentioned pedagogies—insofar as they require students to write *about* the service they perform—pose challenges to the teaching of discipline-specific writing that has come to characterize much of the current discussion of upper-division writing instruction. Certainly, if students are writing for their teachers, there is room for critical thinking. The notions of audience and purpose, however, remain less immediate, and the application to discipline-specific writing is not immediately discernible. Such work involves students in education, but nevertheless holds social involvement at bay, asking students to think about problems but not to solve them actively.

Another strand of service learning, which conceives of student writing *as* rather than *about* service, can provide a fruitful way out of this bind. Paul Heilker of Stanford University argues, in "Rhetoric Made Real: Civic Discourse and Writing Beyond the Curriculum," for an approach to service learning that defines "writing as social action" (74). In this course, according to Heilker, students "actually complete essential writing tasks for the non-profit agencies in which they are placed" (74). Thus, Heilker argues, students encounter a real rhetorical situation in which they complete real tasks that have real purposes and real audiences. Students must understand the "philosophy" of the agency and, by writing from within the agency, from a position of "true authority" in the community, students gain the power to change through their own words—albeit modestly—the worlds in which they work. This model, Heilker contends, enables students to learn "the values and utter necessity of active, participatory, informed, responsible, rhetorical citizenship" (76).

If students are placed in actual agencies, then they are simultaneously and inevitably immersed in whatever profes-

sional field(s) that agency is privy to. Questions of audience and genre are no longer mere classroom constructs but are agency realities. Thus the writing *as* service approach can provide fertile ground for the future of service learning not just because it offers the immediacy of community participation, but also because it presents the potential for students to engage in critical analysis while practicing discipline-specific discourse. However, the two concepts, service and learning, become dynamically interwoven only if the type of learning under this model aids in awarding service learning substantive academic rigor.

III. Writing Program Goals at the University of Colorado at Boulder

The University of Colorado at Boulder's Writing Program demands a strong emphasis on critical thinking. We teach that knowledge and learning result from an ongoing process of inquiry, assertion, critique, and revision; in our minds, writing at the university level should reflect this process. Thus, in all our writing classes, analysis and argument play an integral part because they are two of the most appropriate tools by which students can engage in such intellectual inquiry. Especially for upper-division students, description, while necessary to complete analysis and argument, is not in and of itself acceptable as a major writing assignment. Descriptive writing, we feel, too easily elicits the mere demonstration of existing knowledge, rather than the higher-order critical thinking encouraged by Dewey, Giroux, and hooks for the reasons we discuss earlier. Essentially, then, our courses train students in the strategies and nuances of critical academic discourse.

Increasingly, however, our upper-division courses are moving towards situating writing within specific disciplines whereby students address the contexts and constraints that shape discipline-specific writing and, where appropriate, examine the very discursive nature of disciplinary knowledge. Arts and Sciences students choose from a wide variety of topic-centered writing courses, many of which demand that students choose appropriate "real world" genres to achieve their rhetorical purposes. For example, a student in *Writing on Contemporary Women Writers* might be asked to write a letter to a school board arguing that Joyce Carol Oates's "Small Avalanches" is or is not appropriate reading for a high school

junior. Engineering students in *Writing on Science and Society* might write a letter to the editor about an article in the *New York Times Science Times* or might write a popular magazine article analyzing some issue in their specific discipline.

IV. Our Model: Course Rationale and Design

In our course, students' writing *is* service; it is the means and end to service. Our students complete essential writing tasks for non-profit agencies in which they are placed. Thus our students work with content provided by agencies in order to reach real audiences. They have a supervisor in the agency and have to present their work orally to a live and relevant audience at the end of the semester. More importantly, our course requires students to approach critically the written projects in their own fields of academic and personal expertise. The course itself demands that projects meet three criteria. They must demand analysis and argument; they must allow students to work in their field of expertise; and they must be developed using multiple sources of input. These three criteria shape course design. We will look at each in turn.

Under our critical thinking/discipline-specific model, projects are set up through collaboration between the instructor and various interested agencies before the semester begins. Because of our critical thinking approach, we design projects whose actual content—rather than just planning or design—requires some level of data analysis or problem solving. Indeed, this is the very essence of a critical inquiry/WID approach: writing must bridge academy and professional field. So, a purely informational brochure, for which critical thinking would at best be part of the planning process, would not be acceptable as a major project, even though an agency might need such a document. Instead, the projects must require students to think through a problem or solution by analyzing information critically, with the goal of making a recommendation to an audience with a real stake in the agency.

Most projects require students to examine the raw data of a problematic situation, for example, and then make some sense of it by interpreting the data and/or by recommending and arguing for a solution. Some projects our students complete are—among others—scientific reports, grant proposals, and business plans. For example, a local science museum

asked two students to analyze visitor response to its exhibits and recommend how the museum might better serve visitors. The students designed a visitor survey and analyzed survey results to make several recommendations. In all cases, students must provide reasoned analysis to support their proposed assessment or solution. In other words, they must judge critically the data they gather or receive from the agency and hypothesize about its meaning; their writing itself must articulate that critical thinking. Students thus engage themselves in Dewey's "experimental" form of thinking. We ask that agencies have the necessary demographic, cultural, or organizational data with which our students will need to work and for which the necessary critical thinking has yet to be done. If agencies don't have this information readily available, they work with students to gather it. In this preliminary stage, agencies provide the context and background necessary for making the project discipline-specific. Since agencies function in "fields" roughly related to the academy's disciplinary classifications, they can provide necessary protocols, not only on genre, but also on more localized issues of exigency and politics regarding specific written documents.

The second element of design concerns student placement in appropriate agencies. Obviously, if the course is to teach discipline-specific writing, then students must work on projects and in agencies that demand and teach writing specific to their own academic fields. To realize this goal, we match projects with students who have relevant disciplinary expertise. At the beginning of the semester, students undergo an "application" process. Students submit a job application package to two agencies whose projects are most closely aligned with their field of study—and for which they have some appropriate academic training or personal experience. Certainly, this assignment allows students to prepare for later job applications in a competitive job market, but for our immediate purposes, it allows agencies to choose the "applicant/s" best qualified to complete their projects. (Agencies reserve the right to reject any or all applicants.) Because students in the course are in upper-division Business, Engineering, or Arts and Sciences disciplines, they have some academic expertise on which they can draw to complete projects. A marketing major, for example, might apply for and work on a project requiring a marketing strategy while a political science major might take on a project demanding the analysis

of demographic information for a more politically-oriented project. Agencies have been generally impressed with students' qualifications, with many agencies wanting more students than we can provide. We also set up ample placements, so the scenario where a student fails to be placed is unlikely.

To ensure that students understand what critical thinking projects demand, as well as how projects are unique to a particular field, we require them to submit project proposals once they are placed with an agency. These proposals must outline a project's rhetorical situation, document design, and timeline before work on the project begins. Both agency and instructor approve the written proposal. This application process allows room for personal interest and expertise too, both of which are important—as much research demonstrates—for students to produce effective writing. One of our recent students—a single mother who has volunteered extensively for the campus parent-students association—worked on a project for a local human services office that determined and analyzed the unmet childcare needs of parents enrolled in certain welfare programs. She was able to use both her personal interest and experience in carrying out a worthwhile project for the agency.

A final element of design is the process by which students develop project content. Because our program's goals rest on the idea of knowledge as a form of inquiry—as opposed to knowledge as pre-existing—we insist that students go beyond gathering information from either agencies or academic texts. Both of these options would result in mere descriptive renditions of pre-existing ideas. Rather, students must negotiate the knowledge necessary for compiling the written document by addressing the concerns of three groups with which they are faced:

○ First, they must address the academy's goals of critical thinking. As students begin the process of analyzing their data, instructors provide training in critical thinking and rhetorical strategies by way of weekly in-class instruction and a series of in-class workshops in which instructors and student peers press writers on issues of logic and development. The weekly workshops form an essential part of the ongoing re-thinking and re-writing process students must engage in to produce effective documents. Consequently, students become savvy critics of texts, a skill they can transfer to other contexts.

○ Second, they must address the agency's requirement for a field-specific document. To produce documents that agencies can actually use, students must learn from their agencies not only what general types of documents they desire, but also what the specific contexts surrounding these documents are. Who, for example, are the voices that need representation and how are those voices most appropriately represented? What, for example, are the politically sensitive issues in a project and how do students write, or not write, about those issues while still producing a relevant document? Two students in a recent class who completed a document for a local social services agency, encountered various political alignments and misalignments among the staff surrounding the particular issue with which they were working. These students had to negotiate this political reality as they grappled with document content, a skill they will take with them as they enter the job market.

○ And third, students must address their student peers' concerns. During in-class workshops, students comment on one another's drafts. Writers essentially represent the agencies for whom they are completing the document and peers serve as outside readers, critics, or assistants. The cross-disciplinary makeup of the class enables a comprehensive inquiry into the rhetorical makeup of the document and allows students to learn how to speak to others outside their discipline. While this last objective may seem to run counter to the narrow academic sophistication we suggest in the opening paragraphs of this paper, it can also afford students an awareness of the differences between writing in different disciplines. Moreover, the ability to communicate across disciplinary boundaries is a skill necessary for future academic, community, or professional work that students will conduct. We think it important, albeit not primary, for students to practice it.

Each student, therefore, participates in three concurrent conversations: with their agency, with their peers, and with the academy. To enable this rather elaborate process of inquiry, we rely on Linda Flower's notions of "rival hypotheses" and "multi-voiced inquiry" as outlined in her textbook,

Problem-Solving Strategies for Writing in College and Community. Flower's notion of rival hypotheses, which has its origins in Dewey's notion of "experimental" ways of knowing, calls on students to start thinking about their projects not from a fixed point of view but by opening up a question or questions at issue. Students then consider as many alternative responses to those questions as they can. Multi-voiced inquiry asks students to further evaluate issues in a way that does "justice to multiple ways of perceiving the world and representing knowledge (418). Multi-voice inquiry also helps develop the active and critical thinking that Giroux and hooks argue is essential to a meaningful education.

This link between critical thinking and discipline specificity is reinforced by an oral presentation requirement, fulfilled towards the end of semester, in which students present their work orally to a live and relevant audience—either another wing of the same agency, another agency, or a citizens' group. The oral presentation constitutes yet another form of dialogue by which students can gather additional feedback on their works-in-progress—feedback they must incorporate into their projects. Because we encourage students to present to other community groups whose interests might be related to what our students are working on, students have yet another avenue for broadening their contact with the community. One student, for example, who worked on a resource guide on alternative transportation for the university's environmental center, planned her presentation for administrators at another college campus to try to persuade them to adopt these alternatives.

Finally, we schedule a series of six in-class "business" meetings throughout the course, chaired by groups of two to three students. We assign readings on civic issues around which students base their meetings; students generate scenarios in which class members role play appropriate meeting attendees. Thus, meeting chairs carry the class through a discussion on important social and political issues by way of an agenda. To this end, we select readings such as Martin Luther King, Jr.'s "Letter from Birmingham Jail," case studies on welfare and on the debate over funding for the arts, and extracts from Studs Terkel's *Working*.

V. Case Studies: Two Success Stories

The goals of our course were realized in Lisa and Josh, two students from a recent class. Lisa, a psychology major with a career planned in elementary education, had past work experience in both a children's home in an African country and in a metropolitan area children's museum. For her, then, the project at another local children's museum was a natural fit. This museum had just lost one of its major grants and therefore saw the necessity of strengthening, rhetorically, its *raison d'etre* in order to secure monies for its future survival. With the museum director and another intern, Lisa completed a grant writing team that researched grant opportunities and completed two grant proposals. Lisa's conversations with her agency supervisor (the museum director) guided her thinking as she sifted through information about hundreds of available proposals. Lisa was able to bring her disciplinary experience in education to bear on the innovative thinking required to argue that the museum deserved grants aimed at assisting minority children in educational arenas. And at the same time, the writing class provided peer review, pushing Lisa to make multi-voiced inquiries and to consider different rhetorical strategies as she analyzed what the museum offers these children in terms of educational programs, volunteer opportunities, and community involvement, in order to make a larger persuasive argument about the necessity of ongoing funding. Clearly, the critical thinking that Lisa engaged in required her to push beyond the limits of existing knowledge to experiment with new ways of arguing for the museum. But such a project also enabled her to use the critical thinking necessary to fight for the survival of an agency that she saw as a valuable contribution towards an equitable society.

In some cases, students choose to apply for projects because of personal experience or conviction as much as from disciplinary interest. Josh, a business student with a focus in finance and information systems, applied for and was selected to work with a human service agency serving the disabled. Josh's project asked him to determine whether the agency had an image problem and to recommend how to solve that problem if it existed. Josh's business focus certainly made him aware of the importance of agency image and gave him skills in the kind of meticulous planning a research design needed. But Josh was drawn to this agency for a more

personal reason: his younger sister is disabled. He was interested in working with an agency that strives to help the disabled population live more independently.

Josh's project also called on a Deweyan "experimental" approach towards his problem and the information he gathered. Josh designed questionnaires (with some assistance from our campus research office) and interviewed agency staff and clients, as well as community members, to test some of his rival hypotheses: perhaps the agency had no image problem; perhaps clients' needs were not being met because the disabled misunderstood the agency's mission; perhaps the community didn't understand the agency's identity, and therefore didn't understand and couldn't take advantage of it. Josh's preliminary research led him to believe that, while staff and clients were pleased with the agency's work, the community had little idea what its goals were and how it actually served the community. He supplemented this with published literature on the topic and he collected information, via the internet, about similar agencies across the nation. His analysis of all this information led him to recommend that the agency consider a new name and a new logo that better situate it in the Boulder community and that more clearly distinguish its mission from that of larger government agencies.

Like Lisa, Josh built a persuasive document by combining his agency supervisor's support, his disciplinary knowledge (in research design and systematic analysis of results) and his personal interest in the project. Just as importantly, he used in-class workshops to grapple with strategies that allowed him to present his recommendation persuasively. Further, in order to present his recommendations orally to agency staff, Josh had to again engage in the analysis necessary to turn a written document into an effective presentation. Josh's presentation impressed staff members enough that they asked him to give his presentation again—to the agency's Board of Directors. His independent project had validated a "feeling" they'd had about the agency's image, and they wanted him, as an outside consultant, to impress his findings on their governing board. Clearly, both Josh and Lisa had to adapt discipline-specific content to academically demanding writing tasks. In doing so, they went beyond a personal response to service and intellectual contemplation of social issues to actually effect change in community service agencies and the populations they serve. In ef-

fect, then, both students used critical thinking on a more intellectual, Deweyan, level, but they also used it in the sense that Giroux and hooks intend—to become active inquirers into social formations in their communities so as to work as agents of social change.

VI. Pitfalls

Certainly, the course is not without its problems. And, as might be expected, we encounter pitfalls for each segment of our collaborative effort: for agencies, for students, and for us as instructors. When agencies agree to take part in our service learning course, we explain that we cannot guarantee student placement with them. And, in fact, last semester no students applied to work for one of the agencies whose project description had been carefully prepared and delivered. This agency undoubtedly was disappointed that it was unable to complete (or had to reassign already scarce resources to) a project it looked forward to completing. We hope that this experience does not keep the agency from working with us again. Once agencies accept students, they run a further risk of being dissatisfied with those students' performance. We are careful to emphasize, on the first day of class, that continued enrollment past the first week indicates a commitment to an agency. And, in fact, most students follow through on their commitment and agencies are pleased with their work. Last semester, one student, however, simply quit attending class and, after two initial meetings, the agency never heard from him again. Fortunately for us, the agency supervisor viewed this "desertion" as an anomaly, and is eager to work with us again.

Students, too, face some difficulties. As we have already noted, some students find themselves negotiating agency politics and thus having to spend valuable project time on this task rather than on fulfilling the project goals as originally defined. Certainly this happenstance is a source of frustration for these students. Other students find themselves not in the midst of agency culture, but strangely outside it. These students are often left largely on their own to design research, carry it out, and write their analysis. Despite the frustration these scenarios cause, we believe them to be important learning experiences in the kind of cultural politics that concern Giroux and hooks. Yet another possible difficulty is exemplified in a project whose critical thinking demands

shifted once in the student's hands. Despite our advice about approaches to the project that would meet both agency and course goals, the student pursued a descriptive document. While the agency was quite pleased with the final product, it did not fulfill the course goals, so the student faced a project grade lower than he would otherwise have received.

Problems viewed from both agency and student perspectives translate into problems for us as instructors. We do find ourselves expending energy helping students negotiate agency politics and sometimes advising them on ways to deal with somewhat irresponsible supervisors. We would much prefer to spend this time discussing the rhetorical challenges inherent in original project designs rather than those stemming from exacerbating issues. And while we feel comfortable as we grade most of the students' projects, the project described above, which shifted from analytical to descriptive in the student's hands, presented a real dilemma to us. Agency goals and academic goals do not always mesh, and in this case we were unable to foresee a misalignment. Finally, we also face the very real pitfall of having set up agency projects that require us to juggle instruction about several different genres in the classroom. And while we believe that all students learn something about the specificity of discipline-specific genres, an alternative approach is to have all students in the same section write in the same or a similar genre.

VII.   Strengths of Our Design

Despite these pitfalls, we believe that the three key concerns of our course design (collaborative project definition, student placement, and project development through a critical thinking approach) result in a powerful buy-in from all those concerned in the enterprise. First, the collaboration between instructor and agency to design useful and important projects encourages agencies to buy in to the concept of Service Learning. With this design, agencies receive a document that they can put to immediate use securing monies, revising policy, or designing procedures. Indeed, one supervisor commented on the end-of-term evaluation form:

 In recent months, [our agency] has been involved in a couple of projects with students at CU. None has been as successful as the service learning course. A

few reasons why we think this project worked when others didn't:

○ Clear definition of class and expectations provided up front by instructors.
○ Agencies required to define what they want through project description.
○ Student able to select projects that interest them.
○ Instructors stay in touch with progress of project. We had an excellent student!

Second, the method of student placement encourages students to select a project that meets their personal and professional needs, as well as to serve an agency they find worthy. Students develop critical thinking and problem-solving skills crucial to both their remaining academic careers and to their professional careers. More importantly, they experience first-hand that the two are not only compatible, but mutually dependent. The real issues represented by agency projects demand that students apply these skills if they are to successfully complete their projects. One student wrote, on the university-wide course evaluation, "…to actually complete …the final project was a confidence builder and strong learning experience overall." Another said (this time on the internal evaluation), "writing in the community has enhanced my educational motivation because my work had an actual social purpose, rather than being confined to pure academia. It is much more enjoyable to work hard for a purpose in which you believe."

Finally, we as instructors benefit by this combination of agency and student satisfaction. As we help students develop their projects and watch as they help each other, we are confident that the projects are academically demanding and that they are providing important disciplinary experience—both of which will serve the students well over the long haul. These outcomes make this approach appealing to writing faculty. Moreover, since students cannot dismiss writing as extra-curricular when their projects place them in an agency whose demands link academic rigor with agency progress, faculty reap the benefits of seeing students seriously invested in their writing.

VIII.   Conclusion

By situating our own academic goals of developing the critical consciousnesses of students firmly in real-world, disciplinary contexts, our approach allows us to meet Zlotkowski's challenge of an "intellectual agenda" in service learning writing classes. This meeting between academy and professions gives service learning the academic respect that it deserves, encourages community involvement, and offers students new ways to think about education.

Careful course design assures a classroom experience that meets Zlotkowski's call for "specific disciplinary and inter-disciplinary goals" (25). This course bridges academic and professional worlds because it requires students to write professional documents that merit academic currency. This two-pronged strategy should encourage the degree to which such courses are taken seriously because they develop the very basis by which the academy defines its own activity: disciplinary fluency coupled with cognitive sophistication. And, having a range of disciplines and student interests represented in the same classroom can enhance the connection between disciplinary fluency and cognitive sophistication. To be sure, such a range of disciplines demonstrates to students that critical thinking is necessarily discipline-specific—each project and field have their own content domain and their own appropriate strategies for problem solving. And students must learn and practice these. But students also use what they learn about problem solving in their own fields to help other students with projects-in-progress in other fields; thus as they find similarities and compare differences in agencies' structures and goals, they come to see that, in many cases, critical thinking strategies can be transferred from one arena to another. Disciplinary knowledge, too, does not always function in its own neat little category. Moreoover, the breadth of the genres and class activities themselves—from resumes to proposals to business meetings to oral presentations—provides students with a space to pointedly discuss problem solving, rhetorical strategies, disciplinary content, and agency-specific concerns, all in the context of shared inquiry. Together, then, these approaches promote a Deweyan inquisitiveness in the context of an academic or professional field.

The course design that we discuss in this paper allows for another kind of critical thinking, too—one that allows the course to meet goals not only of academic rigor, but also of

self-reflection and contemplation of important social and political issues that Giroux and hooks urge us to consider. An interdisciplinary student population in the classroom forces discussion of issues that might not arise in courses whose service learning focuses on a particular topic. While discussion of such issues sacrifices depth to some extent, it forces students to recognize the many kinds of agencies, and the populations they serve, that make up and affect our communities. With this variety of institutions and populations comes a variety of class, race, and gender perspectives. When an individual student submits a written draft of her project for classroom review, other class members inevitably bring both their own views and the views of the agencies they represent to the discussion of that project. For example, in our classes, students are exposed to issues in human services agencies and to alternative education centers, to problems confronting the disabled community, and to the needs of museums, arts groups, and science research organizations. All these varied perspectives are brought to the table and students must rethink and revise their writing to account for these varied perspectives, a process which requires depth and breadth of thought.

A focus on academic currency, then, does not preclude community involvement, but invites it. While we would never contend that students who take this class go through an epiphany and vow to devote themselves to community service, we do believe that students learn more ways to think about both community involvement and their own academic or professional fields. The many different projects from very different agencies themselves demonstrate the breadth of community involvement available to college students. And, while our approach meets academic goals, it does not threaten to impose an ivory tower mode of thinking on participating agencies or on the communities served by those agencies. It instead asks students to view the agency from inside out, yet another important step in the development of their critical consciousness.

Thinking about community service in the context of discipline-specific writing and thinking in turn spurs students to think about educational issues. As we introduce the course to students at the beginning of the semester, we ask them to think about the service learning philosophy in the context of their own fields. Our resulting discussion juxtaposes the

students' different philosophies and raises interesting questions about the process of education. Is college's goal to prepare students for the workplace? To make them love learning? To prepare them to be thoughtful and active citizens? Most students admit that they have always assumed everyone agreed on this issue and were surprised to find that, in fact, one can have a personal educational philosophy. We consider this awareness, in itself, to be a worthwhile outcome of the class.

Moreover, our students' discussion of educational philosophies may offer some further answers to the issues Zlotkowski has raised. Perhaps service learning's failure to make an impact on the academy despite its wide acceptance may be simply because few students believe that college, their profession, or their life, is about civic responsibility. Instead, they often seem caught up in earning potential and skill level. Thus, service learning thrives in required courses like ours and in disciplines already firmly aligned with service. But its impact is small because it meets neither students' market-driven philosophy of education nor their "learning for the sake of learning" philosophy. We believe our course may be an exception because it appeals to those students interested in "credentializing" as well as to those interested in developing a critical habit of mind. Yet both types of students are forced to also see the other side—"credentializing" students cannot escape the critical thinking focus of the course and students interested in more abstract, critical thinking get a taste of doing work in a professional setting. Such an approach, we believe, should go a long way towards making service learning an integral and respected part of the academy.

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