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COMPOSITION AND TECHNOLOGY: A PRAGMATIC APPROACH

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
The Degree of Doctor of Philosophy in the Graduate
School of The Ohio State University

By
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****

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ABSTRACT

Recent attempts to integrate technology into the theory and practice of composition studies have raised a host of issues which I attempt to address by developing a non-foundational, pragmatic theory of technology. I consider first the treatment of technology by theoretical paradigms that have been influential in composition: cognitivism, platonism/expressivism, and social constructionism. After arguing that social constructionism is best suited for developing the role of technology in composition, I outline the ways in which pragmatism can augment that development.

I then consider three cases raised by technology in composition to exemplify the benefits of a social constructionist/pragmatic approach to technology. In the first, I analyze the development of Writing-Across-the-Curriculum programs and assess the influence of the visual writing technologies of non-English disciplines on composition pedagogy and research. In the second, I review the role of film as an alternative technology in composition and consider its potential as a medium for writing instruction. In the third case, I consider the possible applications of electronic texts for secondary science instruction, particularly the ways in which such texts can transform the processes of reading and writing into one continuous, active process.
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And Janice, who put up with the complaints and kept the play-dough out of the zip drive.
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CHAPTER 1

THE ROLES OF TECHNOLOGY IN COMPOSITION

The economic, social, and political ramifications of computers have become a recurrent topic in the United States’ media, and those ramifications have certainly affected academia. Not long ago I was discussing a student’s goals with her and she said she just wanted to be financially independent so she could write. I said, with a smile on my face, that she should invest in Internet stocks, and she replied in all seriousness that she traded Internet stocks online, and that she was much richer for it. Today, as I write this, two of the four front-page stories in USA Today concern the Internet. One discusses the transformation of government bureaucracy and services brought by the Internet; the other discusses complications the Internet brings to the traditional means of separating church and state in the United States. In the latter case, the story describes how, although courts have generally restricted public aid to parochial schools, they have, for thirty years, allowed textbooks from public schools to be loaned to parochial schools on the grounds that the textbooks were devoid of religious content. The difficulty is that an $800 million dollar attempt to extend this program by linking public and parochial schools through the Internet cannot restrict content in the way books could, because
computers and Internet connections could be used primarily to access "the Vatican’s Web site or a Bible CD-ROM" (Mauro 1A).

But aside from such indirect and general cultural influences brought by the ramifications of computers, academia is often affected more directly by computers, and composition is (or should be) among the disciplines most attentive to such influence. We study and teach a medium of communication, and that medium itself is in flux. The shift to electronic texts has defamiliarized the previously transparent media of reading and writing and encouraged (or forced) us, as Richard Lanham has argued, to look at instead of through the material contexts of literacy that once seemed so transparent. But although computers are an obvious source of interest and consternation in composition, they are, I believe, only a recent, pointed case in a long history of problems presented by technologies of writing—at least in the broad senses of ‘technology’ and ‘writing’ that I will argue for.

In other words, problems posed by technology are neither recent nor novel in the field of composition, nor have those problems been brought exclusively, or perhaps even primarily, by computers. Consequently, although the computer seems to, and may indeed, present a brave new world to our general culture, I believe it is a mistake to approach computers as if they are a novel, unique, or separate phenomenon within the discipline of composition. Our reception and development of computers is crucially tied to our existing theoretical frameworks and the roles that technology plays in those frameworks. We have, at least implicitly, developed stances toward technology, and the seemingly non-technological aspects of theoretical positions we have taken imply approaches to technology.
My concern over the next pages, then, will be to review some of the important roles technology has played during the history of composition over the last thirty-five years, and to forward a general framework for addressing matters of technology within the field of composition. I will then apply that framework for addressing technology to three particular issues in composition: film as a pedagogical tool, writing-across-the-curriculum, and electronic texts.

Technology and the War over Orality and Literacy

To begin working toward my broad use of 'technology' and the framework I would like to view it within, consider first one event in the history of composition that illustrates the difficulties technology presents. The battles over the proper understanding of 'orality' and 'literacy' were taken up in a wide variety of journals, anthologies, and books in the field of composition. The dispute initially pitted such "great divide" theorists as Walter Ong, Eric Havelock, T.J. Farrell, Ian Watt and Jack Goody against their detractors Deborah Tannen, Beth Daniell, Sylvia Scribner, and Michael Cole.

One claim forwarded by great divide theorists that caused particular controversy was that reading and writing in a fully phonic alphabet caused fundamental advances in the development of human cognition. According to the theory, literacy freed people from the necessity of employing memorization and oral recitation as a means of preserving and transmitting cultural tradition. This newly-released mental capacity, coupled with the new ability to capture discourse in a more static medium, led to the techniques of textual comparisons, abstractions, and non-narrative organization. These techniques, in turn, allowed (or caused) the development of analysis and logic. Consequently, literacy caused
a fundamental rift between oral people and their cultures and literate people and their cultures—literacy so transformed the mind that oral and literate peoples literally thought and lived in radically different worlds.

Detractors of the "great divide" theorists claimed that such arguments ignore substantial middle ground between such cultures, and that they wrongly stigmatized oral peoples as cognitively deficient. The dispute ranged over many claims and positions, but in large measure both camps fought the battle on cognitivist terms that overlooked the role of technology. It was often assumed, for instance, that the difference between the two cultures must be reflected by measurable cognitive criteria, and when such an assumption was questioned, it was usually questioned on social constructionist grounds by claiming that a narrow cognitive focus elided a consideration of the social and political aspects of literacy (Daniell 188). But technological aspects of the dispute were rarely addressed.

Consider in particular the influential research conducted by Scribner and Cole on the effects of literacy among the Vai, a North African people who are one of the few cultures to have independently developed their own phonetic writing system. Their research was widely held to have seriously undermined the great divide position, but it did so largely by accepting the cognitivist terms upon which that position was often based. Scribner and Cole conducted “psychological tests” of classification tasks and logic problems in order to test whether or not such skills are the “inevitable outcome” of learning to use alphabetic scripts or write any kind of text”(69). They, like most of the great divide theorists they criticize, initially assumed that differences between orality and literacy can be adequately measured by acontextual cognitive tests. The variations of IQ
tests that they employed in their initial research led them to conclude that there was "no
evidence of marked differences in performance on logical and classificatory tasks" between literates and non-literates (66). Though less blatant than the great divide theorist Farrell’s claim that standard IQ tests are an adequate test of intelligence in any culture, Scribner and Cole still assume that abstract tests of individuals which exclude crucial aspects of technological and social context can nevertheless adequately reflect differences in culture. Aren’t tools part of a culture? ¹

In their later research Scribner and Cole revised their test designs on social cognitivist tenets to assess the functional aspects of literacy in a context-sensitive manner (66), yet even in these tests they assume that the effects of literacy on individuals should be immediate, direct, and cognitive (Interface 216). But these assumptions seem to elide differences and change that occur in other spheres. Consider, for example, Scribner and Cole’s interest in how differences in memory might be manifested in members of oral and literate cultures. Scribner and Cole confine their tests of such a difference to cognitive tests given orally. But ultimately, if the goal is to test the memories of literates and a non-literates, then denying technologies of literacy to literate persons—whether that technology be pencil and paper or laptop— is denying the substantial role that technology can play on the grounds that difference in memory is only usefully measured by cognitive tests narrowly conceived. Moreover, if, as Plato claims, writing in fact reduces a literate person’s ability to memorize, because the person becomes dependent on writing for

¹ A charitable interpretation of Scribner and Cole’s approach would be that they were simply making an internal criticism of the great divide position. In other words, Scribner and Cole were employing the methods and assumptions of the great divide theorists (without believing the validity of those assumptions) in an attempt to show that even if the assumptions are granted the position is beset with internal contradictions. This does not, however, seem to be the case.
recall, then to test memory while denying writing or any other external technology to the literate person is in fact putting that person at a distinct disadvantage. In their tests of memory, however, that is precisely what Scribner and Cole do (67).

Furthermore, in the case of the Vai it raises a great many more questions. Presumably Scribner and Cole's model would actually expect that Vai literates would test worse for memory than the Vai illiterates, because their memory could well have been weakened by a dependence on writing. But in fact Scribner and Cole found no such difference, and to expect such a difference is to make a crucial mistake; namely, that the effects of literacy should be immediate and universal. The effects of writing on memory (or any other cognitive skill such as logic) can, however, be mediated by at least three variables: time, culture, and technology.

With respect to technology, in the case of the Vai it would first matter whether affordable paper and writing implements were readily available so that, as a practical matter, Vai literates could write rather than remember in a variety of contexts. Another technological aspect would concern how easily the Vai script could be used to replace memory in everyday tasks (since it is less efficient than a fully phonetic script). With respect to culture, it would matter how Vai culture viewed literacy; if ritual and practice frowned on writing in many cultural spheres and limited writing to particular practices, then the individual—though technically literate, would use writing as an alternative to memory infrequently. Finally, with respect to time, the effect of literacy on memory would not be immediate, but would depend on how quickly an individual person's habits changed, which would depend not only on the person's psychological predisposition to change habits, but on a variety of variables affecting how often tasks of memory were
taken over by writing. Only when a Vai person’s cognitive development had been mediated by all of these factors might there be a shift in memory measurable by the sorts of cognitive tests employed by Scribner and Cole, and such change might in fact take several generations.

In his later writing on the matter, Goody takes up the matter of technology and how it has been ignored in the debates over orality and literacy. He notes, for instance, that

- Cognitive effects may be mediated by knowledge that literacy in a particular language brings. In the case of the Vai, very little knowledge has been recorded in their writing system, so there is little indirect effect of literacy in this regard. In a language like English, however, literacy brings more potential for indirect effect, since so much has been written in English about so many things. All of this recorded knowledge is an “external technology”, and though it is not reflected well by cognitive tests, it can have profound effects on identity and culture (Interface 215-16).

- Similarly, some skills require testing in specific, material contexts. Goody gives the example of map reading, which can give a significant advantage to a literate person, but which probably can’t be detected in cognitive tests of general ability or wider intellectual skill. The advantage of map-reading needs to be tested “externally, not ‘mentally’… The problem is that while mental maps and plans are seen as falling within the psychologist’s field of vision, printed maps and plans are excluded” (Interface 244-45).

These considerations lead Goody to highlight the “external-internal” problem, noting that “when a map or a book intervene[s] between the object and the subject, we
are dealing with 'mind’ out there as well as with mind inside” (Interface 255). And in this sense books, maps and writing are ‘technologies of the intellect’ (255). If we illustrate Goody’s distinction by drawing a spectrum (see fig. 1) we see that Goody wishes to undermine the strict separation of the internal and the external by involving material and social ‘external’ elements in the analysis of literacy.

The Internal/External Distinction within Composition

How has Goody's treatment of the internal/external distinction and the role of technology been taken up in composition? In his 1992 JAC article, “Externalism and the Production of Discourse,” Thomas Kent takes up the thread of these issues and argues that composition theory needs to be re-evaluated on the basis of the internal/external dichotomy. Kent holds that all the predominant theories in composition—whether expressivist, cognitivist, or social constructionist—are thoroughly internalist. Thus far we have only defined internalism as what happens inside the head as opposed to what happens outside of it. Kent defines internalism in narrower, epistemological terms, but his definition is consistent with Goody’s in the sense that his definition of “internal” implies a material location inside the head and separate from the world of the social and the material (we will return to discuss the relationship more precisely later). According to Kent’s construal, an internalist holds that

a conceptual scheme or internal realm of mental states—beliefs, desires, intentions, and so forth—exists anterior to an external realm of objects and events. In relation to meaning and language, an internalist thinks that we have ideas in our heads, a kind of private language, and then we find a public shared language to help us communicate these ideas (57).
Kent's definition emphasizes the *a priori*, pre-existent nature of conceptual schemes and beliefs: for most internalists, these are akin to the universal, timeless patterns of Plato's forms, or *modus ponens*, or intelligence quotients. Kent defines externalism as a denial of the subject/object dichotomy assumed by internalism: externalism denies that our thought is epistemologically prior to our language, and asserts that our sense of an inner world actually derives from our rapport with other language users, people we interpret during the give and take of communicative interaction.

Kent then claims that composition as a discipline—particularly the prevailing theories of expressivism, cognitivism, and social construction—has operated almost exclusively on internalist assumptions. This is a very broad claim, and very telling, if sound. Certainly expressivism and cognitivism had their geneses as internalist theories, though members of both camps have certainly moved toward externalism. Social constructionism, however, seems least open to the accusation. But let us briefly consider each theory in turn.

Kent characterizes expressivists as those for whom "discourse production derives from innate categories that actually constitute the human," and notes that said categories have names such as "modes of discourse" (Kinneavy, Cope, Campell) and "repeatable units" (Young, Becker, and Pike) (58). In support of Kent, I would argue that in practice expressivists such as Elbow tend to fault the social for intruding on the development of voice that can be obtained by introspecting on one's true (presumably *a priori*) self. Expressivists are thus internalists to the extent that they believe that a writer's voice or identity is something innate, or something achieved through a process of introspection.
which must not be sullied by external social pressure, rather than something which is achieved by exposure to such social pressure.²

Kent characterizes cognitivists as those who claim that “the mind can be reduced to physical components or to psychological states that account for human action” (59). He notes that in studying discourse production, Flower and Hayes claim that “the process of writing is best understood as a set of distinctive thinking processes which writers orchestrate and organize during the act of composing” (qtd. in Kent 59). Thus, notes Kent, the connection between the internal and the external is always explained in terms of the internal, and “we get concepts like the category effect, top-down processing, the levels effect, activated semantic contexts, and schemas” (60). Certainly Kent is correct in his characterization in the sense that the influential cognitivist models of Flower and Hayes focused on processes in the mind and excluded or minimized the role of the social and the technological in writing processes. Cognitivists in general are internalist to the extent that they focus on studying writing and thinking as a process that can be reduced to mechanisms in the mind (though of course many cognitivists have moved away from such reduction).

Finally, Kent also categorizes social construction as an internalist theory, claiming that it holds that “subjectivity derives from conventionalized human behavior and not from innate mental categories of representations of mental processes” (60). He then claims that for such an epistemology, like the epistemologies of expressivism and cognitivism, the “objective world exists ‘out there’ someplace, and we cannot get at it”

² It is not surprising, then, that externalist-leaning Marxists such as John Trimbur have been critical of certain expressivist claims.
But I would defend social construction against Kent’s internalist categorization—or at least with the placement of social construction in the same category as expressivism and cognitivism. I agree with the claim that composition should move toward externalist approaches to theory, history, and ethics, and I will readily admit that social construction has not sufficiently addressed the issue of technology. But I would still maintain that social construction has always been the theory pushing the envelope toward externalism and that it would be unfortunate to align it with more internalist theories such as expressivism and cognitivism.

It must be admitted that there are many understandings of just what social construction is, or what it might be, so I will attend to the summary characteristics of internalism which Kent attributes to all three theories, namely, that they are stymied by the insurmountable problems of skepticism and the public nature of discourse (61). Concerning skepticism, Kent claims that all three theories are solipsistic in that they “cannot explain how it is that we know anything at all about the world outside of our own subjectivity” (61). Similarly, “we cannot explain how it is that we know the mind of another, since we only possess contact with our private minds or our internalized conceptual schemes” (61). Thus, for these theories, “clearly a separation exists between an inner realm of mental states and an outer one of events and objects, a separation that creates doubt about the possibility of knowing with any certainty the world or the minds of others” (61).

Before addressing these claims with respect to social constructionism per se, I find it telling that Kent is dismissive of these theories because of their failure to provide “certainty.” The danger, I will argue, with pushing toward externalism too heavily is that
it produces a foundationalism that simply mirrors that of internalists such as Descartes, who arrive at certainty via a separate path. Certainty, in my view and in the view of any social constructionist I am aware of, is not considered a rewarding goal in the game of theory-building. Later in his article Kent aligns himself with Nietzsche, Dewey, Heidegger, the later Wittgenstein, Quine, Rorty, and Derrida, so it seems clear he is not after a foundationalist level of certainty either (62). Dewey, for instance, devotes a whole book, *The Quest for Certainty*, to an explication of why having certainty as a goal is a bad idea, and all of the writers invoked by Kent undermine foundationalist certainty.

If we can agree, then, that neither a certain, foundational understanding of the world nor of the minds of others will be a central concern, does social constructionism give some explanation for how we might have a non-certain but robust understanding of such things? Certainly. Indeed, social construction denies arguments for private "inner" languages, and holds that language is necessary both for understanding one's own mind and the minds of others. However, social construction doesn't claim that language is entirely "external" to the body, because that would reinforce the mind/body dichotomy. Social construction need not (and no versions that I am aware of does) hold that there is a separation between the "inner subjective realm of meaning and thought, and an outer objective realm of objects and events," as Kent claims (Kent 61). The crucial term here is 'events.' Social constructionism might have difficulty with technology and non-human 'objects,' but it doesn't have a general problem with 'events.' It is only through the experience of 'events' with others, according to social constructionism, that we come to know our own selves. Discourse communities and language are precisely the sort of things that are neither purely "internal" nor "external" — they are both.
In a similar vein, Kent argues that expressivism, cognitivism, and social
collectionism all falter in explaining the public nature of discourse, or how it is that we
can "know the mind of another" (62). But social construction, as we have noted above, is
perfectly positioned to address the problem—indeed it plays directly into one of the
greatest strengths of the theory. The mind of another (if we must assume a strict "other")
has many of the same general concepts that we have. We know this because language is
a public thing—something that we learned from interaction with others. To the extent
that we have an interesting separate "identity," we have it by combining public categories
in a slightly new way. But we know that most of the major distinctions which form our
identity are publicly held in our language; we are thus always partly the public and partly
ourselves.

Social construction may hold, as Kent claims, that "we can only get at our
communal conceptual schemes" (61), but any version of social construction I am familiar
with holds that such communal conceptual schemes are shaped by interaction with the
world. People are, after all, "out there"—how does Kent propose that we come to a
consensus about our communal conceptual scheme? We can do so only by interacting in
the world, not by internal mental telepathy. Indeed, it is only the least-externalist
versions of social construction (where it is held that there are many very
incommensurable paradigms) that approach compatibility with internalism. Given its
many incarnations, attempting to characterize social constructionism is certainly
daunting, but the sense of vertigo increases when Kent later classes Rorty as an
externalist with whom he identifies (62), despite the fact that many a social
constructionist (including Bruffee, who Kent classes as an internalist social
constructionist) have claimed Rorty as major contributor to their social constructionist thought (Bruffee 774 ff.).

Given the confusion caused by various types of social construction, it might be helpful to develop Kent’s characterization of social construction by mapping it as a large swath on the internalist/externalist spectrum (see fig. 2). Kent argues that in Kuhn’s version of social construction “different communities construct different and largely incommensurate languages” (61), but a wide variety of positions can be held by social constructionist theories with respect to commensurability. Perhaps we can address Kent’s concern for the relationship between internalism and commensurability by categorizing as follows: if a social construction theory holds that few people exist within commensurable paradigms, and that there are thus many, incommensurable paradigms, then that theory would be a more internalist version of social construction. Thus, as the number of discourse communities approaches the number of people in the world, such a social construction theory would approach extreme internalism and its corollary, solipsism. Conversely, as the number of discourse communities decreases and all humans become part of one, commensurable community, then social construction approaches a thoroughgoing externalism.

But the difficulty with such an explanation is that it does not address the source of incommensurability. The crucial question with respect to externalism and internalism is the extent to which the external, as opposed to the internal, plays a role in determining commensurability. Some theories of social construction could claim a high degree of incommensurability between communities, but the explanation of that incommensurability might be internal rather than external. Thus, for instance, the
explanation for the degree of incommensurability might focus on differences in innate mental or logical categories, and hold that the external world offers little influence on the shaping of language and identity. More externalist social constructionist theories that also claimed high degrees of incommensurability could hold that the world does play a large role in shaping language, and that the level of incommensurability can be explained through differences in external conditions such as disparate geographies or widely variant communication technologies. Thus, a social constructionism theory could be highly external but still reflect the incommensurability—the lack of certainty—that Kent dislikes. Neither certainty, nor degree of commensurability, then, maps easily onto externalism or internalism, nor do they appear to be basic factors that are at the forefront of compositionists’ concerns.

In the end, regardless of differences in its depiction, social construction is in the best position of the prevailing theories in composition to make sense of technology, and it would be counterproductive to dismiss it by conflating it with more internalist theories. Internalist theories have little place for technology because they valorize thought and language as hermetically sealed from the “external” world: thus, social, technological, and material conditions don’t play any interesting role in thought—or it isn’t clear how they could. Social construction has recognized the need to move into the external world, but it has in most cases failed to appreciate that moving the production or source of knowledge out of the head and into the world doesn’t mean only that social elements play a role in the production of that knowledge, it means that the entire empirical world suddenly plays a role. Social elements are the closest to the immaterial—and closest to our perceived “internal” identities—so they are perhaps a natural point of transition.
Moving from the internal (or the *a priori*—the hermetically sealed aspects of mind) to the external requires giving up the permanence, perfection, and certainty of most internalist theories, but the reward is a connection to the world. That means, among other things, that you can account for the social, the contingent, the material and the technological. Of the three prominent factors in the external world—the social, the technological, and the non-human material—at least social construction has addressed itself to the first.

**The Interplay of the Material and the Theoretical**

These issues broach the larger question of the relationship between the theoretical models of literacy and the material conditions of literacy. What are the relationships between the material distinction made by Goody and the theoretical claims made by Kent? Do the material and the theoretical affect one another, and if so how? Consider, for instance, Goody's claims concerning the ways in which the external should be included in analyses of literacy. He claims, for instance, that formal reasoning is not simply a general cognitive ability, but rather a highly-specific skill dependent upon several conditions, including the "conjunction of language and visual forms (e.g. in lists)" and the "capacity to store, retrieve and build upon earlier knowledge in an incremental way (which is not to say writing is necessarily used in this way)" (Interface 256).

To make such a claim about logic and its temporal, material, and local basis is to question much, for it introduces a crucial difference between foundational and non-foundational approaches to epistemology. Foundational approaches, which have roots in Plato and have a storied tradition culminating in analytic philosophy, sequester logic off from the rough and tumble world into a universal, timeless, static realm of platonic forms.
(in its more modern guise, the ‘analytic’ as opposed to the ‘synthetic’). The appeal of 
cognitivist theory based on such a foundational approach was that it might lead to 
discoveries that held that same universality and timelessness; once certain inherent 
cognitive patterns could be established then much could be solved once and for all. We 
would need only one flow chart to model the workings of the mind in the process of 
writing. Or we would need only one good I.Q. test (or SAT battery), and objective, 
timeless standards would be permanently established. We can begin to see, then, one 
crucial connection between a material condition (the status of being physically 
“external” or “internal”) and a theoretical stance (foundationalism). Questioning the 
universality and centrality of logic by locating it in the plastic, “external” world places 
Goody amongst sophists, pragmatists, and feminists in a more punctuated tradition of 
detractors to foundationalist traditions.

Similarly, though Kent’s claims do not take up Goody’s material distinction 
directly, their characterizations of “external” and “internal” are consistent in important 
ways. Consider figure 3, which maps theoretical schools onto a spectrum between the 
internal and the external. It would seem that Goody’s physical definition of “internal” is 
consistent with Kent’s theoretical definition of “internal”: the theories Kent criticizes—at 
least expressivism and cognitivism—do emphasize the physically internal as Goody 
defines it. Does this imply that there is a strict correspondence between the two spectra, 
or that we could usefully reduce theoretical to the material? It would seem not, for 
several reasons. It does not seem that the holders of various theories alter their foci to 
elements in or out of the head just for the sake of it. There seem to be more basic 
motivations.
Consider marxism, for instance. In its more extreme forms, marxism is heavily externalist because it supposes that internal phenomena (i.e. the “superstructure”) are reducible to external phenomena (i.e. the “technology of production” or the “base”). But marxism is akin to many internalist theories in its pursuit of foundationalism, for all phenomena are always explained through the objective “foundation” of the base. Similarly, marxism—like internalist theories such as expressivism—severs the subject from the object. By foregrounding the external so heavily, marxism displaces the internal subject, which results, for instance, in the elimination of individual agency. Conversely, expressivism also severs the subject from the object, but it accomplishes this by foregrounding the individual at the expense of the social and material. If expressivism becomes more extreme in its emphasis on the internal it also becomes more foundational, for it assumes some objective, originary “voice” in writers.

Internalists often emphasize what goes on in the head because it often forwards the larger and more primary goal of foundationalism and atomism. Moving into the head allows an escape from the social and material flux of the world and it allows explanations that assume permanent mental structures. If processes can’t be observed because they are inside the head, then it can be claimed that they are primary and unchanging. Further, reducing something like writing to processes in the head forwards a severing of the subject from the world. For example, if someone is a good writer, it can be said that they were “born that way,” because they aren’t dependent on any external material or social tool, and because whatever they do mentally to write well is mysterious and invisible. Severing the subject allows such pull-yourself-up-by-your-bootstraps arguments because it separates individuals from dependence on a social environment; thus, students don’t
need great schools and resources to excel—they just have an innate interest in science or they don’t.

In the recent past, undermining atomistic, foundational positions through the assertion of the role of unequal external contexts was limited to the claim that social environments are crucial in the formation of ability and interest. It was thus claimed that inequity often derives from a dearth of support from teachers, families, and peers. Material or technological environments have received less attention because while it is true that a high level of literacy requires material support such as paper, pens, and books, such things are generally inexpensive and available widely enough to be downplayed or dismissed as sources of inequity. The double-edged sword of the computer derives from the fact that, on the one edge, it externalizes writing processes and makes it more apparent that the playing field isn’t level because excellence requires access to expensive equipment. On the other edge, it polarizes the playing field, because those who had inadequate external supports are now at an even more pronounced disadvantage because there are both social and more-pronounced material sources of inequity.

If we cast a slightly wider net and place the internal/external distinction in a broad historical context, both internalism and externalism have long traditions in Western thought that have exerted theoretical influence in the field of rhetoric and composition. Roughly speaking, internalism corresponds to idealism, and externalism corresponds to realism. Plato is perhaps the first and most prominent internalist. For Plato, when searching for true knowledge no appeal to the empirical world need be made; truth is discovered through turning inward and introspecting on the forms, of which you had glimpses in past lives (Shirley MacLaine was probably Plato in a past life). The a priori
is where the action is. An extreme internalist would be a solipsist—everything would simply be a product of his or her imagination and nothing outside of his or her mind would actually exist. Plato was not a solipsist, however, because he held that there was a knowable, person-independent truth that was "out there"—though not "out there" in the empirical world (just where "out there" is has always been a problem for platonists). Descartes is another arch internalist in the Western tradition, as are Hegel and Kant.

Externalism has a shorter history, although the sophists tried to get it off the ground early. The sophists' claim, for instance, that knowledge and morality are community-specific, and that they can be best known by empirical means, set them at odds with Plato. But Plato's model eclipsed that of the sophists in influence, and the externalist ball didn't really get rolling until Darwin, and the extender of Darwin's tenets, Marx. Marx is perhaps the most widely influential externalist in humanities circles. Historically speaking, however, Darwin may be the most important figure in overturning internalist assumptions, for it was Darwin who first posited a Western paradigm for explaining both the status quo and change through external causes (perhaps in order to talk comfortably about technology in composition we need to talk as much about Darwin as about Plato). Darwin's theory of evolution showed how external, environmental influences could be responsible for forming fundamental categories of both our physical and mental make-up. But it was through Marx's application of Darwin's model to the social sciences that externalism began its spread into the non-sciences.\(^3\) The strength of Marx's deterministic model was that it gave focus to a study of the material sources of

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\(^3\)Marx explicitly and freely admitted his debt to Darwin, asking Darwin's permission to dedicate the first volume of *Das Kapital* to him. Darwin refused, saying that he was deeply honored, but that his family would be disturbed to have such a godless book dedicated to him (Boorstin 19).
many social phenomena by positing a very narrow causal model. The weakness of Marx's model was that same narrowness—the presumption of a unilateral effect of base (the technology of production) upon superstructure—which precluded any interplay between base and superstructure.

I have argued above, however, that it be a mistake for compositionists to pursue more extreme externalist theories as a remedy to the problems associated with internalism. If I am correct, then what useful alternatives are there? What theories have avoided the extremes and theorized the center of the spectrum? What approaches to theorizing technology would be fruitful in composition?

The Importation of "Technological" Theories into Composition

Composition is an eclectic field, and a wide variety of theoretical approaches have been imported that might provide bases for studying technology. I have already discussed some of the limitations of cognitivism, expressivism, and social constructionist theories, and I have argued for a complement to social constructionist approaches. Two other prominent influences—Plato and Marx—also fly to extremes on the spectrum. Several varieties of postmodern theory have had a significant influence on composition in the last decades, but they also do not provide a good basis for theorizing technology. As Christina Haas notes, postmodernists "tend to be technologically deterministic because human motive—in the form of human agency—is missing (Barthes, 1981). Without a place in history or activity for some human agency, postmodernists have to assume that technology develops and changes of its own volition" (Haas 216). She also notes that postmodernism is "intrinsically antimaterialistic," arguing that, for Foucault, the "body" is "not a material, physical, biological system, but rather a discursive, linguistic, and
cultural construct" (216). Derrida—another significant source of influence in composition—broaches issues of technology and undermines Plato’s internalist attacks on writing as an inferior, material medium. Nevertheless, notes Haas, his “project is one of critique, not of construction” (43).

Three sources of externalist theory—Thomas Kuhn, Lev Vygotsky, and pragmatism—have been imported into composition as aids to developing social constructionist thought, and all offer potential for developing theories of technology. Kuhn is often cited as a source of social constructionist thought by compositionists, but composition imported only one sense of his notion of “paradigm”—the broader sense in which a paradigm is a socially constructed set of cohering beliefs and assumptions. A second, narrower sense is also outlined by Kuhn, in which a paradigm is formed by a technological exemplar. Thus, for instance, Newton’s work with prisms, through which he explained the nature of light refraction, became the technological paradigm for later work in optics (MacKenzie 11). And Kuhn explicitly states that the second sense of ‘paradigm’—paradigm as technological exemplar—is “philosophically … deeper” (Kuhn 175). Indeed, it could be argued that the early Flower and Hayes employed the technological paradigm of a computer for their internalist, cognitivist model. Like the computer, their early model focused on methods of processing using a recursive flow chart. Unfortunately, though the computer was certainly a powerful force in many ways, as an exemplar for the mind it was limited, for just as the operating systems of computers do not process social, material factors in writing processes, neither did the model of Flower and Hayes.
Perhaps compositionists only imported Kuhn's broader sense of paradigm—paradigm as a socially constructed set of cohering beliefs and assumptions—because of the dominant cognitivist assumptions that held sway at the time. Social elements of externalist approaches are less obviously material than other technologies, so they are perhaps a natural point of transition from internal, cognitivist approaches to externalist approaches. Kuhn has been very helpful in giving credibility to externalism, perhaps primarily because he credibly undermines the foundationalism of the bastion of truth that is science. But his work has limited direct applicability to composition in that it is concerned with different subject matter.

The theories of Vygotsky and John Dewey—arguably the most prominent pragmatist—have remarkable similarities, though it seems less remarkable in light of the fact that Vygotsky apparently read William James' work extensively (Wertsch 7). As David Russell notes, each synthesized a variety of disciplinary knowledge while charting new courses for their nations' educational systems; both began as Hegelian idealists who moved to externalism but continued to assert Hegel's focus on human development, collective and individual, in history and culture, along with a preoccupation with human activity—labor. Both fought atomistic reductions and abstract dualisms and dichotomies of many sorts in their attempt to view education and communication (in the broadest sense of both) in terms of history and culture (in the broadest sense of both). While Hegel dealt with atomistic and dualistic explanations by synthesizing them toward an Absolute, Dewey and Vygotsky dealt with them by denying all absolutes to assert a dynamic holism. (173-4)

Though both Vygotsky and Dewey devoted long careers to undermining both the subject/object distinction assumed by narrow cognitivist models, and of constructing a theory which incorporates technology, ethics, aesthetics, epistemology, and pedagogy in
a coherent, externalist framework, Vygotsky seems to be making the bigger splash in composition (cf. Haas 13-18). But pragmatism—and particularly Dewey—is particularly suited to developing a theory of technology within composition in ways that Vygotsky is not.

First, although Vygotsky considers the nexus between the internal and the external, his emphasis is on the mediation of the social in language acquisition, and he leaves undeveloped the roles of material and technological mediation. He theorizes the interaction of cultural and the neurophysiological, but not the relationship of these with material technologies. As James Wertsch notes, Vygotsky’s approach fails to account for “processes that arise from the organism’s experience with the external, physical world” (46). Wertsch goes on to note that critics have argued that Vygotsky “really viewed thinking as the product of social factors alone” (47). In short, Vygotsky does not have a developed general theory of technology, which limits his effectiveness in helping to move social construction toward a more external stance. Dewey, however, developed a broad theory of technology that provides a useful springboard for extending social construction within the field of composition (and to that theory we will soon return).

Second, although Vygotsky addressed writing more directly than Dewey, Vygotsky’s theory over-emphasizes the immediate relationship between literacy and cognitive effects. Goody describes Vygotsky’s theory with respect to writing as follows:

When an individual comes to master writing, the basic system underlying the nature of his mental processes is changed fundamentally as the external symbol system comes to mediate the organization of all his basic intellectual operations. Thus, for example, knowledge of a writing system would alter the very structure of memory, classification and problem-solving by altering the way in which these elementary processes are organized to include an external (written) symbol system (216).
Such a theory does not give sufficient emphasis to the mediatory effects of factors of time, history, and culture (discussed above in relation to the studies of Vai literacy by Scribner and Cole), which in turn leads to an oversimplified view of causation. It leads to the supposition, notes Goody, that the effects of literacy, for instance, should be found “immediately and everywhere” (216). Dewey, however, consistently foregrounded culture, history, and time in his theory of technology.

Third, Dewey wrote in English and there are inexpensive editions of his work, new and used, in abundance. This may seem trivial, but it is, perhaps, an underestimated, externalist point. The development of theory, especially within the presuppositions of a social constructionism framework, implies or requires wide consideration and review of primary materials. Dewey’s work is already widely held in libraries, and editions of his work can be found in most used bookstores. Further, Dewey worked in a tradition familiar to most compositionists, which leads to the next point.

Fourth, there are at least lingering, implicit formative influences of Dewey in composition, who is, as Janet Emig notes, “everywhere in our work” and a forerunner of contemporary composition research (12). Admittedly, the thread of that influence has largely been lost, or is misunderstood because of the warping of Dewey’s work by many of his supposed followers. There have, however, been recent reconsiderations of Dewey’s influence within composition.4

Fifth, the inclusiveness and breadth of pragmatism holds the promise of encouraging dialogue between many groups both within and outside the field of

4 See, for example, Donald Jones’ “Beyond the Postmodern Impasse of Agency: The Resounding Relevance of John Dewey’s Tacit Tradition.”
composition studies. Any attempt to forward an ethically informed theory of technology within composition, for instance, must work in concert with the extensive work already done in the field on the ethics of writing instruction. Despite the traditional association of pragmatism with the political mainstream, it exerts strong appeal among many theorists of race, class, and gender. Pragmatism has demonstrated such a wide appeal, though within composition the strong association of pragmatism with Rorty has obscured some of potential depth of that appeal.

Cornel West, for example, claims that American pragmatism is second only to prophetic Christianity as a source for Afro-American critical thought (Prophesy 15-22). And West describes Dewey’s work in particular as “awesome and inspiring” and claims that “for too long it has lain dormant in the American unconscious, venerated by parochial epigoni, depreciated by myopic specialists, yet seriously interrogated by few. He deserves better. In fact, I believe a renascence of Dewey is soon to come” (Evasion 86). In her recent article “In Excess: Radical Extensions of Neopragmatism,” Susan Jarratt considers the many parallels between pragmatism and feminism and notes that feminism and pragmatism are linked by “the focus on historical contexts for thinking and acting along with a rejection of the distanced analytic stance of the Cartesian subject in favor of value-laden, politically committed intellectual work” (216). In “Where Are All the Pragmatist Feminists?” Charlene Seigfried notes that pragmatism was marginalized for holding positions consistent with feminism, including “early and persistent criticisms of positivist interpretations of scientific methodology; disclosure of the value dimension of factual claims; reclaiming aesthetics as informing everyday experience; linking of
dominant discourses with domination; subordinating logical analysis to social cultural, and political issues; realigning theory with praxis; and resisting the turn to epistemology and instead emphasizing concrete experience” (5). John Trimbur notes the usefulness of Dewey within a Marxist framework, especially when theorizing the relationship of the individual to society (Consensus 603). And West notes that Dewey incorporated much Marxist theory while rejecting its “imperial, monistic, and dogmatic versions” (Evasion 221). West even goes so far as to claim that the difference between Gramsci and Dewey is not that Gramsci accepts Marxist theory and Dewey rejects it, but that “Gramsci tenaciously holds onto Marxist theory in those areas where it fails” (Evasion 221).

Fifth, pragmatism could be useful to composition because of the contemporary extensions of the historical tradition of pragmatism in other fields. The primary sources of Dewey, Mead, Peirce, James, and Schiller have been mulled and reworked by scholars from a variety of fields, and there has been a recent revival of interest in their work. This work provides just the sort of interdisciplinary base that many scholars attempting technology studies have called for. In the field of composition, these revivals of Dewey’s work offer some especially promising applications.5

History of Theory in Composition and Dewey’s Externalist Critique

I will briefly review aspects of Dewey’s views on technology that relate particularly to the field of rhetoric and composition and then, in the spirit of pragmatism, adapt and apply that theory to issues in composition. One place to begin to use pragmatism to provide a technological complement to social construction is in a

5 See, for example, Hickman, Hollinger and Depew, Shusterman, Siegfried, Strange, and Welchman, as well as West’s The American Evasion of Philosophy: A Genealogy of Pragmatism.
reconsideration of influential historical precedent, for both pragmatism and social construction (as it has been adopted in composition) assume that technology must be theorized historically. Compositionists and rhetoricians have begun to reconsider a variety of historical periods, but ancient Greece has been a frequently-treated subject. Social constructionist treatments of ancient Greek history such as Susan Jarratt’s *Rereading the Sophists* have explored contemporary externalist alternatives to Plato primarily by focusing on thinkers such as the sophists, who were externalists to the extent that they denied Plato’s foundational claim that truth was eternal and outside the scope and influence of earthly existence. For the sophists language and ethical standards were, rather, a contingent product of social interaction: our actions in the world form our language, our conceptual categories, and our ethical norms. Dewey offers a complement to work like Jarratt’s by providing a technological critique of Plato’s internalism.

Pragmatic, externalist approaches to such matters are interested in undermining, and explaining the genesis of, the distinction between what Plato and Aristotle called *techne* and *episteme*, and thereby extending the critique of Plato from the social to the technological. Aristotle and Plato held that *episteme* was foundational knowledge that could not be otherwise. Because pragmatism and other externalist theories deny this, they have an interest in alternative explanations of the nature of *episteme*. For Dewey, the construction of such theoretical knowledge is a special case of technical production—a position that stands Plato on his head. *Techne*, for the Greeks, applied to a body of skills that was stable; but technology for Dewey and like-minded pragmatists is an active method of constructing new skills, as well as reconstructing old ones. For Dewey, then, technology is not different in kind from theory: they are inextricably linked, and both
have as their goals the “appropriate transformation of a problematic situation” (Hickman 45). Dewey claims that the long tradition of dualism with respect to both body/mind and theory/practice can be traced to this mislocation of technology by ancient Greek philosophers. From a pragmatist perspective, however, knowing, knowledge, theories, and metaphysical systems are technological artifacts or tools, and much of pragmatism is an attempt to replace such traditional theories of knowledge with theories of inquiry. One can see, then, how much the traditionally-divided histories of thought and theory, on the one hand, and practice and technology, on the other hand, would be collapsed, for on the pragmatist view such things as theories, and practices, and printing presses are all of a kind (Hickman 18-19).

Dewey gives a broad account of the role material technology played in ancient Greece that anticipates the work of Eric Havelock in works such as Preface to Plato. Dewey’s account, however, doesn’t focus on orality and literacy; he argues more broadly that the work of all artisans in Greece provided the model from which Plato, Aristotle and other Greek philosophers constructed their theories. According to Dewey, artists in Greece worked in a variety of material media, and as a result of this work, this “techne” as Plato would categorize it, they produced objects which were aesthetically pleasing, and, as Dewey would say, finished “ends-in-themselves”:

Greek philosophy as well as Greek art is a memorial of the joy of what is finished, when it is found amid a world of unrest, struggle, and uncertainty in what, since it is ended, does not commit us to the uncertain hazards of what is still going on. Without such experiences as those of Greek art is it hardly conceivable that the craving for the passage of change into rest, of the contingent, mixed and wandering into the composed and total, would have found a model after which to design a universe like the cosmos of Platonic and Aristotelian tradition. Form was the first and last word of philosophy because it had been that of art; form is change arrested in a prerogative object. It conveys a sense of the imperishable
and timeless, although the material in which it is exemplified is subject to decay and contingency. It thus conveys an intimation of potentialities completely actualized in a happier realm, where events are not events, but are arrested and brought to a close in an eternal self-sustaining activity. Such a realm is intrinsically one of secure and self-possessed meaning. It consists of objects of immediate enjoyment hypostatized into transcendent reality. Such was the conversion of Greek esthetic contemplation effected by Greek reflection. (Later 1: 78)

And this conversion was of great importance, for, as Dewey notes, Greek thinkers "were as much dominated by the esthetic characters of experienced objects as modern thinkers are by their scientific and economic (or relational) traits" (Later 1: 75).

But though Plato and other Greek thinkers were taken with objects of art, they could not identify with the processes that produced such “technological successes.” Those processes were inextricably tied to work in material media, to *techne*. As Hickman notes:

> The free Greeks, the Greeks who had the leisure for reflective *thinking*, exhibited an attitude toward such technological successes that was deeply contradictory. On the one hand, they regarded such production as “menial,” literally as having to do with domestic affairs rather than those of public men. This was less so in the case of the dramatic arts because of their perceived links with the life of the polis. But for the most part, and when not occupied with the tools and implements of battle, those who engaged in public affairs did not grapple with instruments and materials; they were proud to be “free” of involvement with, and knowledge of, the means of production. On the other hand, aesthetic objects, once they were finished, received honored attention as objects of immediate enjoyment. (Hickman 91)

Thus it was the case that a rift in the social structure in Greece made it impossible for the strengths of the upper and lower classes to complement one another. Dewey argues that the Greek community was marked by a sharp separation of servile workers and free men of leisure, which meant a division between acquaintance with matters of fact and contemplative appreciation, between unintelligent practice and unpractical intelligence, between affairs of change and efficiency—or instrumentality—and of rest and enclosure—finality. Experience afforded
therefore no model for a conception of experimental inquiry and of reflection efficacious in action. (Later 1: 80)

For Dewey, it is precisely this interanimation between means and ends, or theory and practice, that is the proper goal of a society. His educational theory, for instance, foregrounds the need to connect academic curriculum to social exigency. Though Plato forwarded a meritocracy—and even granted the right of women to rule if they were found capable—he was committed to the unilateral priority of episteme over techne rather than mutual interanimation of the two forwarded by Dewey. Greek artisans, notes Dewey, did not live in a world in which they could contemplate form (or, indeed, “the forms”) at their leisure—instead, they labored with the material. Plato was

so troubled by the consequences of this ignorance of form on the part of all who live in the world of practice...that he elaborated a plan by which their activities might be regulated by those who, above labor and intanglement in change and practice, provide in laws forms to shape the habits of those who work. (Later 1: 78-79)

Dewey asserts that it was thus primarily a classist and patriarchal bias that led to this “misplacement” of technology and the splitting of means and end, theory and practice, processes and products, and mind and body. The political ramifications are, of course, manifold. One immediate consequence is that the misplacement of technology becomes a rationalization for existing class divisions:

The conception that contemplative thought is the end it itself was at once a compensation for inability to make reason effective in practice, and a means for perpetuating a division of social classes. A local and temporal polity of historical nature became a metaphysics of everlasting being. (Later 1: 98)

In a platonic system, then, epistemology, metaphysics, and ethics are assessed within an internalist theory. The forms do not exist in the physical world and are not subject to it. What is best to know is truth as it exists in the forms. Thus, for Plato, you do not look to
the actual world to learn how, for instance, to construct a just society. You look to the forms. You introspect; you appeal to *a priori* experience.

And the bias has continued to this day, in the sense that foundationalist approaches often place reason (or a curriculum) beyond the material and social world.

But contemplative thought and rationality, Dewey argues,

is always a means as well as an end. The doctrine of the universality and necessity of rational ends can be validated only when those in whom the good is actualized employ it as a means to modify conditions so that others may also participate in it, and its universality exist in the course of affairs. The more it is asserted that thought and understanding are "ends in themselves," the more imperative is it that thought should discover why they are realized only in a small and exclusive class...The ultimate contradiction in the classic and genteel tradition is that while it made thought universal and necessary and the culminating good of nature, it was content to leave its distribution among men a thing of accident, dependent upon birth, economic, and civil status. Consistent as well as humane thought will be aware of the hateful irony of a philosophy which is indifferent to the conditions that determine the occurrence of reason while it asserts the ultimacy and universality of reason. (Later 1: 99)

Dewey’s critique of Greek thought has been complemented and developed by narrower studies such as the recent work of Eric Havelock, who argues that it was a technological shift initially advanced by merchants (namely, the use of the alphabet and writing) that allowed Plato to make the abstractions that launched his hyper-internalist version of philosophy. Havelock argues that "the alphabet converted the Greek spoken language into an artifact, thereby separating it from the speaker and making it into a 'language,' that is, an object available for inspection, reflection, analysis" (8). This technological shift, then, contributed to the development of the values of the new print culture: whereas nonliterate speech in ancient Greece had favored discourse describing action in the world, the postliterate milieu altered the balance in favor of reflection, and thereby forwarded Plato’s foundationalist agenda. The syntax of Greek, argues
Havelock, began to adapt to an increasing opportunity to state abstract propositions in place of describing events in the world:

But how, while still working within the [oral] tradition, can one start to extrapolate such topics and principles out of the narrative flux? The answer is that you can take similar instances and situations which are severed and scattered through different narrative contexts but which use many of the same words and you can proceed to correlate them and group them and seek for common factors shared by all of them. Navigation and its rules do not constitute a topic of the first book of the *Iliad*. But the four different narrative contexts in which embarkation and landing are in question do in effect provide a paradigm of the rules. This can be seen if the pluralised instances are unified, if the ‘many’ can become a ‘one’... Once it becomes this, the original syntax of the poem has been destroyed. (218)

Once this process of abstraction has occurred, the principles, laws, and objects that are produced become separated from the world and time. The syntax used to express the relationships of these abstractions is analytic rather than narrative, and the terms and propositions are organized in timeless relationships (Havelock 219). This process, according to Havelock, was the “‘bottom line' of the alphabetic legacy to postalalphabetic culture” (8). One casualty of that legacy was the traditional Greek gods, for the *Odyssey* and *Iliad* were essentially sacred texts to the Greeks, and in their oral forms they were slowly and unrecognizably altered to address and support the current attitudes and concerns of the culture. Under those conditions, theory and practice, the external and the internal, were connected in Greek oral culture. However, writing down the epics meant that their content—including the nature and behavior of the gods—could be stabilized. Once stabilized, they became ossified both because they lost their adaptability to current problems and beliefs, and because inconsistencies in the characters and actions could be more readily identified and criticized. Where the gods of Greece were once tied to the external world and the history of that world, Plato constructed a new set of gods—the
forms, true episteme—that were not linked to that external world, and which could only be accessed through internalist introspection.

Plato, however, denied the very technological source of his new approach, linking writing with painting and thereby associating it with techne and with the inferior products of the inferior class of artisans:

Socrates: You know Phaedrus, that's the strange thing about writing, which makes it truly analogous to painting. The painter's products stand before us as though they were alive, but if you question them, they maintain a most majestic silence. It is the same with written words; they seem to talk to you as though they were intelligent, but if you ask them anything about what they say, from a desire to be instructed, they go on telling you just the same thing forever. And once a thing is put in writing, the composition, whatever it may be, drifts all over the place, getting into the hands not only of those who understand it, but equally of those who have no business with it; it doesn't know how to address the right people, and not address the wrong. And when it is ill-treated and unfairly abused it always needs its parent to come to its help, being unable to defend or help itself. (Phaedrus 521, 275d)

Thus we can see how Dewey critiques internalist theories and demonstrates the role of the material in a particular cultural context. But we began our discussion of theory in composition by asking what theories might assess technology while avoiding the extremes of internalism and externalism (see fig. 3). Though Dewey certainly doesn't succumb to internalist extremes in his critique of Plato's internalist theory, does he succumb to an extreme externalism? To a type of technological determinism? Dewey was accused of technological determinism frequently during his career, partly because much of his effort was expended critiquing internalist positions. But Dewey continually and explicitly renounced determinisms of all sorts. As Hickman notes, Dewey usually focused on the necessary conditions for various phenomena rather than the sufficient

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6 Havelock devotes an entire chapter to Dewey's position vis a vis technological determinism, discussing his position in relation to marxism, Jacques Ellul, and Langdon Winner (140-165).
conditions that concern determinists (177). Dewey says, for instance, in his essay "Search for the Great Community," that

the study will be an intellectual or hypothetical one. There will be no attempt to state how the required conditions might come into existence, nor to prophesy that they will occur. The object of analysis will be to show that unless ascertained specifications are realized, the Community cannot be organized as a democratically effective Public. It is not claimed that the conditions which well be noted will suffice, but only that at least they are indispensable. (Later 2: 333)

This focus on necessary conditions was part of Dewey's consistent concern for directing technology, not succumbing to its inevitable strictures. In his analysis of industrial forces on social organizations, for instance, he notes that he has "emphasized the role of technological and industrial factors" in the development of society, but that

what actually happens in consequence of industrial forces is dependent upon the presence or absence of perception and communication of consequences, upon foresight and its effect upon desire and endeavor. (Later 2: 332-333)

But though Dewey's subtle position with respect to the effects of technology would require extensive analysis, it should be clear from the emphases of his general philosophy that he is no technological determinist. Dewey's pragmatism continually undercuts any sort of foundationalism—technological or otherwise—and attempts to create a space between typical dualisms of mind/body, internal/external and idealism/realism. He foregrounds history and experience—both individual and cultural—and attempts to understand the dynamic, temporal interaction between the theoretical and the material that occurs in inquiry.
Constructing a Framework that Addresses the Internal and the External in Composition

In retrospect, then, I have tried to indicate some of the broad challenges technology brings to composition—challenges that go beyond the obvious and extensive influence brought most recently by the computer. Such challenges cannot be properly addressed within an internalist theoretical orientation, and because Kent appears to be largely correct in his claim that composition is dominated by internalist assumptions, we need to consider methods of altering our theoretical frameworks. Social construction, I have argued, offers an excellent bridge to a consideration of material technology because of its focus on the role of external social context. Matters of social interaction such as collaboration, for instance, are crucial to analyzing the mediation of the material contexts defined by computers. Dewey's philosophy offers a broader framework that includes a concern for the social, but also addresses the material without falling into extreme forms of technological determinism.

A central lesson from Dewey for our purposes is that we need to consider the interaction between the internal and the external, but we must realize that that interaction is not necessarily directed or dominated by either the internal or the external. Rather, in particular contexts we must consider the synergy between the internal and the external, realizing that an external technology cannot merely be pressed into service as a mere means to a preselected end (ends that are often internalist in the humanities). Scholars in the humanities (including Havelock, as we have seen above) have often argued this precise point with respect to the technology of writing, pointing to the pitfalls that attend the view that writing is a mere transparent, instrumental means to a pre-existing end.
And scholars in composition have pressed the point that focusing on the “end” in writing (the finished product) is counter-productive to a robust understanding of the ways in which product and process interanimate. But we cannot lose sight of this interanimation in other contexts such as computers or electronic texts, when those in the humanities are often tempted to attempt to treat “external” computers as mere means to the “internal” goals directed by their research or teaching. Computers are no more plastic before the whims of compositionists than language is plastic before the whims of scientists (and to the extent that language is transparent in science, people have worked very long and hard to make it that way).

We are not pursuing a static, perfect golden mean between the two extremes; such a mean would fail to convey the dynamic of both elements and would effectively produce a final “end” rather than a recursive process. Because means and ends interpenetrate, Dewey argues, the result of a particular technological decision will often become the condition for a decision at another time in another setting (in Hickman 163). Dewey holds that for this and other reasons technologies—both internal and external—teem with values, and these values are often made explicit only after extensive analysis. In the United States, for instance, Dewey holds that we have an implicit technological constitution as well as an explicit political one; however, the prevailing view that abstract ideas like political constitutions can always lead technological choices—regardless of intermediate interactions between the two—has obscured our understanding of political situations (Hickman 165).

If we return, then, to our spectrum of the internal and external (fig. 3), and consider these matters in relation to that spectrum with an eye toward the concerns of
composition, there are some cautionary points worth making. I have argued above that Goody’s physical distinction between the internal and the external is a useful means of visualizing the relationship between theories in composition, but that theories do not seem to be intrinsically motivated by moving in or out of the head per se. Given the other concerns discussed above, it would seem plausible to claim that there are four elements that are more primary to theories than the physical movement in and out of the head per se, but which are related to such physical movement. Curiously, regardless of whether a theory endorses either the “internal” or “external” extreme of the spectrum, there are these four results:

1) **Forwarding of Foundationalism.** The assertion of, or desire for, foundationalism, which is expressed through claims of universality, ahistoricity, or permanent truth. As we have seen above, this can be pursued either by foregrounding the internal (e.g. platonism and expressivism) or the external (e.g. marxism).

2) **Limitation of Language.** The denial that knowledge or truth is language dependent. Internalists generally hold that a conceptual scheme or internal realm of mental states—beliefs, desires, intentions, “voice” and so forth—exists prior to, and independent of, the a posteriori world. Externalists hold that language is an epiphenomenon of more basic material factors. Language is thus a means of communicating with one another, but it is not constitutive of truth or knowledge (it can also be held—in the manner of positivism—that knowledge is dependent on language, but that language can be rendered objective and theory-neutral).

3) **Elision of Experience.** Internalist theories accomplish this through an emphasis on what goes on in the head (or the a priori, or previous lives, etc.) rather than the
interaction of the mental with the empirical world. Externalist theories accomplish it by reducing the role of the will and the mental to prior material conditions. Eliding experience can occur both at a macro level (a lack of attention to history and changes in culture) and at the micro level (a lack of attention to the individual and everyday occurrences).

4) **Severing of subject.** Extreme emphasis of either the internal or the external separates the subject from the object. Externalist theories produce a powerless, unimportant subject (e.g. marxism). Internalist theories valorize the subject by displacing the role of the external, but they cannot explain how the subject interacts with the external world (e.g. expressivism).

I believe that it is safe to say that the great majority of recent scholarship in composition has shown an interest in avoiding these four results, and I am certainly interested in avoiding them. However, if Kent is correct in his claim that composition is overly internalist—and I believe he is—then there must be consequences of this emphasis in particular contexts within composition. If we attempt to correct this mis-emphasis and move left on the spectrum there are at least three theoretical concerns to attend to. First, we must obviously avoid moving too far left on the spectrum, which would result in a form of technological determinism and produce the four results we wish to avoid. Second, it would behoove us to acknowledge the importance of differences brought by a variety of contexts, so that we do not presume that there is a perfect point on the spectrum that applies to all situations (the framework I have constructed is intentionally broad so that it can encompass such variation). Third, we should not assume, even in a very particular context, that there is a perfect, static mean that will somehow capture the
optimal balance between the internal and the external. If, indeed, the relationship between the internal and the external is dynamic as Dewey claims, then the proper approach to a problem might involve a recursive alternation between two points on the spectrum, for it may be that by that very process of transition that the desired consequences fall out.⁷

The balance of this project will attempt to apply this framework in case studies of three areas of composition. The first study (chapter 2) addresses the degree to which research and recommendation on response to student writing has addressed issues of technology. The second case study (chapter 3) considers the influence of film in composition as an alternative communicative technology. The last study (chapter 4) is concerned with the role of electronic texts in the teaching of high school science.

Chapter 2

The second chapter reviews the current prevailing views in composition and finds that there is a surprising degree of unanimity on commenting in composition; namely, that commenting should be facilitative and not directive. Indeed, I believe one would be hard-pressed to find any other non-truism upon which there is more agreement—at least theoretical agreement by those publishing in journals. But virtually all commenting research and theory operates on internalist assumptions in that it assumes that research that has been done in composition classes on standard composition genres (i.e. the five paragraph essay) can be reliably applied to any genre. On that assumption, it is presumed that research that supports the use of non-directive, facilitative comments is applicable in writing instruction in any discipline. In making such an assumption language is limited

⁷This point is similar to that made by Richard Lanham in The Electronic Word, where he argues that
in that it is thought that genre is somehow transparent, and that the mental/emotional/
physical processes that writers go through in one genre are gone through in the same way
when writing in any genre.

For this homogeneity of cognitive process to be true, writers would have to be
unaffected in any meaningful way by the external factors that differences in medium,
genre, discipline and technology present. Study of an experienced teacher of an
introductory engineering class provides evidence that there are plausible reasons linked to
the external factors of genre and discipline which can explain why non-directive,
facilitative commenting is not universally effective in commenting on engineering
papers. In this particular genre, in fact, directive commenting can often be most
effective. I conclude by considering how a more externalist approach to WAC would
affect research methods and writing pedagogy in disciplines other than engineering.

Chapter 3

Though there are broad historical precedents for the ways in which technology—
such as the alphabet or the printing press—has affected society and education, during the
thirty-odd year history of composition as a discipline the prevailing technology has
changed little until the advent of the computer. There is, however, at least one prior
precedent worth examining: film. In this chapter I review the role of film in composition
by examining discussions of film in composition journals and describing some of my
collaborative attempts to teach film. With respect to the former, I argue that since
compositionists in the 60s and 70s tended to foreground the internal, formal, 'universal'
elements of written texts, they likewise focused on the grammar, punctuation, and syntax-
-the formal and visual structure—of film as text. Recent approaches to film have begun to pull away from such internalist formalism on social constructionist grounds, but in many ways film seems less dynamic as a medium in composition than it was in the days of such internalist approaches.

One source of this lack of dynamism, I believe, is that now, instead of teachers holding internalist assumptions, students hold internalist assumptions. While earlier approaches tended to use art film, about which students were relatively unfamiliar, more recent approaches have stressed popular film, which has introduced its own distinct difficulties related to assumptions held by students. I am not claiming that this means that students want to study the grammar of film, nor am I claiming that the use of popular film is ill-conceived (indeed, I would claim the contrary). But in my collaborative attempts to teach popular film we have found that students—like early compositionists—want to separate popular film from the external world, but for different reasons. Film, for most students we encounter, is considered "just entertainment," entertainment that is somehow hermetically sealed from the external social and material world. The material, medium-specific aspects of film are so transparent to students that they are largely unaware of the ways in which the concrete placement and movement of the camera in the world it records can affect them as viewers. Similarly, and more immediately frustratingly, they are convinced almost to a student that film neither reflects nor affects the cultural/political mores of society in any important way. Thus, our

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8 Note here that emphasizing grammar is internalist because internalist positions are usually foundational; such positions attempt to find some imperviously "true" thing upon which to ground epistemology and system-building, rather than adopting the holistic, coherence approaches of externalist theories.
9 For a more complete explication of this transparency in popular film see Laura Mulvey's "Visual Pleasure and Narrative Cinema."
students deny that film operates significantly in either the social or material (i.e. the 
e external) realm. Instead, film somehow floats outside of time and history, entertaining 
them in some direct, universal way that excludes the ethical and the political force of 
film. To conclude the chapter, I relate our approach to teaching *Rear Window* and *Pretty 
Woman* in the attempt to address and undermine these student assumptions.

**Chapter 4**

In chapter four, I apply the internal/external framework in the context of an attempt to 
develop electronic texts for secondary science instruction. After describing how I built a 
collaborative relationship with a biochemist interested in secondary education, I argue 
that secondary science education has been internalist by reviewing the National Research 
Council’s 1996 *National Science Education Standards*.

I then describe how we assessed and developed software that would facilitate the 
externalist emphases that would help balance the predominant internalism that prevails in 
secondary science instruction. Part of our attempt to externalize instruction concerns the 
choice of subject matter and emphasis, but for the purposes of this dissertation I focus on 
our decision to foreground writing in our instruction. We are particularly interested in 
software that externalizes the cognitive processes that occur during writing. By 
externalizing the processes of writing—particularly the process of prewriting—we found 
that we were able extend prewriting beyond conventional note-taking to a form of visual 
sorting that occurs during the process of reading. Our goal, then, is to collapse reading 
and writing into one, continuous, active process by providing students with external tools 
that facilitate such a process in ways that traditional texts can not.
CHAPTER 2

AN EXTERNALIST APPROACH TO WRITING-ACROSS-THE-CURRICULUM

There are presently two subcurrents within WAC—frequently referred to as writing to learn (WTL) and learning to write (LTW)—that shape WAC programs in very different ways. WTL can be characterized as internalist in that it assumes that there are broad or perhaps universal patterns in the ways that human minds work, and that in general human minds can use writing as a means of learning as well as a means of showing what has been learned. There are, however, aspects of WTL that are consistent with externalism. WTL does emphasize the view that knowledge is not passively received by the tabula rasa of the mind, but is instead constructed interactively by the learner. The nature of these active constructions of knowledge changes as each person grows, and because of the idiosyncrasy of the particular personal level of cognitive development it is helpful to explain something to yourself before you attempt to explain it to others. An effective way to learn, then, is to write to yourself as an audience; hence, WTL proponents often promote expressive writing. The work of James Britton and Janet Emig is considered seminal in theorizing WTL in the 1970's, and the WAC program that Toby Fulwiler developed at Michigan Technological University is a prominent application of this approach (Abels 4-6 and McLeod & Soven 4). Thus, although WTL is

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not necessarily at odds with externalist approaches, in practice, WTL has viewed the interactivity between knowledge and learner with predominately internalist assumptions. As I hope to show, the role of the social (such as the different discourse communities represented by different disciplines) and technological interaction between learner and subject matter has been largely overlooked.

In the last decade, an externalist rival to WTL—LTW—has gained momentum, and there has been an ongoing debate about the extent to which the WTL and LTW are incompatible approaches. LTW—also referred to as ‘writing-in-the-disciplines’ ‘writing-to-communicate’ and a ‘rhetorical’ approach to WAC—emphasizes the discipline-specific nature of academic writing. On this view, academic disciplines comprise discourse communities, each of which has its individual conventions and beliefs about knowledge, learning and writing. Knowledge in disciplines is not as much discovered as agreed upon: beliefs are socially justified through an ongoing conversation. Consequently, students need to be introduced to the conventions and assumptions of the particular discipline they are attempting to enter. In order to expedite their entry into such discourse communities, students must study the conventions and assumptions of those communities and tailor the types of writing and instruction that we give to that particular academic context. In practice, LTW has usually involved an emphasis on transactional rather than expressive writing (although I would argue that neither expressive writing nor WTL is precluded by LTW theory).

In order to facilitate the entry of students into the disciplines they choose, writing teachers must, of course, also study those communities. Indeed, the internalist approach of global, generic application of WTL strategies such as the indiscriminate use of
expressive writing has been rejected by recipients in many disciplines, and many composition scholars have begun to acknowledge both the importance of disciplinary context and the study of rhetorical practices and writing conventions within particular disciplines (cf. Abels 14). Some scholars have referred to this shift from WTL to LTW as a shift from the “first stage” of WAC to the “second stage.” In his 1991 article, “The Second Stage in Writing Across the Curriculum,” Charles Bazerman affirms the efficacy of this shift by reviewing the merits of four books that he feels represent the shift: Linda Brodkey’s Academic Writing as Social Practice, David Jolliffe’s Advances in Writing Research: Writing in Academic Disciplines, Susan McLeod’s Strengthening Programs for Writing Across the Curriculum, and Herbert Simons’s Rhetoric in the Human Sciences. Bazerman argues that the survival and prosperity of WAC must attempt more than “the conversion of every class into a writing laboratory” (210). These four books, he feels, outline the means by which WAC can—and must—“attach itself to the lifeblood of communication by means of which disciplines and professions organize themselves” (210) and thereby make itself indispensable.

However, although there may be a general consensus in the shift to LTW by many practitioners of WAC across the country, that shift is pursued in many ways. As Kimberly Town Abels points out, much rhetorically-inclined LTW research studies “how knowledge has already been constituted through language rather than the process through which the writer has come to constitute his or her knowledge with language” (35). In this regard, she notes, LTW is in danger of “leaving writing-to-learn theory behind and undeveloped as it runs forward to investigate learning-to-write in the disciplines without considering how or if this theory should be put into practice” (33). In “American Origins
of the Writing-Across-The-Curriculum Movement,” David Russell makes a similar point, noting that “WAC thus far has only begun to explore those issues that lie behind its basic assumption: that language, learning, and teaching are inextricably linked” (19).

Certainly these are well-said warnings. It would be unwise to lose sight of what is arguably the primary goal of WAC—facilitating student learning. But in order to pursue either WTL or LTW successfully within a discipline, it would seem necessary to first study the assumptions the discipline holds about knowledge and writing—assumptions that are expressed, at least implicitly, in the conventions of genre within various disciplines. The necessity of such study is evident for intellectual, social, and technological reasons. On intellectual grounds it is true because you must have an understanding of what it is that students are trying to acquire in order to study how and if they are successful in their attempts to acquire it (I must assume in making such a claim that there are not sufficient universal cognitive practices to warrant application of WTL strategies across the disciplines. This is perhaps most obvious in the case of social conventions, though I would argue that it is the case with intellectual (i.e. ‘cognitive’ or ‘ideational’) elements as well). It is true for social reasons—in a very practical sense—in that most faculty are primarily devoted to their respective disciplines. Attempts to entice collaboration in researching WAC issues will have limited success if they appeal only to broad philosophical or institutional ties. Consequently, recognizing the relatively autonomous status of disciplines is efficacious even if it is believed that such autonomy should be reduced and the distinctions between disciplines softened (Russell 19). Finally, studying the assumptions a discipline holds about writing is necessary for technological reasons, in that genres are external, materially-embodied entities that have different
purposes and function in different ways. They are, as I have argued, in that crucial nexus between the internal and the external where writing functions as a tool to create and disseminate knowledge.

How, then, can LTW be pursued in a manner that does not overlook the process of student learning? And how can externalism help in guiding the study of such issues? At least one practical avenue presents itself: focus on a teacher's response to writing in a discipline other than English. By focusing on response, one can learn what technologies and conventions are valued by practitioners in a discipline, and how they wish to guide students to an understanding of those conventions.

What work then, has already been pursued within composition concerning study of response? And what bases do they proffer to justify recommendations for responding techniques? A review of the literature on responding to student writing reveals that the status of facilitative commenting has made a steady ascent in composition and that it is generally held that the effectiveness of facilitative commenting holds for writing in any discipline or genre. Early on it was argued that students should control their texts, and that such control could be achieved through facilitative rather than directive comments. C. H. Knoblauch and Lil Brannon reviewed the state of the art on teacher commentary in 1981 and advise that commenting be part of a conversation between teacher and student in an environment that fosters revision and gives students control over their writing. Three years later, Brooke K. Horvath synthesized current views on written response, among them that response is most effective when it is used to foster revision, and that the goal is to return control of the paper to the student (140).

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10 I am indebted to Jaye Bausser for her significant contribution to the review of literature on response.
Since Horvath, there have been no literature reviews on commenting; though several theorists and researchers have included some literature reviews in their publications. These publications reflect concerns about the effect of teacher comment which has driven much of the research and theorizing. Publications categorize, analyze, and theorize about the best kind of comments, consistently advocating facilitative comments. Brannon and Knoblauch (1982) maintain that comments should help students see the ways in which the intention of the writer is not yet effective. Their concern is that the students retain control of their texts by having a choice in what to do. Nancy Sommers has similar concerns and advice. Leonard and Joanne Podis identify facilitative comments as those which encourage student potential and advocate a method of response in which teachers analyze difficulties in student drafts as a way to understand the intentions of student writers and to help them find those intentions.

Both Patrick Sullivan and Frances Zak give evidence for the effectiveness of positive as opposed to negative comments, the implication of which is that positive comments have a more facilitative effect. Nancy Welch equates control of text with personal growth, maintaining that a student will "take charge not only of a particular text and a particular revision but also of the person she is and the person she is becoming" (501). In a similar vein, Richard Bullock urges that comments should not judge and should be non-directive. In an early article about student control, Elaine Lees identifies the teacher's goal as "leading students to revise for themselves" (3730). Richard Straub and Ronald Lunsford develop a method of analyzing the ways in which a selected group of commentors differ in degrees of being facilitative and directive: nonauthoritative
modes of commentary were one of the seven similarities found among the participants in the study (373).

There is, then, a surprising degree of unanimity on the superiority of facilitative commenting in the discipline of composition; indeed, I believe one would be hard-pressed to find any other interesting claim upon which there is more agreement. And there is a consistent assumption that the findings and recommendations are applicable to genres and disciplines outside of English: the conclusions in favor of facilitative commenting are rarely if ever limited to the particular types of writing studied, or to any particular types of writing at all. But virtually all commenting research and theory in composition operates on internalist assumptions in that it assumes that research that has been done in composition classes on standard composition genres (i.e. the five paragraph essay or the narrative) can be reliably applied to any genre. On that assumption, it is presumed that research that supports the use of non-directive, facilitative comments is applicable in writing instruction in any discipline. In making such an assumption, it must be thought that genre is somehow transparent, and that the mental/emotional processes that writers go through in one genre are gone through in the same way when writing in any genre. For this homogeneity of writing process to be true, writers would have to be unaffected in any meaningful way by the external factors that differences in medium, genre, discipline and technology present.¹¹

Recent scholarship has begun to foreground the tenuousness of blanket approval of facilitative comments. In 1996, Straub begins to challenge the status quo within composition, noting the "remarkable consistency [with which] the recent scholarship on
response has urged us to reject styles that take control over student texts and encouraged us instead to adopt styles that allow students to retain greater responsibility over their writing" (223). He reviews recent scholarship on response and questions what he sees as facile dualisms between directive/facilitative, authoritative/collaborative, and masculine/feminine that have dominated the discussion, arguing that compositionists too easily equate directive response with authoritarian response (224-5).

While Straub's essay initiates a challenge to the status quo on commenting in composition courses, it is an internal (as opposed to 'internalist') critique in that his study is also limited to standard writing genres in composition and English courses. Over the last ten years, however, the consensus for facilitative commenting has faced a second, external, externalist challenge from studies of other non-English genres—a challenge brought by the widespread shift to LTW. That challenge was in part motivated by a dissatisfaction with generic approaches to writing instruction in composition that, as I have noted, elided differences between academic disciplines and genres of writing within those disciplines.

With respect to commenting, this shift to LTW has resulted in several studies of writing outside of composition that question the consensus for facilitative commenting. Larry Beason, in a study of writing-across-the-curriculum classes, evaluated both teacher and peer feedback and concluded that while feedback patterns of both teachers and students have some similarities to those in composition courses, there are other patterns that need to be evaluated. In another study comparing composition writing with writing in other disciplines, John Hagge found that formal conventions are more highly-valued in

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11 This is essentially the same assumption made in advocating WTL in general across disciplines without
occupational writing than in composition courses. With respect to technical writing in particular, Sam Dragga argues that research on commenting has focused on the essay and has erroneously assumed that "student writing is generic and that the kinds of comments appropriate to introductory composition are also appropriate to technical writing" (202). His comparison of technical writing teachers and technical editors and supervisors leads to a recommendation that technical writing teachers adopt the responding techniques of technical editors and supervisors, among them using including explicit and systematic directives, questions, and suggestions.

In light of these considerations, I initiated a study of genre and responding techniques in undergraduate engineering courses with a fellow graduate student and a professor of engineering. Because technical writing is the genre of academic writing that is in many respects least similar to the genres typically taught and studied by compositionists, it seemed the genre most likely to cast light on the weaknesses of previous, internalist approaches to responding that were built solely or primarily on studies of English genres. Furthermore, there is much potential in collaboration between technical writing teachers with backgrounds in composition and teachers of technical writing in various disciplines: compositionists bring an understanding of the history and theory of writing instruction, while teachers within the disciplines bring a deep understanding of the discipline's writing conventions and genres.

Purpose of Study

Our study explored the responding techniques of engineers whose courses for beginning students require a significant amount of technical writing. In general, we are tailoring it to the particular context of the curriculum, class, and type of writing being learned.
interested in the genre conventions of student engineering papers, the ways in which the
writing of those papers are taught by engineers, and the ways in which such methods and
conventions compare with those of other fields. Our focus in this study is responding
techniques of engineering teachers and the ways in which responses to writing can be
understood and effectively employed by teachers. We address in particular the following
issues:

1) What kinds of comments does an engineering professor make on drafts of
   student papers in an introductory class and how do students revise on the basis
   of those comments?

2) How do the kinds of comments given by an engineering professor compare to
   those made by technical writing teachers trained in composition programs,
   and those made by professional technical editors?

3) Is there a relation between the kinds of comments given by the professor and
   the genre of the assignment?

Research Procedure

We gathered data on commenting in a first-year engineering course required of all
engineering students at Ohio State University. In this course, Engineering Graphics 166
(EG166), students learn basic graphics and problem-solving skills. During the last half of
the course, while they continue to learn new skills, students do a team design project that
allows them to apply the skills they have learned to a "real life" situation. As part of the
design project, students must collaboratively prepare a formal written report and make an
oral presentation.
The written report is to be a professional document. Students are expected not only to learn the technical material necessary to solve the problem they are assigned but also to learn the format and conventions of a formal technical report. The report must contain the following elements: (1) cover page, (2) table of contents, (3) list of figures, (4) introduction and statement of the problem, (5) requirements and constraints (i.e., the criteria the final product must meet), (6) preliminary concepts, (7) analysis of preliminary concepts and selection of a final design, and (8) description of the final design (including both a written description and a set of drawings that could be used to construct the object).

Because of the large demand for this required course, 8-12 sections are taught each quarter. A common syllabus is used, but there are some small variations from section to section. In some sections, students simply submit the final report at the end of the quarter. In others, students are required to submit drafts for comment earlier in the term. The professor in the section that was observed had the students turn in a draft of the first half of the report about four weeks before the end of the term. She commented on that draft and returned it. Two weeks later, the draft of the second half of the report was due. Comments on that draft were returned with one week left in the quarter, and students were expected to make revisions and submit the entire report for a grade on the last day of class.

The professor who participated in this study was recommended by her department chair as a member of the faculty with expertise and interest in writing pedagogy. She has taught EG166 more than 20 times, receiving consistently high teaching evaluations from students. In addition, prior to joining the engineering faculty, she worked for a decade at
a scientific research firm writing winning proposals and preparing high-quality technical
reports for a variety of customers. At that firm she served both as a project manager and
as a line manager, and thus had experience in preparing technical reports and in
reviewing and commenting on reports prepared by others. In many ways, then, this
professor is less representative than exceptional: in addition to her extensive experience
in professional writing, she is more interested in writing instruction than many
engineering professors, and she comments more extensively and in more detail than is
typical.

Students in the classes observed were primarily freshman engineering students.
In order to be admitted to the class, they were required to be in, or through, calculus.
Most of the engineering students came from the top 15% of their high school classes and
had a math ACT score of at least 25. While the students are generally technically
competent and highly motivated, they need not meet any minimum standard for writing
competence, and few, if any, of them had ever written a technical report.

Data were collected in four ways:

1) **Observation of classes.** One of us observed classes and took field notes
   when the professor discussed writing—such as when the paper was introduced
   or when drafts were returned.

2) **Review of drafts and final reports.** Copies were made of the drafts and final
   reports of each team in the professor’s classes over three consecutive quarters
   (one academic year). The comments on the drafts were categorized and
   counted to gain an understanding of the professor’s commenting technique,
and then the final reports were compared with the drafts to determine how the students revised on the basis of the various types of comments.

3) **Student interviews.** Students were interviewed to obtain their views on aspects of the writing assignment.

4) **Discussions with professor.** The professor was regularly consulted about the presentation of the assignment, the goals of the assignment, her commenting techniques and methods of instruction.

In this paper we employed two related but distinct approaches to analyzing the data collected. In the first, we compared the data with research data on commenting patterns and strategies in other fields of technical writing. In the second, we analyzed the relation of the professor's comments to the genre conventions of the paper they address.

**Comparison with Research on Comments in Other Technical Writing Fields**

A particularly useful precedent in research on responding in technical writing is Sam Dragga's 1991 article "Responding to Technical Writing," which was mentioned briefly above. Reflecting the shift to writing-in-the-disciplines, Dragga argues that research on responding to writing has over-emphasized the standard English essay and is therefore inadequate as a guide for effective commenting strategies in fields such as technical writing. His study compares the commenting strategies of technical writing teachers with the commenting strategies of professional technical editors by analyzing their responses to a variety of identical papers. His findings show that technical writing teachers should occupy a middle ground between composition teacher and technical editor: commenting strategies should demonstrate a concern for both product and process,
and commenting strategies should foster both a sense of individual and collaborative authorship.

Dragga’s study draws on the work of Alan Purves and adapts the speech act theory of J. L. Austin as the basis for his analysis of commenting styles. The fundamental distinctions drawn from Austin divide modes of discourse into *locutionary acts, illocutionary acts, and perlocutionary acts*. Using Dragga’s examples, “the locutionary act is the discourse as written or spoken (e.g. the assertion ‘I have organized the files at the office.’). The illocutionary act is the intention of the discourse (e.g., a criticism of the listener/reader for not having organized the files previously). The perlocutionary act is the specific response desired by the speaker/writer from the listener/reader (e.g., that the listener/reader keep the files organized or that the listener/reader proceed to organize other materials at the office)” (203). The theoretical structure of Austin that Dragga employs is effective in pointing out the many ambiguities and misunderstandings that attend the relationships of illocution, locution, and perlocution.

In the process of explaining his results and qualifying his conclusions, Dragga notes the many ways in which the context of professional editing differs from an academic context—ways which might justify the differences between the responding strategies of teachers of technical writing and professional editors that he finds in his study. But there are teachers of writing who fall between these two extremes and who could provide a third, complementary foil: engineering faculty, for instance, teach in an academic context, but they rarely have a background in the field of composition and they are generally very aware of the professional demands—including writing skills—that will
soon be made on their students. How does an experienced engineering teacher respond to writing?

Methods of Comparison

We largely adopted Dragga’s methodology of categorization for purposes of comparison: using his method of analyzing teachers’ comments into seven categories of locutions enabled us to compare commenting by the engineering professor with Dragga’s results of the commenting styles of professional editors and academic teachers of technical writing. Dragga divides comments into seven categories:

1) “Compliments are locutions referring to communicative successes and using honorific words (e.g., ‘good,’ ‘nice’)” (207). Examples from our study include:
   - “Good mental picture here.”
   - “While I made several comments on this section, I was very happy to see the introductory paragraph. It is important, and you have a good understanding of what should be in it.”
   - “Good.”

2) “Criticisms are locutions referring to communicative failures and using pejorative words (e.g., ‘wrong,’ ‘poor’)” (207). Examples from our study include:
   - “Poor choice of location of dimension.”
   - “Sloppy.”
   - “This is not an acceptable draft.”

3) “Directives are locutions exhibiting the syntactic structure characteristic of commands (i.e., [you] + present tense verb, imperative mood: e.g., ‘insert comma
here'; or you + modal of obligation + verb: e.g., ‘you must...,’ ‘you need to ...,’ ‘you ought to...,’ ‘you should...’)"(207). Examples from our study include:

- “If you use subheadings here, they should appear in the text as well.”
- “Turn Fig. 3 180 degrees.”
- “Give figure number and title.”

4) “Suggestions are locutions referring to likely revisions and using modals of possibility or probability (e.g., ‘might,’ ‘could,’ ‘would’), quasi-commands (e.g., ‘try to...,’ ‘consider...’), or explicit indicators (e.g., ‘I suggest that’)”(207). Examples from our study include:

- “This statement might be a little strong.”
- “Try not to use first person in technical reports.”
- “Could make the front view section A-A and put all dimensions on the section view.”

5) “Questions are locutions ending in a question mark, using interrogative (i.e., who, what, which, when, where, why, how), or exhibiting the syntactic structure characteristic of questions (i.e., modal + subject + verb: e.g., ‘Should you explain ...?’ or be + subject: e.g., ‘is this ...?’)”(208). Examples from our study include:

- “If you said this to 50 different people in a mall, would they each have a mental picture of the same device?”
- “What is the first thing a prospective customer would ask if you offered to sell him a GOLD candle holder?”
- “Do you mean it makes recycling easier?”
6) “Explanations are locutions referring to in-text markings of accompanying locutions” (208). Examples from our study:

- “The reader will expect them.” [with directive to use subheadings]
- “People have a negative reaction to the term ‘economic class.’” [with criticism that the term ‘economic class’ sounds bad]
- “For example, research on the sizes of dogs people own would help you decide how big to make the dog dish.” [with directive to show how data was used to refine final design]

7) “Observations are all remaining locutions (i.e., locutions impossible to categorize as either compliments, criticisms, directive, suggestions, questions, or explanations)” (208). Examples from our study:

- “Information needs weren’t discussed.”
- “Table of contents required”
- “First paragraph describes the holder. Second paragraph describes how it works.”

In addition to strictly parallel comparisons to Dragga’s study provided by a common method of categorization of comments, we extended and adapted Dragga’s methodology by introducing a distinction between linguistic and graphic elements of a paper. In our preliminary study of writing in engineering we were struck by the relative importance of visual elements. Consequently, in order to begin analyzing this variable we subdivided Dragga’s categories between comments that address issues of format or graphics and comments that address issues of linguistic form (i.e. comments that address locutions). For example, in our study the comment “Fine bar graph” would be
categorized as a graphic compliment, while the comment “Fine introduction” would be categorized as a linguistic compliment (in Dragga’s study they would both be categorized simply as compliments). Comments pertaining to matters of format, to visuals, or to proper methods of referencing visuals within sentences are all considered graphic comments.

Finally, employing Dragga’s categories required overlooking many non-linguistic forms of commentary and editing. The professor edited student drafts frequently, employing a wide variety of signs that reflected her background as a professional technical writer: sentences and sentence parts were rewritten, circled, and repositioned with arrows; errors in parallel construction were indicated by circles, words and arrows; inconsistencies in graphs and drawings were pointed out with arrows and questions marks. None of these editing comments are represented by the seven locutionary categories, since they are not, strictly speaking, locutions. But beyond lacking sentence structure, such editing comments are difficult to categorize and quantify. With locutions, the standard unit is the sentence: one sentence counts as one unit. How many units does a one-word insertion count? The same number of units as a completely rewritten sentence? How many units does a redrawn bar graph count? A series of repositioned page numbers in a table of contents? Without the advantage of the sentence unit the task quickly seems arbitrary. Nevertheless, the importance of the editing should not be overlooked for several reasons:

- The professor devoted a lot of her commenting time to editing.
- The students revised consistently and successfully on the basis of editing comments.
• The importance of visuals in the reports often led to visual editing which is not common in English papers or the commenting research that has emphasized the English essay. But in the field of engineering the visuals are as important—or more important—than the linguistic component (below we will develop the importance of visuals in the student papers).

• The editing was a means of modeling the engineering style and voice, acquiring both of which are goals of the design report.

Comparing the Comments: An Engineer and Teachers of Technical Writing

In Dragga's study, technical writing teachers' most common form of comment was the question, followed by directives, criticisms, compliments, suggestions, explanations, and observations, respectively (210). The results of the engineering professor's comments offer several marked differences, as shown in tables 1 and 2. Note first in table 1 that the most frequent comment given by the teachers of technical writing is the question (40%), while the engineering professor only questions in 15% of her comments. According to Dragga, this is a point in favor of the engineering professor, in that questions often do not give clear revising strategies to students (211). However, as can be seen from his examples (e.g. “Could you combine these two sentences?”), he has in mind primarily comments that address linguistic elements of the paper. But as seen in table 2, the majority of questions posed by the engineering professor pertain to graphic elements of the paper. Unlike questions that pertain to linguistic elements of a paper, the questions posed by the professor concerning graphic elements of the paper usually had clear, directive illocutions. For example:
• “Where is the hole in the top and front views?”

• “Why do you have this circle?” [followed by: “Round is made by creating \( \frac{1}{4} \) circle tangent to top and side. When tangent, no line of intersection shown.”]

• “Why is this picture here?” [followed by: “It is not the final design. This will confuse the reader.”]

• “Where is hole in this view?”

• “Where are the multiple views and the dimensions?”

Despite their expression as questions, the comments all have clear perlocutions. Thus, even in the relatively few instances that she does employ questions, the professor’s questions rarely suffer from the ambiguity typical of questions criticized by Dragga.

The most dramatic difference represented in table 1, however, occurs in the relative number of observations. The technical writing teachers almost never make observations (3%), while almost a third (30%) of the engineering professor’s comments are observations. But again, the particular context of the class requires some explanation of her observations. Like her questions, her observations usually have a clearly directive intent. Consider the following typical examples:

• “Information needs weren’t discussed.”

• “Table of contents required.”

• “Solid cylinder diameter goes on longitudinal view.”

• “Usually the ‘organization of the report’ is a separate paragraph that says what is found in each section of the report.”

• “This page goes before the introduction.”
“First paragraph describes the holder. Second paragraph describes how it works.”

“Graph isn’t on the next page—where the reader would expect to find it.”

“This section needs an introductory paragraph.”

Almost all of these observations are very close to directives. For instance, “Information needs weren’t discussed” easily becomes “You need to discuss information needs” or “Discuss information needs.” Furthermore, the perlocutions of the observations and their close directives are identical: the teacher wants the student to include a discussion of information needs. As Dragga noted in an email exchange concerning the results of this study, the passive nature of the observations is consistent with the general emphasis in engineering on passive constructions. And in this case the passive construction puts a softer edge on some of the many directive comments, which might reduce the cumulative, wearing effect that consistently directive comments might have on the student.

Consider then, the overall picture of the relationship between the teachers of technical writing with backgrounds in composition and the engineering professor:

- A plurality (40%) of the technical writing teachers’ comments are questions. The engineering professor, however, asks much fewer questions (15%), and when she does, they usually pertain to graphic elements of the paper, where they are highly directive.

- In contrast to the technical writing teachers’ emphasis on questions, the most frequently-made comment by the engineering professor is directive—fully a third of her comments classify as directive.

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- Almost a third of the engineering professor's remaining comments are observations, which, as we have seen above, also usually have clearly directive illocutions. Observations, however, are the least prevalent comment among technical writing teachers (only 3%).

- Almost all of the engineering professor's editing marks, which did not qualify as locutions and hence are not represented in the table, are directive.

In sum, the engineering professor has an overwhelmingly directive commenting style—much more directive than the technical writing teachers with backgrounds in composition.

When interviewed, the engineering professor was not surprised that her comments appeared to be directive. "Most engineering students are talented and highly motivated," she observed:

They want to do their work well, and generally appreciate clear, concise direction. Very few of them have experience writing a technical report, but they do their best to prepare good first drafts. My comments on their drafts are designed to meet several objectives. First, I try to provide students with the information they want, and need, to prepare a solid technical report. At the same time, I want to recognize the effort the students have already made and to be encouraging; thus the 'softer edge' on comments. Finally, because engineering students have a tendency to do exactly what is asked of them, i.e. incorporate editorial suggestions verbatim—and sometimes mindlessly—where possible, I make 'observations' which require the students to think about a 'problem' with their report and to devise their own 'solution to the problem'. The trick is to write comments that lead the students to do what you want without actually telling them what to do—and to accomplish this with very few words. In short, the goal is to get students to think about and learn how to write a good technical report rather than simply to have them prepare one report to my specifications.

Interviews with students corroborate the professor's perception that students "generally appreciate clear, concise direction." Randomly selected teams of students were interviewed after they received comments on their drafts from the engineering
professor. When asked how they would respond to her comments, they said they understood the comments and that they would "do what she told us to do." In general, the attitude of the engineering students concerning the directive comments was positive and accepting. When the final reports were compared with the marked drafts, it was clear that students had incorporated the instructor's comments.

**Comparing an Engineer to Professional Editors of Technical Writing**

Dragga found that the majority of professional editors' comments were directives, questions, and suggestions. None of the editors offered observations, because the illocutions and perlocutions of observations are often obscure (213). Criticisms among editors were atypical, and though compliments were often given orally, they were rarely written (note that Dragga did not quantitatively analyze the comments of editors, so there is no numerical basis for comparison) (213).

Like the editors, the professor has a high percentage of directives and questions. However, unlike the editors, her percentage of suggestions is low. The low number of suggestions may be due to the introductory status of the classes she teaches. Dragga points out that suggestions by the editors are usually preludes to negotiations with the writer about an aspect of the writing. Such negotiation is more likely when an editor comments on an experienced writer's paper—a writer who in some cases is more a peer than a student. The difference in experience between the engineering professor and her students, however, would be much greater, so negotiation would seem a less likely possibility.
Again, as was the case with the teachers of technical writing, the engineering professor offers more observations than editors. Dragga found that none of the editors and supervisors he interviewed said they offered observations in their commentary on writing because the "illocutions and perlocutions of observations...prove either obscure (and this inefficient) or passive (and thus unproductive), designating either no clear revising activity or no revising activity" (213). As discussed above, the engineering professor's passively-constructed comments generally do not suffer from obscure illocutions and perlocutions, and they are in fact highly directive. Given, then, the highly-directive nature of her observations, her commenting style is not radically different than the style of professional editors, though the comparison cannot be quantified and is less clear than is the case with the comparison to the teachers of technical writing.

The Design Report, Visuals, and the English Essay: Comparing Commenting Style to Genre

What, then, might be the sources of the engineering professor's high degree of direction? Is such a high degree of direction justifiable? Dragga notes that the highly-directive commenting strategies of professional editors reflect their emphasis on writing as product rather than process (213). It is true that in engineering there is a similar emphasis: very few of the engineers teaching the design report at OSU, for example, require drafts of the report. But the engineering professor whose comments we studied appears to be even more directive than the teachers or editors in Dragga's study, especially when one considers that many of her comments were directive editing, a form of comment which is not even reflected in the seven categories used in the comparison
with Dragga. Part of the degree of direction can be explained by the introductory level of the class: the students have had little or no experience in the genre and would therefore more likely need more direction than a professional writer receiving editorial advice. But there are additional reasons inherent in the genre of the design report that shed light on the highly-directive commenting style of the professor.

**Shift in Audience.** For many students the design report may be the first time they have been required to write in a genre determined rather strictly by an external, non-academic "real" audience rather than in a genre heavily influenced by a teacher's individual preferences and requirements. Many genres that students typically employ in English classes—especially those which emphasize personal voice—allow fairly wide variations within general conventions. The design report, however, has more prescriptive conventions and allows the writer less latitude for improvisation.

Commenting on papers that reflect this shift in audience requires an adjustment from the commenting strategies employed on a standard English essay. A teacher might give an English composition essay global comments that might result in wholesale restructuring of a paper; such global restructuring, however, almost never occurs in a design report, unless the original topic were to be thrown out entirely. Once the topic is chosen the construction of the paper is largely prescribed: it has eight parts that appear in a precise order (cf. the description above). The papers can thus be written piecemeal—as they usually are by the groups of engineering students who work on them. Broad, facilitative comments that are often useful on an early, inchoate draft of an English essay emphasizing personal voice have no real parallel in a design report. Instead, the engineering teacher is usually trying to make clear the expected content of each section.
The Report as Visually Organized Reference Tool. A salient result of the shift in audience in the design report is that readers will not read the report linearly from cover to cover, but will instead refer to sections of the report that are pertinent to their interests. The professor often pointed out that the design report should satisfy three types of readers, few of whom will read the report linearly: the reader who consults only graphics; the reader who consults only the written text; and the reader who uses both integrally. Satisfying all these readers is a difficult and radical shift for students. They may have satisfied the “text” reader in English class or the “visual” reader in math class, but few have likely been asked to satisfy all three of the above readers, in the same document, simultaneously.

Even when first-year students have written in more “objective” genres similar to the design report that also require them to draw on sources other than their personal experience, it is usually in the form of the research paper. But though the research paper moves away from the narrative structure of personal experience essays, it is still highly linear in form and fairly fluid in local convention. As a genre, the research paper rarely draws on visual cues any more than the standard English five-paragraph essay does, and even when graphics are used in research papers it is rarely, or never, assumed by teachers in the humanities that some readers will only read the graphic elements.

There are several consequences to such non-linear reading of the report. First, there is a need for overt, visual guideposts such as tables of contents, headings, subheadings, lists of figures, and the like. Student writers are, however, more accustomed to giving internal, semantic, transitional phrases for such guideposts, and few have had experience giving the sort of external, visual cues required by the design report.
where some transitional phrases might be replaced by headings, and others might be replaced by introductions which do not assume that the reader has read the immediately-previous text. They are thus unaware of the need for strict consistency in visual format required to facilitate ease of navigation through the report. Second, they do not understand the need for sections of the report to be semantically self-contained so that a reader can understand parts of the report that are read in isolation from the rest of the report. The repetition of information and the frequent use of introductions that is required for semantically self-contained sections would be viewed as useless redundancy by most students' previous writing instructors, who would usually assume that the audience would read the entire document linearly.

Commenting on a paper with such a hypertextual/visual structure leads to an emphasis on visual conventions, which is often a matter of arraying elements of the page—whether graphs or headings or page numbers—in the proper format so that the reader can navigate easily through the paper. Thus, it is not only an emphasis on product over process in engineering that results in a more directive commenting style, it is also the structure of the paper: the hypertextual/visual nature of the paper leads to an emphasis on visual conventions—on proper format—which in turn results in an emphasis on very directive commentary. Facilitative comments simply do not work well when you must correct students on detailed—and in some cases arbitrarily determined—matters of format convention.

**Visual Prewriting.** The effects of visual orientation do not, however, merely affect the product of the design report or the teacher's commenting strategies; they also affect the process of writing the report. Through discussions with the engineering professor
concerning prewriting we learned that engineering students, unlike most English students, often do their planning and prewriting graphically, through diagrams, drawings, graphs and charts. Consequently, it is often the case that when students in engineering actually write sentences down they are in a fairly late stage of thinking through their project; their writing-to-learn thus often occurs in a distinctly different technology of writing. In fact, the earliest draft for the design report required in the class we studied was primarily a set of drawings.

The effect of visual orientation in writing has been addressed very little in composition theory, but it would seem probable that it would have broad effects on the success of commenting strategies. It is often the case with English papers—or it is at least argued by compositionists that it should be the case—that later drafts are given more directive commentary because global, facilitative comments have already been absorbed in earlier drafts and the evaluation of the writing as a product is often at hand. But since engineers often do their early thinking visually, then it would seem likely that the written drafts handed in by students are often products of a later stage in the thinking process. It would seem reasonable, then, that like the later drafts of English essays, such "later" drafts of engineering papers would also lay more emphasis on product over process, and be best served by more directive comments.

Conclusion

Comparing the engineering professor's comments with Dragga's data on professional editors and teachers of technical writing highlights the surprising extent to which her commenting style is directive. The high degree of direction in her commentary
is, however, largely explained by the context of the introductory class—particularly the genre conventions of the paper she commented on.

Our study, then, reinforces the arguments of Beason, Hagge, and Dragga that the commenting strategies developed in composition cannot be exported to other disciplines in toto. But in the larger context of a consideration of the roles of internalism and externalism in composition, the study provides strong evidence for questioning the internalist assumptions which provided the basis for the belief that facilitative comments are effective across genres and disciplines. The case for recommending particular commenting strategies should take into account not only student and teacher, but also the interaction between discipline, genre, and technology.

But given the need for taking into account such interaction, to what extent are the results of our study confined merely to the particular design report under consideration in the study? Does an avoidance of the internalist impulse to universalize limit the recommendations of such research to merely one paper in the context of a particular class? We would argue that it is plausible that the highly-directive commenting style of the professor we studied would be effective in other genres that had at least some of the following characteristics:

- A non-linear, hypertextual form in which the reader’s navigation is guided by visual cues.
- The expectation that readers will often not read the document entirely, but use it as a reference tool for selected information.
- The expectation of divided readership, where some readers will only read linguistic elements of the document, and some only visual elements.
• The extensive use of visuals.

• The exclusive or partial use of visuals as a form of invention and prewriting.

As discussed above, all of these characteristics would appear to lend themselves to a more directive commenting style than is commonly recommended in composition. Because many of the genre forms grouped under the broad term "technical writing" display at least some of these characteristics, it would seem that there is at least preliminary evidence for a more positive view of directive commenting in some types of technical writing pedagogy such as the design report described above. However, these characteristics are certainly not necessary and sufficient conditions for directive commenting, and additional research is needed to refine our understanding of the interactive relationship of these characteristics with each other and with the other elements of particular genres.

This limitation on the applicability of commenting strategies leads to a broader question of the extent to which the training that writing teachers receive in composition programs can be successfully applied in other disciplines and genres. If effective commenting must be tailored to a particular genre, what else must be? If internalist assumptions led to faulty generalizations concerning commenting, what other generalizations might be suspect? One indication would be the need to develop research methodologies that are tailored to specific genres and disciplines. In our study, for example, the use of speech act theory limited our categorization and analysis of written comments to locutions; no methodology of similar power has been developed to analyze the visual elements (or visual comments) used in many technical genres. Because technical genres often differ so substantially from the genres typically studied in
composition, the field of technical writing stands to gain much from developing its own research practices.

Our study would also indicate that the emphasis on process prevalent in composition, for instance, might need to be broadened to take into account non-linguistic forms of the writing process such as graphs and drawings. Strategies for WTL in particular could be developed by examining the role of drawings and charts early in the writing process. And, of course, externalizing the writing process—making thinking visible by means of tools such as computers and standard drawing techniques—might lead to innovation not only in engineering but in English as well. Through the study of genre, which is the nexus between the internal and the external, steps can be made toward adapting more material technologies such as computers to the exigencies of particular writing tasks.

Finally, if we consider responding theory in composition in the general context of the internal/external spectrum, we see that although composition has moved away from the highly-internalist stance of giving foundational status to the sentence and to grammar, the field nevertheless has an internalist bias in that it still assumes a foundation can be had at the level of genre. It is as if writing as exemplified in the standard English essay is somehow sufficient as a model for any and all other types of writing. Though the move from the sentence to the genre is progress in that it has widened the context and basis of the foundation, it is still not sufficiently wide—or sufficiently externalist—to address the social and technological differences in disciplines and the pedagogy that must adapt to those differences.
CHAPTER 3

REAR WINDOW: LOOKING AT FILM THROUGH PEDAGOGY

The WAC discussion in the previous chapter argued that a more externalist orientation will facilitate compositionists’ attempts to develop expertise in a variety of disciplines. However, within the traditional discipline of composition, and prior to the recent influence of the computer, film was imported as a text worthy of classroom study in addition to traditional written texts. Film thus represents the first substantial shift in communication technology that has affected the texts that are studied in writing classes. Film has never threatened to displace traditional writing in the way the computer has, but it has nevertheless been employed fairly widely in composition classes in a variety of ways. As the only shift in technology within composition that even approaches the influence of the computer, it offers a precedent with useful analogical comparisons. In what follows I will first examine the medium of film, and then employ the internalist/externalist distinction in a critique of how film has been taken up by composition from the 60s to the present. Finally, I will discuss attempts I have made to employ film in composition that employ the insights gained from such a critique.
The External Nature of Film

Film, it has been argued, is an inherently externalist medium. The artifacts produced by writing, of course, exist outside of the head, so in that sense writing is also external, but Seigfried Kracauer and others have argued that the filmmaker is more dependent on the external world than either a painter or a writer (Kracauer 27-37). He argues that film is the best medium for recording physical reality because it refers to it more directly. If, for instance, you film a person, you have no access to the internal thoughts of the person, you instead have external indicators of those thoughts that are given by what the person does or says. A more internalist medium such as a novel, however, can overlook the external and provide internal access to a character.

Critics of Kracauer such as Parker Tyler have argued that films such as *Persona* and *Blow-Up* explore aspects of internal consciousness very effectively (in Dick 241). Tyler would seem to be correct, at least in the sense that films certainly range from more to less externalist. On one end of the spectrum there are externalist/realists such as Roberto Rossellini. Peter Wollen notes that Rossellini almost always shot on location, never used a shooting script, used amateur actors without makeup, and created on the scene so that he never knew how a film would end until he began shooting it (137). For Rossellini, then, the external, “natural” physical context in which the movie was made drove the creation of the movie. At the other extreme is Josef Von Sternberg, who almost always used scripts and sets, “cut every sequence in his head before shooting it,” employed stars and advanced the star system, and tried to “exert autocratic control” over nature by “festoon[ing] the set with nets, veils, fronds, creepers, lattices, streamers, [and] gauze” (Wollen 138). Von Sternberg, in contrast to Rossellini, moves toward the internal
both in the processes and products of his creations. But even Von Sternberg does not lie
at the extreme, for an even more “internal” form of filmmaking can be pursued with
special effects, which eradicate the need to employ external reality in any given way. Digitization has allowed the creation of feature-length films such as *Toy Story* that rely
entirely on special effects, a capability which undermines Kracauer’s thesis and brings
filmmaking closer to internalist media such as painting and novel-writing. So it would seem that film is not *necessarily* an externalist medium, and that different technologies
can favor either the internal or the external in different contexts. But again, it is useful in
this regard to recall Dewey’s distinction between necessary and sufficient conditions
when considering the determining force of technology: film may not require a highly
external, realistic approach to art, but it certainly enables it, and it is the approach that has
been most widely employed by filmmakers.

**The Importation of Film into Composition**

During the 60s and 70s, the early part of its history when it first imported film,
composition was internalist in the sense that it emphasized grammar and foregrounded
the finished product of writing, the textual artifact.

This emphasis on grammar and product led to the following particular

1) **Forwarding of Foundationalism.** An emphasis on grammar is foundational in the

sense that there is a belief that there is an objective building block—the sentence—

which can be used to ground writing pedagogy. This emphasis on the sentence is at

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12 I am indebted to my advisor Lewis Ulman for this example.
least partly attributable to the success of linguistics in using quantitative methods to analyze the sentence—a success which led to a reification of grammar as a timeless, form-like entity that was "true" in the same sense that logic is true. There is thus one, correct *a priori* Grammar independent of the imperfect, actual uses of grammar in the world. In its more extreme forms, this foundational approach held that if students could learn the sentence correctly then they would be able to write effectively in any context. Consequently, pedagogy during this period foregrounded grammar and correct mechanics, often at the expense of matters of macrosentential structure and the relationship of that structure to discourse communities.

2) **Limitation of Language.** Such a foundational approach limits language in that it assumes that there is a prior "form"—a timeless grammatical structure—that dictates correctness and "truth" in language. Such a view limits the adaptability and constitutive force of actual language use.

3) **Elision of Experience.** One obvious way in which such foundational approaches limit experience is that they elide the process of writing in favor of the product—the finished text. Although this emphasis may, at first blush, seem externalist in the sense that attention is focused on a physical textual artifact, it is crucially internalist in that the texts are used as a means of guiding students to an internal, timeless standard, Grammar, that is independent of the world or their experience.

4) **Severing of subject.** An emphasis on grammar isolates the source of correct writing in the head and strips writing of meaningful content. Consequently, learning to write well does not require interaction with the world in a meaningful way; it requires an exercise of an internal, cognitive ability.

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But what would be the result of importing film into this context? Did compositionists simply adapt film to such internalist approaches, or did the “external” medium of film lead to a revision of such assumptions?

If composition were to adopt film by adapting it to its foundationalist, internalist assumptions, then presumably a universal “grammar” of film would be compared to the grammar of writing. Indeed, if a very close match between the two grammars could be described it would reinforce the claims of universality forwarded by compositionists during that time. There certainly were compositionists who used film in such highly-internalist ways. Adams and Kline note in 1975, for example, that some teachers import film into composition using “the simple equation of frame to word, shot to phrase, and sequence to sentence” (260). If such an approach were viable, then it would seem to affirm internalist approaches. Adams and Kline, however, argue that such an approach does not offer much to those who intend to improve student writing because it “is an oversimplification that has only limited value” (260). The issue is crucial in determining the relationship between film and composition, so let us consider it in some detail.

In 1976, Joseph Comprone wrote a fairly comprehensive bibliographic essay, “The Uses Of Media in Teaching Composition,” which reviews 268 articles and thirty books, many of which address the role of film and television in the teaching of writing. Of the six articles and books he discusses that focus on the relationship between the languages of visual media and writing, only one includes a comparison of the syntactic structure of film and writing, John Harrington’s 1973 *Rhetoric of Film*. When Harrington discusses the relationship between the languages of film and writing, however, he notes that direct analogies “quickly break down” (11) and argues that it is “necessary to think
in terms of the languages used in film rather than in terms of the single or dominant language” (6). Attempts to relate the grammars of film and writing are hindered by basic differences in the two media. Richard Coe notes that in visual arts an image is not apprehended in the strictly linear, part-by-part way in which a sentence is read (in Comproone 173). And Dick concludes that film semioticians do not make strong comparisons of the two “grammars” for several reasons. Dick notes that the semiotician Christian Metz, for instance, argues that film does not have the equivalent of “parts of speech,” and that the smallest unit of discourse in film would compare to the sentence in writing:

In language, a word can acquire a different meaning merely by the addition of a single letter—for example, doir added to love. But film has no words. Metz rightly rejects the shot-as-word theory and compares the shot to the sentence. (Dick 247)

But, of course, if the basic unit of discourse in film is equivalent to the sentence, then there is no “grammar” of film. Morris Beja makes this point as he also argues against such shot-as-word theories:

Such one-to-one analogies, at first glance perhaps intriguing, are in fact basically misleading. If editing is syntax, how do we know when a particular example of a “sentence” (or shot) is “ungrammatical” or “nonstandard”? If frames are words, how can a dictionary be compiled which will “define” each image? Moreover, a fundamental problem in such analogies is that by describing film in terminology which is suitable to verbal language, they inevitably make film seem cruder by comparison: film is not being examined on its own terms. (54)

The source of this breakdown between written language and film can be at least partly explained through the latter’s more externalist orientation. One way of exploring the difference is to employ Saussure’s distinction between the signifier and the signified.
Dick notes that film and writing differ in the relationship of the signifier and the
signified:

Sadness can be broken up into its signifier (the sound sadness) and its signified
(the concept of unhappiness). But in film the signified cannot be disengaged from
the signifier. In a movie the sound of sadness is not [the phonetic sounds
produced by the letters sadness] but a child weeping, a man wailing...in a movie,
sadness is not a concept but an actual situation (a sad family) or an attribute of a
specific person (a sad man). For the same reason, denotation and connotation are
not distinct in film. (248)

Because film resists the disengagement of the signifier from the signified, it is a more
external medium than writing. Writing systems—especially phonetic writing systems—
abstract from the concrete world more than film. In film, notes Beja,

A photograph of a bird has a relationship to the “real” bird which seems closer or
more direct than does the word bird. Yet the photograph is not a bird; it is a
picture (a sign, a symbol, a representation of birdness). It is unlike the word in
that it is universally recognizable as signifying a bird and because it is specifically
representational (of a cardinal rather than an eagle, say). Still, neither the word
nor the picture will fly, so to speak. (55)

The disengagement of the signifier from the signified allows written and spoken language
to be “internalized” more than film in the sense that a person can compose and think in
their head or with minimum external tools such as pen and paper. Film as it has typically
been practiced, however, requires not only an extensive recording apparatus but a world
“out there” to be captured—sets, actors, landscapes, etc.

However, Saussure’s system is inadequate for explaining the language of film for
several reasons. The heart of the problem is the internalist bias of Saussure’s
semiological system, which employs only two categories, the signifier and the signified.
The latter is arbitrary and has no natural connection to what it signifies; thus, the sound o-
k-s has no connection with the concept ox (Wollen 117). Saussure’s system, then, is
predicated on the separation of the signifier and the signified, but in film—unlike
writing—such a separation is untenable. Further, Saussure privileges the signifier over
the signified, arguing that semiology must be founded on the arbitrary signifier:

When semiology becomes organised as a science, the question will arise whether
or not it properly includes modes of expression based on completely natural signs,
such as pantomime. Supposing the new science welcomes them, its main concern
will still be the whole group of systems grounded on the arbitrariness of the
sign... Signs that are wholly arbitrary realise better than the others the ideal of the
semiological process; that is why language, the most complex and universal of all
systems of expression, is also the most characteristic; in this sense linguistics can
become the master-pattern for all branches of semiology although language is
only one particular semiological system. (in Wollen 117-18)

In a general sense, maintaining such a foundational preference leads quickly to a
dualism which prefers the internal over the external, the abstract over the concrete, and
the mind over the body. It precludes as a focus the interaction between the arbitrary and
the 'natural', the internal and the external. With respect to film in particular, the
signifier, as we have seen above, cannot be disengaged from the signified as it can in
verbal and written language, so the power of linguistic systems cannot be applied to film.
It is true that film employs verbal and written language, and it is the case that,
hypothetically, the medium of film could be used to exclusively show the words of a
book on screen, which would render the two media quite similar—an approach that is
partially employed in silent films by the use of print intertitles. Lucy Fischer points out,
for example, Hollis Frampton's film Poetic Justice (1972) which "consists entirely of
sequential pages of a shooting script photographed in silence upon a coffee table" and
"Su Friedrich's Gently Down the Stream, in which lyrical verses are scratched directly
into the photographic emulsion—creating the effect of their being ‘written’ on screen
before the viewer’s eyes” (172). Fischer notes other less-extreme examples of the blending of writing and film:

One thinks, for example, of the films of Godard in which street signs, tabloid headlines, and packaging logos carry semiotic and dramatic weight. In The Married Woman (1964), as the heroine trysts with her paramour in an airport, one sign reads “Rendez-Vous Points” and another exclaims “Danger.” (172)

But these examples are anomalous and are not central to most film. The “natural” and “unarbitrary” visual images foregrounded in most film clearly have the major communicative role, and they resist categorization within Saussure’s system. Wollen argues that

Our experience of cinema suggests that great complexity of meaning can be expressed through images. Thus, to take an obvious example, the most trivial and banal book can be made into an extremely interesting and, to all appearances, significant film; reading a screenplay is usually a barren and arid experience, intellectually as well as emotionally. The implication of this is that it is not only systems exclusively ‘grounded on the arbitrariness of the sign’ which are expressive and meaningful. ‘Natural signs’ cannot be so readily dismissed as Saussure imagined. (120)

There is, however, a second tradition of semiotic theory that is more appropriate for analyzing film; the school of theory founded on the work of the pragmatist Charles Peirce. Peirce divides signs into three categories: icons, indices, and symbols. Icons resemble their referent (e.g. a road sign for falling rocks). An indexical sign is associated existentially with its referent (such as smoke is a sign of fire). Finally, a symbol is related to its referent only by convention (such as the case with words or traffic signals). Symbols in Peirce’s system are thus the equivalent of Saussure’s arbitrary signs. Peirce, however, did not make the rigid distinction of Saussure, for he maintained that all three types of signs overlap and interanimate, which precludes an internalist bias such as Saussure’s. Indeed, Wollen notes that Peirce pushed the claim of interanimation so far as
to make the prescriptive claim that "in the most perfect of signs the iconic, the indexical and the symbolic would be amalgamated as nearly as possible in equal proportions" (142).

Wollen proceeds to give an extensive analysis of film and film theory using Peirce's trichotomy, noting that theorists of cinema have consistently founded their theories, and then foundered, by foregrounding one of the three types of signs to the exclusion of the others. Peirce's semiotic system shows promise for application in composition beyond film because of its foregrounding of experience and the interplay between the internal and the external. For present purposes, however, it is sufficient to note Wollen's argument that it is the more external and less abstract of the three types of signs, the iconic and the indexical, that predominate in film, and that the symbolic is "limited and secondary" (140).

Consequence of Differences Between Film and Written Language for Composition

If indeed, then, the language of film differs from written and verbal language, there are several consequences of these differences with regard to composition. One consequence is that most compositionists during the 60s and 70s make structural analogies to film at levels of structure equal to or higher than the sentence. Adams and Kline, for instance, argue in 1975 that a teacher must see and communicate the many areas of common ground between the rhetoric of film and the rhetoric of written composition. And lest it be assumed that these areas are few in number, we suggest that all the major rhetorical elements (connotation, denotation, the methods of discourse, cliché, comparison and contrast, deduction, induction, etc.) may be illustrated visually by cinematic equivalents. (260)
A second consequence of these differences can be found in the different nature of the processes of writing and filmmaking. William Costanzo argues that thinking about communicating in the external context of film gives students a concrete space in which to visualize their work, which gives them a better understanding of how to construct an essay:

A surprising number of students can recognize the compositional elements of clarity, unity, completeness, continuity, and mechanics more readily in visual terms than they can, initially, in their own writing. When they discuss how they would write an essay about the campus, for example, too many get no further than a vague notion of picking up a pen and writing until the time runs out, but when discussing how they would make a film “on location,” they can describe the process in specific ways. (80)

Ronald Primeau’s “Film-Editing and the Revision Process: Student as Self-Editor” provides another example of how the inherently external medium of film provides analogues for methods of externalizing writing processes. Primeau argues that if revision in composition is viewed like the film editing process there are several useful results. First, it undermines the view that revision is always remedial, since film editing is not considered remedial. Second, film production can be used to show how successful ‘revision’ or ‘editing’ in photography or filmmaking lies in the production of sufficient shots or footage to make the selection and arrangement of materials meaningful. Just as film editing requires several shots from various (or even the same) angles, so also the writer must try out various ways (some even repetitious) of saying and developing his point. Third, the sequence of film shots is rarely chronological, which reminds students that they are under no compulsion to write pages in the order they will eventually be presented (406).
Because the process of filmmaking requires the creation of concrete physical things (takes) which are invariably revised externally (as opposed to the process of writers, some of whom can compose and revise internally), film does not have the degree of internalist bias that writing does. And although Primeau is not arguing explicitly for an externalist approach to writing instruction, his article consistently attempts to find ways to augment the writing process with external tools. When students have nothing to say after completing a reading, he argues, it “really means that memory itself unaided cannot recreate his immediate reactions to an assigned reading in a situation that calls as much for recreating the past as it does for creating the present” (408). They need, in a sense, a film of their own responses, because they cannot effectively internalize and recall those responses. Primeau’s instinct is to try to collapse reading and writing into one continual process by employing an array of material for marking and reacting during the process of reading. He goes on to outline methods of mimicking the film editing process in writing by employing a “film” of “takes” of their reading reactions through the use of notes, questions, “mimeograph copies”, doodling, color highlighting, shorthand systems, even “composing on a roll of paper that approximates the continuity of the movie reel” (410). This attempt to collapse reading and writing into one continual process using external tools anticipates the roles that the computer will play which I will discuss in the next chapter.\(^{13}\)

\(^{13}\) Primeau also refers to film theorists such as Ernest Lindgren, who argues that film came into its own when it broke from the theatre, which was much more “artificial” and “unreal” and applied itself to methods of “representing the physical world around us...[and] the process in which one visual image follows another as our attention is drawn to this point and to that in our surroundings” (in Primeau 406). Lindgren is arguing, in essence, that the more internal context of the theatre did not fully realize the potential of film and the camera, which flourished when it moved to a more external context.
Thus in the 60s and 70s we see in composition a lively discussion about film and some very promising applications. It may even be the case that film—given its externalist predilections—undermined the internalist, foundationalist stance of composition and contributed to the movement away from emphases on grammar and on the product (as opposed to the process) of writing. However, most of the scholarship addressing film remained largely internalist in the sense that formal, structural analogies were the predominant connection made between the two media. Those structural analogies were construed widely enough to include rhetoric, genre and process, but not so widely as to include politics, culture, or social context.

However, there were some efforts made in that direction. Despite the fact that most articles discuss the uses of fairly esoteric feature length and short films, Comprone reviews a few articles that defend uses of popular culture. He feels these articles have a “tiresome tendency to claim a place for media in the writing course merely because students are exposed to a great deal of media in their everyday lives” and adds that such claims are “often combined with diatribes against the traditional teaching of rhetoric and composition” (171).

The Social Constructionist Turn and its Relationship to Film

Since the 1976 publication of Comprone’s essay composition studies has developed a notion of the inherent value of energizing the purpose and content of writing by having students write about texts, ideas, issues, values, and experiences familiar to them, while it has questioned a focus on basic composition structures or rules of grammar at the expense of such content. If we consider composition as having moved historically
from an emphasis on the text (grammar, modes, etc.), to the writer (cognitivist approaches), to the context of writing (social construction, cultural studies), then the shift in emphasis is not surprising: indeed, it might be thought surprising how much interest film generated in composition given the more formalistic, product-oriented attention to the text prior to 1976.

Recent efforts to connect composition instruction to popular culture can offer a means of externalizing writing instruction because they foreground the experience of students, and because they undermine the severance of the subject and object produced by internal approaches to instruction. But the shift to an emphasis on the context of writing is certainly not reducible to an interest in studying texts that students are familiar with. Several related externalist shifts have attended this new emphasis. Foremost among these shifts was a movement away from a universalistic and formalistic approach to an approach that emphasizes the contingent, non-universal world of culture, value, ethics, and politics. And these new interests have been accompanied by a corollary interest in the critical thinking that attends any analysis of such matters.

These shifts have brought a renewed interest in the contexts of writing themselves—previously the charge of literature, cultural studies, and gender studies programs—which has led to the increasing influence of a cultural studies paradigm within composition courses. This interest in context has required that composition instructors balance the teaching of writing with the critical analysis of the contexts for that writing, or more specifically a critical analysis of students’ perceptions of and experiences within a given culture or discourse community. Interest in discussing such cultures and communities has led to a desire to find texts that offer a meeting place for
teachers and students to talk about shared experiences while still being able to produce critiques of the larger socio-economic issues at stake in the course. One kind of text that fulfills these interests, of course, is film.

But given the increasing emphasis in composition over the last twenty years on cultural studies and student-centered pedagogies, it is surprising how little scholarship there is in composition addressing film. Between 1970 and the 1976 publication of Comprone's essay, *College Composition and Communication* published six articles that were devoted to the issue of using film in composition: Richard Williamson's "The Case for Filmmaking as English Composition" (1971); C. F. Angell's "Response to Richard Williamson's 'The Case for Filmmaking as English Composition'" (1971); Stanley Solomon's "Film Study and Genre Courses" (1974); Ronald Primeau's "Film-Editing and the Revision Process: Student as Self-Editor" (1974); Adams and Kline's "The Uses of Films in Teaching Composition" (1975); and H.R. Struck's "Twenty Well-Tested Films for Freshman Writing Courses" (1976). In the twenty-odd years since Comprone's article—the years that saw a consistent increase in the role of cultural studies in composition—I found only one comparable article in *College Composition and Communication*, William Costanzo's 1986 "Film as Composition."

**Theory into Practice**

Despite the lack of scholarly interest in film, as a composition teacher I was convinced, given the reasons outlined above, that it should be a good medium to explore in a writing course, so I agreed to team teach a first-year composition course on film with a fellow teacher, Eddie Maloney. Though many in composition, and certainly we as
teachers, look more favorably now on employing texts familiar to students, we wanted to go beyond claiming a role for media such as film merely because students are extensively exposed to such things. Nevertheless, there are reasons for advancing a role for popular culture in composition that hinge on students’ extensive experience with such media. By and large, the emphasis on film as a formal medium or as a content driven text has ignored some of the significant ways in which film has become what we might call a ‘naturalized text’ for students. By naturalized text we mean an object that has become so familiar to students that the mechanisms by which that object produces meaning and value for students are often obscured by students’ relative familiarity to the object. As a naturalized text, film is a valuable object for the study of writing. Students’ familiarity with film allows for a common discursive text for the entire class—something that is harder to attain with what we might call ‘high literature’ since many students are often resistant to written texts—and thus makes it easier on one level to focus on students’ writing rather than spending a disproportionate amount of struggling with students’ resistance.

When we first set out to design a composition syllabus that used film as a primary source, we did not, however, wish to ignore the formal aspects of film. Using film as a cultural text enables teachers and students to gain quick access to different perspectives on our culture, but it does not highlight the unique experiences of the medium of film and the differences that result from its inherent externalist structure which was discussed.

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14 We would hardly suggest that this resistance is a good thing or one that should be encouraged not to use so-called high-literature; however, as goals of composition studies change and develop because of an emphasis on the process of writing rather than on the object of writing, the use of film rather than say novels has merit as a naturalized text.
above. Our experiences with film are often different than our experiences with literature, television or advertisements, and these differences are a direct effect of the conventions of film. These differences lead to a second, formal approach, which sees film as a separate and distinct medium that requires its own hermeneutic structure of investigation. A formal approach closely mirrors the direction of the discipline of traditional film studies, and much of the critical work done on film (and the adaptation of film to the composition classroom) tries to suggest methods for reading the formal aspects of film.

As with a cultural studies approach to teaching film, formal approaches to film have both advantages and disadvantages. In addition to recognizing and accounting for the effects of the specific filmic experience, the formal aspects of film can be used as a model of the composing process, of the rhetorical elements of both organization and style, and—as Comprone notes—of aspects of “grammar, punctuation, and syntax”. This is the approach reviewed above that dominated scholarship in the 1970s and produced useful results. We would argue, however, that a narrow, formal treatment of film often ignores larger cultural issues, issues that we have seen increase in value for composition studies.

In addition, the constraints of the focus of a composition course means that a discussion solely of the formal aspects of film might take away from the focus of the course.

Given these considerations, we decided that it was important to integrate, as much as possible, formal and context driven readings into our syllabus, while we also recognized the need to compensate for the problems that both would bring to the course. In addition, we felt it was necessary to make it clear to our students how our reading of film worked within the larger structure of a composition course. In order to make this

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15 See Jeske and Costanzo for extended treatments of film as a model for composition.
claim, we needed to show two things: that our reading strategy worked within the current emphases of composition studies, and that the models we were developing for the analysis of film were helpful tools for students who were learning writing. This meant showing how the critical analysis of film complemented the writing process, both as a formal study and as a cultural reading practice. Ultimately, we were trying to get our students to recognize the effect that film—and other cultural productions—had on their lives and their attempts to write successful critical analyses. Our approach, then, was three-fold: to give students tools to analyze film; to facilitate students recognition of the value of film as a cultural text that has something to say about the society in which we live; and to help students see film as model for, and a complement to, the writing process.

Implementing this three-fold approach presented logistical hurdles. We realized that not all films would be useful in emphasizing all three aspects. Rather, we decided we would have to alternately emphasize one aspect over the other two, with the hope that by the time we got to the last films on our list we would be able to bring the three things together in a meaningful way. As with any course that uses extensive outside materials, one of the most difficult challenges was to balance the logistics of incorporating film into the classroom. We decided that we would show films at specific non-class times and place films that were available through the library on reserve so that they could then be viewed by students at their leisure. When the library did not own a film on the syllabus and students could not attend the scheduled viewing, it was their responsibility to rent the film (all our students had access to video stores and players, either on campus or at home, and we confirmed that all the films we were viewing were available to all students). Film was thus treated as homework, just as reading a novel would be. An interesting effect of
the familiarity issue we have been discussing, is that most university students, even those in their first year, are unused to treating film as a homework assignment, and therefore expect all films to be shown in the classroom during the scheduled time. One of the problems that instructors might face, then, is finding ways of making films available without wasting half of the scheduled meeting times showing them. This will be less and less a problem once film is used more widely in composition courses.

Our first attempt to teach the course foundered immediately for one basic reason: students were unwilling to entertain the basic premise that film could either reflect or affect culture. The consistent response given was that film is “just entertainment.” We had been prepared to discuss the extent to which film interacted with culture, but we were blindsided by the complete denial by the great majority of our students that any such interaction took place. In the end most of our students remained unconvinced that the film affected the values of American society, let alone themselves, in any interesting way. Film for our students was the ethical equivalent of ice cream: some people liked it, some didn’t, it could be made better or worse, but it was largely a matter of taste; and it certainly didn’t have the power to shape or mirror world views. And many of our students were deeply committed to this view—a view which seriously undermined the relevance of our course by making any discussion of the cultural issues we intended to address a hollow, academic game.

In hindsight, our students’ position is understandable. Purveyors of popular culture—unlike parents, religion, and friends—are often interested in denying (or at least soft-pedaling) their bias and degree of influence. Cigarette advertisers, for instance, claim that they only influence choices among brands of cigarettes, and for decades
Hollywood has been concerned with camouflaging the political content of both the form and content of its films. Furthermore, first-year students are often at a point of heavy identity stress: at Ohio State they are often away from home for the first time, trying to decide on a major or career, deciding whether to join Greek societies, trying to live with roommates who are under similar stress, attempting to find new friends, and trying to understand a new academic system and whether or not they should identify with it. In the midst of all this pressure on how they define themselves, popular culture is often a means of escape. The last thing that a person in such a position would want to hear is that their means of escape is actually another source of formative pressure.

Our experience convinced us that film (and, of course, television), like literature in the late nineteenth century, has come to occupy the position of what we might loosely parallel to Louis Althusser’s concept of an Ideological State Apparatus (ISA). Thus, although film often provides insights into the cultural values and beliefs of the time, and though it has the power to influence the popular perception of the culture, it is also like Althusser’s ISAs in that its influence often goes unperceived and unexamined. In this regard, there is an ethical motivation for the use of film and popular texts in general: to the extent that students are unaware of the power of popular texts such as news, film, television and advertising, they can be influenced by such texts without their conscious choice. We would argue, indeed, that facilitating an understanding of the ways in which popular texts shape issues, sell products, and promote values is as, or more, important than any other form of civic/humane education within the state.

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16 See Mulvey for an extended discussion of this camouflaging.
Our students’ position, then, is highly internalist. It is thought that film somehow appeals directly to some amoral “entertainment” center in their psyches. It is almost as if there is a platonic “form” of entertainment which floats above the actual social and political world, and above their individual identities, which each person can commune with directly. People who make films are inspired by this form and create films that appeal to people directly. For the rest of the course both Eddie and I were in a continual state of back-pedaling as we tried to address this issue in a way that would make the course relevant for the students.

This experience brought to mind Comprone’s summary of John H. Clarke’s argument against the use of popular media as presented in “One Minute of Hate: Multi-Media Misuse Pre-1984.” Clarke, Comprone notes, fears that film and other popular media are “too often used as mere entertaining fillers in writing classes and create, as a result of this misuse, passive students and teachers who, rather than learning to criticize what they see and hear, become passive receivers, completely under the control of the media-makers” (Comprone 172).

Certainly these dangers exist if film and other media are treated merely as naturalized texts in the classroom. Indeed, student resistance to treating popular film as anything more than “just entertainment” would lead quickly down the path Clarke fears, unless that resistance is addressed directly and immediately. In order to use film, then, we felt it necessary to denaturalize both the form and content of popular film in an attempt help students be less passive and more critical of such texts. And we felt that these critical skills would work to complement the writing process. Our hope was that as students became familiar with the tools of critical analysis, their relationship to writing
would become richer and more complicated. The value of film for the composition course, then, would result partly from students’ predefined familiarity with film (which fosters an interest in the subject and enables connections), and partly from our ability to denaturalize film without destroying its allure (which enables critical thinking and writing).

Fairy Tales and Pretty Woman

In our discussion with students during the first, disastrous class in which we employed film, we asked whether they felt influenced by anything, and if so, what, it became clear that they felt that their childhood’s were particularly impressionable. In addition to the influence of parents, school, and friends they felt affected—at least in their youth—by stories and fairy tales. And indeed in my class that quarter none of my students had seen Casablanca, but all knew the story of Cinderella either through children’s books or through the Disney movie. Moreover, Cinderella was the only text that we could identify that everyone in the class felt familiar with.

The following quarter Eddie and I decided to teach the course again after we had reorganized it to address the internalist presuppositions of students. We began the course by discussing fairy tales—Cinderella in particular—and using them as a springboard for an analysis of Pretty Woman. Our first goal was to use the Cinderella tale as a means of illustrating the variety of ways in which cultures can adapt and augment a story, which provides an entrée into the broader question of how stories can reflect a society’s values. Part of the motivation for this approach is that it prevented students from being overwhelmed by unfamiliar approaches and terminology. Instead of launching a whole
new vocabulary about film we could reduce film to more abstract patterns—patterns that they were more familiar with in English classes. Students were familiar with both the Cinderella story and (at least implicitly) with film as a medium. That familiarity allowed us to focus on the unfamiliar—the development of analogies between the movie and the Cinderella tale and the ethico/political connections between those analogies.

This approach seemed most expeditious to us, because in general students were less resistant to the claim that movies reflect a prior cultural element (such as a Cinderella tale) than they were to the claim that movies affect them or a culture generally.

Particularly useful in this regard were Marcia K. Lieberman’s “‘Some Day My Prince Will Come’: Female Acculturation through the Fairy Tale” and Louise Bernikow’s “Cinderella: Saturday Afternoon at the Movies.” These essays demonstrate the plasticity of fairy tales through time and culture and show both that Disney’s version was not the first Cinderella story, and that it was significantly altered for its American audience.

Lieberman analyzes the various values reflected by the tale: the importance for women of beauty, of passivity, of obedience, and of marriage as a defining moment of social and economic success. However, women who are both powerful and good are rarely human: those who are human and have power (or seek it) are almost always repulsive. Bernikow’s essay focuses on the competition and enmity between women that the tale reflects. Both authors introduce the idea of a master narrative, a broad narrative structure such as the Cinderella tale that maintains a recognizable structure in its hundreds of mutations across cultures, genres, and media. The essays laid the groundwork for a consideration of Pretty Woman by not only showing how fairy tales are
adapted by cultures, but also by leading many students—especially women—to seriously question the image of women portrayed by the Cinderella tale.

After the essays, and in conjunction with the showing of *Pretty Woman*, we had groups of students give presentations responding to six analyses of *Pretty Woman* that developed the themes introduced by Lieberman and Bernikow. Particularly useful in regard to the fairy tale theme was Leda Cooks' "The Fairy Tale Theme in Popular Culture: A Semiotic Analysis of *Pretty Woman*," which outlines structuralist "codes" in the Cinderella tale (the Prince code, the Princess code, the Godmother/father code, the Ball code, etc.). She then explicates the ways in which these codes operate in *Pretty Woman*, outlining parallels between the Cinderella tale and the film (e.g. Cinderella/Vivian, The Prince/Edward Lewis, The Ball/The Opera Scene, The Gift of the Dress/The Shopping Scene, The Godmother/father/Barnard (the hotel manager), etc.). Thus, for example, students were able to see that in Cinderella the Prince is not just a prince, but that he functions as a symbol for the apex of power, prestige, and wealth in the society at the time of the fairy tale. When we asked students who they felt represented the apex of power, prestige, and wealth in American society, we got responses ranging from super athletes like Michael Jordan to music stars like Garth Brooks. Students conceded, however, that a maestro of corporate takeovers like Edward Lewis was certainly in the running—especially given the film's release during the takeover crazes in 1990—and they understood why such a character would work well as a "prince" in a film like *Pretty Woman*. Likewise, they saw why a prostitute would work well as a "Cinderella" in the film (though we had a long discussion about whether or not

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17 See Caputi, Cooks, Greenberg, Kelley, Lapsley, and Miner.
the Cinderella of the source fairy tale could have been a prostitute instead of a poor girl
with mean older sisters).

Once this algorithm of comparing Cinderella and Pretty Woman was grasped by
students, the discussion became serious, lively, and contentious. Most of the class,
especially those who had previously decided that the Cinderella tale didn’t do women
justice, had also very much liked Pretty Woman when they had viewed it prior to our
class. They now recognized that the film incorporated the same characterizations of
women as the Cinderella tale, and they weren’t sure that they should like the movie. In
the process of the debate several wider, useful issues surfaced. First, students began to
seriously entertain the possibility that film could affect their values as well as reflect
them. It became clear to many students that their “impressionable” years as children had
latent effects and resonances that popular culture could appeal to in systematic ways, and
that such appeals couldn’t always be relegated to a non-ethical realm of “just
entertainment.” Second, it became clear to many students that although they had an
extensive, innate understanding of film, they might not be fully aware of how and why a
film appealed to them. Because many students now seriously entertained these issues,
they were able to meaningfully engage the wide variety of reviews and commentary that
addressed Pretty Woman, an engagement which in turn gave purpose to the writing in
their journals and formal papers.

Following the discussion of Pretty Woman, we attempted to move beyond the
general discussion of the ways in which the abstract content of film reflects and affects
society to a discussion of the specific ways in which film communicates as a distinct
medium. We hoped that once the internalist nut had been cracked by our discussion of
the social and political content of *Pretty Woman*, that we would be able to entertain the more subtle, more external role of film as film. We did not, however, want to divorce such medium-specific discussion from the social and the political in the manner pursued by formalist study, but rather explore the ways in which they interact.

In some ways our plan for the trajectory of the course mirrors the trajectory from internalism to externalism in the field of composition. Composition, as noted above, moved from an internalist position that emphasized grammar to a position that foregrounded the role of social context through social constructionist theory. In order to understand the politics of the material, it is best (or perhaps even necessary) to understand the politics of the social, for material politics are always tied to social politics, and social politics are easiest to recognize when first moving from an internalist position. We felt as teachers that the most effective way to address the internalist position of our students was to foreground the role of social context in film as we did with *Pretty Woman*. An attempt to immediately discuss the social and political content of film as film would be met with bewilderment if students didn’t first entertain the possibility that the content of film could have social and political exigence. The next step, for students and for the field of composition, is to develop an understanding of the material, the more external end of the internal/external spectrum.

An Externalist Approach to *Rear Window*\(^\text{18}\)

Since we were teaching a first-year composition course, to begin our exploration of the material aspects of film, of film as film, we felt that it was important to begin by

\(^{18}\) I am indebted to Eddie Maloney for his significant contribution to this analysis of *Rear Window.*

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exemplifying some of the ways film can work both formally and thematically to stress the structures of composition. Initially, we wanted to focus on the ways film makes meaning through visual cues. Also, since the remaining films on the syllabus were contemporary, we chose an older movie, partly to give students a broader range of experience with film and partly to ask students to look at a movie that did not rely on many of the conventions of narrative film making they were familiar with, such as special effects or a contemporary soundtrack. We chose the 1954 Alfred Hitchcock film *Rear Window*.

Because *Rear Window*—even as it is a murder mystery—is fundamentally a metaphor for film, we felt that it would be a good movie for treating film as film. *Rear Window* is the story of L. B. Jeffries (played by Jimmy Stewart), a magazine photographer who, at the beginning of the film, is in his sixth and final week in a wheelchair after having broken his leg while taking a risky picture of a crashing race car. During the six weeks he was in his wheelchair, he was confined to his apartment, and he spent this time—in between visits by his down-to-earth nurse, Stella, and his high society fiancée, Lisa Fremont—looking out his rear window. His rear window looks out onto a courtyard and into the apartments of the different complexes that all share the same courtyard. The first moment of the film is a camera pan up from the stairs leading into the courtyard, around the courtyard to the various apartments, then into Jeffries' apartment, around the main room, and finally resting on Jeffries, who is asleep. The sweeping of the camera around the courtyard and into Jeffries' apartment is a concise, visual narrative of Jeffries' life for the past six weeks, which consisted of little more than watching the lives of the various people in the other apartments. This narrative is told solely by the camera using iconic and indexical signs, with no voice over or symbolic
textual clues students might be more familiar with. Many of the items that we see in the camera pan, such as a picture of Lisa, do not make sense until the film progresses and we are introduced (a second time) to these things. However, one of the things we were able to demonstrate in this scene is the way the camera works to tell the story. For example, the movement of the camera from the photography equipment on Jeffries' shelf to the picture of a crashing race car to the clasp of the cast on Jeffries' leg, uses indexical connections to tell us how Jeffries came to be in a wheel chair. In addition, since Hitchcock made Jeffries a photographer, the emphasis on the visual gaze of camera makes more and more sense.

From the beginning of our analysis of the film in the classroom, then, we asked our students to pay attention to how iconic and indexical visual cues could make meaning in fairly complicated ways. There are certainly many instances of this in *Rear Window*. As Jeffries watches the goings on of the people he sees in his rear window, we as audience members come to see how his actions parallel ours. As he watches, we watch. Our sense of similarity with Jeffries is heightened towards the end of film as the murder plot plays itself out. While playing the peeping tom, Jeffries believes he sees evidence that one of his neighbors has killed his wife. He does not actually see a murder take place, which is what creates tension between himself and the friends that visit him in his apartment; his friends do not believe that murder has taken place, and each in turn, like Jeffries, must spend time looking out his rear window to the 'screen' of the courtyard to be convinced that a murder might have been committed. Jeffries' friends are reluctant to become personally involved in what happens on the 'screen' outside in any way that would require real obligations and action on their part, a reluctance that mirrors that of
our students, who also wish to keep the content of film separate from the reality of their lives.

As the murder plot works itself through, the metaphor of the film as film continues to develop as well. In order to understand the murder narrative, Jeffries’ friends Lisa and Stella must watch. They become part of the audience; the audience that makes up Jeffries’ apartment. This becomes important for the tension we feel as real audience members, especially since at certain points in the film we see things through Jeffries’ eyes (or binoculars or camera lens), but we also see things that Jeffries does not. For example, we see Thorwald, the suspected murderer, returning home while Jeffries is asleep. Jeffries never sees this, and his ignorance supports his theory of murder. There is a tension created because we are asked to identify with Jeffries’ view and see the ‘film’ of his neighbors’ lives as he does, but we are also one step removed because we are watching Jeffries just as he is watching others.

In other words, as audience members we are watching essentially two films: the first is the events that take place in Jeffries’ apartment. His relationship with Lisa, Stella, and Doyle take place here for the most part. We will call these events the first order film or text. The second is made up of the events that take place in the courtyard and other apartments. We see these events primarily through Jeffries’ eyes, and our visual experience is affected by this perspective, a perspective we would not have if we were watching through Lisa’s eyes, for example. We will call these events the second order film or text. Instead of relieving some of the tension created by the plot, this double-watching heightens that tension. At different points in the film we move from watching Jeffries to watching his neighbors to watching both. Our interpretation of the film is
filtered through these different lenses. These movements of perspective work to stress the formal constructions of the film that are used to create tension for us as audience members, and one of the things we worked on as instructors was to get students comfortable analyzing the moves of the film.

As we’ve discussed, we were not solely interested in the formal aspects of the film. Our close reading of the movie was used to help us see how the film makes meaning, and how the formal aspects of film connect to social and cultural issues. There are two separate strands at work here, each related to the first and second order films. A motivating subplot of *Rear Window* is Jeffries’ struggle with his own insecurities about marrying Lisa, who is played by Grace Kelly. The film portrays this insecurity by offering a cultural comment on marriage in the second order film. It does this by connecting each one of the stories that Jeffries sees through his rear window to the idea of marriage, and this is what we tried to foreground and analyze with our students. From the flirtatious young woman, Miss Torso, to Miss Lonely Hearts and the songwriter, each representing models of loneliness for Lisa and Jeffries, to the newlyweds, who start out on their honeymoon only to fall into stereotypical patterns of married life by the end of the film, to the happily married couple sleeping on their fire escape to escape the heat, to Thorwald, a husband so fed up with his ‘nagging’ wife that he murders her, Hitchcock sets up cultural text within the second order film that portrays what are the perceived views on marriage at the time. Jeffries’ decision, then, is helped along by what he sees out of his rear window. In other words, Jeffries’ choices about marriage are at the very least reflected in the second order film, but in more complicated ways they are arguably affected by what he views. The murder plot, then, complements the larger cultural text.
within the film, and the successes and failures of the various second order plots help Jeffries make his decision to finally marry Lisa, or so we are led to believe by the end of the film.

The second order film as cultural text is not the only cultural text in the movie. Just as we watch the film of the courtyard through Jeffries’ eyes, we are also watching Jeffries and the events that take place in his apartment through our own eyes. We are twice removed. At this point, we ran into our first resistance from our students. While they were inclined to recognize the cultural comments Hitchcock is making about marriage in the subplots played out in the second order text, it was more difficult for them to recognize the cultural values and issues at stake in the first order text. We therefore tried to explicate the multiple layers of the film, and the tension that is created between the different levels of viewing—we feel tension for Lisa, as we see her through Jeffries’ eyes, when she is caught in Thorwald’s apartment, just as we feel tension for Jeffries when Thorwald enters his apartment. The reading process is similar to asking students to do cultural analysis in composition classes, where we ask students to recognize both the meaning of events and the meaning of the structures in which those events take place. In class we foregrounded how the visual cues made meaning, in the same manner that Laura Mulvey argues in “Visual Pleasure and Narrative Cinema,” but this time meaning that may not have been meant within the context of the film, rather meaning that might have been generated by the film’s place in a larger cultural context. We emphasized the issue of the gaze and who controls the action; like the subplots of the courtyard scenes, the gaze and the action is tied to the issue of marriage and ultimately to the issue of gender.
As a model, Lisa represents the visual in a very different way from Jeffries. She represents high society and money, and her relationship to the visual is as the object of the gaze. For example, our first image of Lisa is a full close-up of her face that fills the entire screen, while our first image of Jeffries is of him asleep, an inactive action, as it were—even though Jeffries is inactive here, we know he’ll wake up; we can’t be so sure about Lisa. Jeffries, on the other hand, is a photographer, and an action photographer at that. He travels the world in search of wars or sporting events to photograph. His relationship to photography is active rather than passive. The film makes the connection between activity, passivity, and the visual very clear, and our students were willing to see this. Jeffries’ power, in a sense, comes from his ability to look, to photograph, to see. When he is incapacitated by his accident, all he can do is look, which is similar to our situation as audience members. Jeffries’ viewing allows the murder plot to develop, and it allows us to feel his tension when he is unable to save Lisa (other than by calling on the help of the police) or to defend himself from Thorwald.

The issues at stake in the first order film or cultural text are more complicated because they are less visible. For example, Jeffries’ relationship to Lisa throughout most of the movie is lukewarm. He makes it very clear that he feels threatened by her, or rather by the idea that she will make him become a fashion photographer and thus take away his power and his freedom. During the movie, he maintains his distance and constantly keeps her advances at bay—until the moment she enters Thorwald’s apartment and endangers herself. There are two things going on here: Jeffries fears for Lisa’s life when Thorwald returns home and finds Lisa snooping around his apartment; and, more importantly, Jeffries becomes attracted to Lisa as soon as she enters the second order
film. In other words, as soon as Lisa becomes part of the Jeffries’ gaze—rather than as a member of the audience watching the courtyard with Jeffries—his interest in her is renewed. Lisa cannot watch anymore; she must be watched. Just as the thematic aspects of Lisa character—as model, as future wife—affect Jeffries’ relationship with her, the position that Lisa occupies with the filmic metaphor affects his, and ultimately our, relationship to her. As Mulvey notes, as an object of the visual gaze, Lisa no longer represents a threat to Jeffries’ ability to see, and thus his ability to control. The film ends with the promise of marriage, and it does so because Jeffries is finally able to see Lisa as we, in the audience, do. What we tried to develop in our class, then, is that the relationship between visual imagery and power is caught up with issues of gender and ultimately with cultural contexts of the film.

As we’ve said, our goal in introducing the formal aspects was to help students see connections and interactions between the material aspects of film as a medium and socio/cultural value systems. Though we were successful in the sense that students recognized the cultural contexts of the second order film in *Rear Window* and its relationship to the first order film, we had a harder time with the effect of both the first and second order films on them as viewers. Part of the purpose of using *Rear Window*, in our view, was that the relationship between the first and second order films in the movie mirrors the relationship between us as viewers and the movie *Rear Window* itself. If we see how Jeffries was affected by watching the ‘movie’ of the second order film, and we recognize how easily we as viewers have identified with Jeffries, then we can come to see more easily how film in general, and *Rear Window* in particular, might affect us as viewers. Students were often willing to see how the second order film could reflect
and even affect Jeffries' decisions about marriage. They were also willing to analyze the ways both the first and second order texts reflected the larger cultural views of the time about gender and marriage. But even though we were able to communicate how our perspective, as audience members, meshed with Jeffries', our students were much more resistant to the idea that the cultural values in the film could in some way affect the cultural values of the people watching the movie, or them in particular. We speculated that this was, in part, because we were asking them to critically analyze structures that they all took for granted as neutral, apolitical 'givens.' It was also because we were asking them to comment on a film that was made forty years before and that had little, at least from their perspective, to say about present day culture.

So, in the end, we began to understand why it might be that there has been so little scholarship on film and composition—and presumably little increase in the use of film in composition classrooms—since the publication of Comprone’s essay in 1976. Given the social constructionist turn in composition, and the growing popularity of film, teachers would probably be inclined to treat film as popular culture. But as we have seen, treating film as popular culture collides with the internalist assumptions of students. Of course, this collision could (and does) occur with any text, but with film it is particularly difficult, because film has largely been presented by its creators and by our culture as "just entertainment," and film is less obviously intended to form opinion or spur to action than texts such as advertising or letters to the editor.19 Though we decided that it is possible in first-year composition class to undermine such internalist assumptions and use the space opened by that undermining to teach writing and critical thinking, it is difficult,
given the lack of time. Any attempt to teach film as film raises the issue of how much time will be spent launching the unique vocabulary and concepts of film studies, and there are simply too many competing objectives in a composition course to teach such things thoroughly. Nevertheless, film is a powerful force in our society, and the external leanings of the medium of film offers a perspective for moving students away from extreme internalist presuppositions that traditional texts such as print essays and short stories do not. Another medium that enables externalist approaches to education is the computer, and to that I now turn.

Both Eddie Maloney and I have used critiques of advertising in our classes, which provides a helpful introduction to the more subtle influences of film.
CHAPTER 4

EXTERNALIZING THOUGHT: THE ELECTRONIC TEXT

Beginning a Collaboration with a Scientist

In the spring of 1997 I was approached by a friend, Janet Russell, who had just completed her doctorate in biochemistry and wanted to work on approaches to integrating technology into the teaching of secondary science. Janet was already certified to teach high school science, and she had already done student teaching in area high schools. She was interested in collaborating on a project that would combine her expertise in science and secondary education with my experience teaching using technology in a social constructionist framework. She proposed that she apply for a National Science Foundation fellowship that called for innovative approaches to integrating technology into secondary science instruction. I would be written into the fellowship as a technical and pedagogical consultant.

In the original proposal, the project is cast as a constructivist approach to secondary science education. Constructivism in this context was defined as a theory that holds that a learner should be exposed to science content in authentic, challenging, active tasks. Features crucial to such an approach include performance-based assessment, multidisciplinary tasks, collaborative work, interactive instruction, student exploration,
heterogeneous groups, and teachers acting as facilitators rather than unilateral dispensers of knowledge.

In general, the approach outlined in the fellowship constitutes an attempt to take a more externalist approach to science instruction. The implied assumption of such a claim is that science instruction has predominately been approached on internalist grounds. This may seem an odd statement to make, given that science is devoted to the study of the external world, but the practice of something by those proficient in it and the teaching of that practice to those unfamiliar with it need not be approached the same way. But even if this difference is granted, how can one go about exploring and defining something as daunting as “traditional” science instruction?

The Internalist Leanings of Secondary Science Education

As a means of characterizing traditional science instruction in the United States, consider what is the most important recent event in the field of secondary science pedagogy: the 1996 release of the National Science Education Standards by the National Research Council. The Standards are the product of collaboration between all the major groups concerned with secondary science education, including teachers, school administrators, publishers, curriculum developers, college faculty and administrators, scientists, engineers, and government officials (National Science Teachers Association 32). “The Standards,” according to the National Science Teachers Association, “both in vision and development, truly exemplify American pluralism” (32). In his characterization of the Standards as a truly watershed moment in secondary science education, Michael Matthews notes that the Standards “are the outcome of an extensive
writing and consultative process that began in 1991" (203). Between 1991 and 1994, 150
public presentations were made to promote discussion about the development of
standards. After review by a variety of focus groups, forty thousand copies of the 1994
Draft were printed and distributed to some 18,000 individuals and 250 groups for
comment and review. Matthews notes that “all of the major contributors to US science
education had the opportunity to be involved in the development and revision of the
standards” (203). The NSTA notes that the *Standards* are a

vision of science education ranging from the specifics of classroom practice to the
overall organization of the educational system. More succinctly, the *Standards*
present a view of a scientifically literate populace. (32)

The *Standards* have much to say about where science instruction should go, but
they also—more indirectly—have much to say about where secondary science instruction
has been. The central recommendation of the *Standards* is a shift away from the study of
science as a finished, static, product, and toward an emphasis on science as “inquiry.”
The nature of this shift is outlined in the “Overview” to the standards:

Implementing the *Standards* will require major changes in much of this country’s
science education. The *Standards* rest on the premise that science is an active
process. Learning science is something that students do, not something that is
done to them. “Hands-on” activities, while essential, are not enough. Students
must have “minds-on” experiences as well (National Research Council 2). The *Standards* call for more than “science as process,” in which students learn
such skills as observing, inferring, and experimenting. Inquiry is central to
science learning. When engaging in inquiry, students describe objects and events,
ask questions, construct explanations, test those explanations against current
scientific knowledge, and communicate their ideas to others. They identify their
assumptions, use critical and logical thinking, and consider alternative
explanations. In this way, students actively develop their understanding of
science by combining scientific knowledge with reasoning and thinking skills (2).

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20 The *National Science Education Standards* can be accessed at
http://www.nap.edu/readingroom/books/nses/.
There is a curious parallel here to the shift in composition to an emphasis on the writing process as opposed to the finished product of writing. Both the shift in composition and the shift in science instruction represent a move toward externalism and away from internalism. Externalism puts science and writing in time and history, contextualizing it and trying to connect it to the individual pursuing it; internalism de-emphasizes time and history and the subjectivity of the individual by emphasizing the final product, which can be viewed as a universal, static entity. To understand this shift away from internalism it is useful to consider past teaching practices in more detail, and one very effective approach is to review the *Standards* for its characterization of those past practices. The *Standards* contains eight chapters:

1) Introduction
2) Principles and Definitions
3) Science Teaching Standards
4) Standards for Professional Development for Teachers of Science
5) Assessment in Science Education
6) Science Content Standards
7) Science Education Program Standards
8) Science Education System Standards

At the end of chapters 3-8 of the *Standards* there are brief sections titled “Changing Emphases” that summarize the practical implications of the chapter. These sections provide an excellent focus for analyzing the shift away from internalism. For my purpose of reviewing past classroom practice I will focus on 3) Science Teaching Standards; 5) Assessment in Science Education; and 6) Science Content Standards. However, all of the
chapters reflect a movement away from internalist emphases. Consider first the chapter on Science Teaching Standards, which ends by recommending the following changes:

<table>
<thead>
<tr>
<th>Less Emphasis On</th>
<th>More Emphasis On</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treating all students alike and responding to the group as a whole</td>
<td>Understanding and responding to individual student’s interests, strengths, experiences, and needs</td>
</tr>
<tr>
<td>Rigidly following curriculum</td>
<td>Selecting and adapting curriculum</td>
</tr>
<tr>
<td>Focusing on student acquisition of information</td>
<td>Focusing on student understanding and use of scientific knowledge, ideas, and inquiry processes</td>
</tr>
<tr>
<td>Presenting scientific knowledge through lecture, text, and demonstration</td>
<td>Guiding students in active and extended scientific inquiry</td>
</tr>
<tr>
<td>Asking for recitation of acquired knowledge</td>
<td>Providing opportunities for scientific discussion and debate among students</td>
</tr>
<tr>
<td>Testing students for factual information at the end of the unit or chapter</td>
<td>Continuously assessing student understanding</td>
</tr>
<tr>
<td>Maintaining responsibility and authority</td>
<td>Sharing responsibility for learning with students</td>
</tr>
<tr>
<td>Supporting competition</td>
<td>Supporting a classroom community with cooperation, shared responsibility, and respect</td>
</tr>
<tr>
<td>Working alone</td>
<td>Working with other teachers to enhance the science program</td>
</tr>
</tbody>
</table>

(p.52)

This list is revealing of the past internalist character of science instruction in several ways. In the previous model students were often presented a “rigid curriculum” presented through “lecture, text, and demonstration” and then assessed by “reciting
acquired knowledge” and “factual information.” This is an internalist model in that scientific knowledge is viewed as a separate, static entity to be passively absorbed by students. In such a model knowledge is not achieved by interacting with the external world or with science as it developed through that world; instead, scientific knowledge is disconnected from the actual experience of students and presented as an atemporal, finished, fixed set of facts and relationships.

The previous model also reflects the hyper-individualism and atomism that results from the strong subject/object dichotomy characteristic of internalism. Previously, students often “worked alone” reading and listening to lectures and demonstrations—which reflects the assumption that students need not experience the process of science for themselves or by working with others, but can instead learn science by mentally, abstractly, and internally studying the distilled results of the work others have done in science. Such individualism led to “competition” rather than “cooperation” in the old model.

The critique in the Standards of assessment practices mirrors the critique of teaching practices:

<table>
<thead>
<tr>
<th>Less Emphasis On</th>
<th>More Emphasis On</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessing what is easily measured</td>
<td>Assessing what is most highly valued</td>
</tr>
<tr>
<td>Assessing discrete knowledge</td>
<td>Assessing rich, well-structured knowledge</td>
</tr>
<tr>
<td>Assessing scientific knowledge</td>
<td>Assessing scientific understanding and reasoning</td>
</tr>
</tbody>
</table>

115
In the old model, assessment reflected the internalist assumptions of content and teaching. Because scientific knowledge was viewed as a static finished product, testing a student's knowledge of the process of pursuing science could be displaced in favor of testing that emphasized memory of facts and "discrete knowledge." Such testing, of course, lends itself to distinct end-of-chapter and "end-of-term" tests, as well as quantitative tests that can "easily measure" a student's knowledge. On the new model there is an emphasis on the context of learning, so that achievement is assessed in the context of the "opportunity to learn." Also, the new emphasis on self-assessment by students and on peer evaluation represents an interest in the context and motivation associated with the learning of science—it is not simply assumed that students should have an innate interest in science and should passively accept the evaluation of their teacher. Rather, students should participate in evaluating their own work as part of the process of learning. Once it is thought that the connection of students to subject matter is important (as opposed to operating on the assumption that students ought to pursue science for its own sake) there are serious implications for pedagogy.
Consider also the changed emphases in science content standards:

<table>
<thead>
<tr>
<th>Less Emphasis On</th>
<th>More Emphasis On</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowing scientific facts and information</td>
<td>Understanding scientific concepts and developing abilities of inquiry</td>
</tr>
<tr>
<td>Studying subject matter disciplines (physical, life,</td>
<td>Learning subject matter disciplines in the context of inquiry, technology,</td>
</tr>
<tr>
<td>earth sciences) for their own sake</td>
<td>science in personal and social perspectives, and history and nature of science</td>
</tr>
<tr>
<td>Separating science knowledge and science process</td>
<td>Integrating all aspects of science content</td>
</tr>
<tr>
<td>Covering many science topics</td>
<td>Studying a few fundamental science concepts</td>
</tr>
<tr>
<td>Implementing inquiry as a set of processes</td>
<td>Implementing inquiry as instructional strategies, abilities, and ideas to be</td>
</tr>
<tr>
<td></td>
<td>learned</td>
</tr>
</tbody>
</table>

(p.113)

When scientific knowledge is viewed as a finished product it is reified into static, separate, distinct subject matter disciplines that should be known “for their own sake” rather than as the products of practical inquiry. The understanding of process and context called for by the new, externalist model requires a sacrifice of breadth for depth, in that true inquiry can be a long and winding road that does not lend itself to rapid coverage of content. On the new externalist model, because subject matter disciplines are no longer studied for their own sake they must be integrated with and related to “inquiry, technology, science in personal and social perspectives, and history and nature of science.” It is worth noting in this context that Dewey and other externalists who
advance experience and inquiry in education warn against dismissing the organization of knowledge into subjects and disciplines. Organizing knowledge in this way provides a complement to individual experience by providing a tool (as opposed to an independent end) to guide inquiry, and it maintains and develops the discipline across generations.

Finally, the new emphasis on inquiry is deemed so important as to merit its own, separate table of reformed emphases to promote inquiry is included at the end of the chapter on science content:

<table>
<thead>
<tr>
<th>Less Emphasis On</th>
<th>More Emphasis On</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activities that demonstrate and verify science content</td>
<td>Activities that demonstrate and verify science questions</td>
</tr>
<tr>
<td>Investigations confined to one class period</td>
<td>Investigations over extended periods of time</td>
</tr>
<tr>
<td>Process skills out of context</td>
<td>Process skills in context</td>
</tr>
<tr>
<td>Emphasis on individual process skills such as observation or inference</td>
<td>Using multiple process skills—manipulation, cognitive, procedural</td>
</tr>
<tr>
<td>Getting an answer</td>
<td>Using evidence and strategies for developing or revising an explanation</td>
</tr>
<tr>
<td>Science as exploration and experiment</td>
<td>Science as argument and explanation</td>
</tr>
<tr>
<td>Providing answers to questions about science content</td>
<td>Communicating science explanations</td>
</tr>
</tbody>
</table>

21 This change in emphasis became a significant issue when we attempted to integrate inquiry with high school curricula, which required that designated material be covered within an allotted time.
<table>
<thead>
<tr>
<th>Individuals and groups of students analyzing and synthesizing data without defending a conclusion</th>
<th>Groups of students often analyzing and synthesizing data after defending conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doing few investigations in order to leave time to cover large amounts of content</td>
<td>Doing more investigations in order to develop understanding, ability, values of inquiry and knowledge of science content</td>
</tr>
<tr>
<td>Concluding inquiries with the result of the experiment</td>
<td>Applying the results of experiments to scientific arguments and explanations</td>
</tr>
<tr>
<td>Management of materials and equipment</td>
<td>Management of ideas and information</td>
</tr>
<tr>
<td>Private communication of student ideas and conclusions to teacher</td>
<td>Public communication of student ideas and work to classmates</td>
</tr>
</tbody>
</table>

(p.113)

Let us return, then, to the characteristics of internalism outlined previously and consider their relationship to the old model presented by these tables of changing emphases:

1) **Forwarding of Foundationalism.**

   In the old model science is separated from "personal and social perspectives, and [the] history and nature of science" and instead studied for its own sake. Students "demonstrate and verify science content" rather than applying it or developing it using their own hypotheses. The result, for students, is the absorption of existing, static, knowledge.

2) **Limitation of Language.**

   Neither the old model nor the new model emphasizes the mediation of language in scientific inquiry. One of the goals of our project is to foreground the ways in
which such mediation—especially writing—can develop the other goals of the new standards. I will return to this matter shortly.

3) **Elision of Experience.**

The old model emphasizes mentally acquiring a range of information organized statically into separate subjects. It foregrounds methods such as lecture, textbooks, and demonstrations that minimize the external activity of the student in favor of internal, cognitive activity. Students are assessed by reciting the facts they have stored in their heads.

4) **Severing of Subject.**

In the old model students are taught and assessed as atomistic individuals. They interact very little with each other (or the teacher). Because science isn’t connected to their individual desires, concerns, and histories they are isolated as subjects and expected to learn science “for its own sake.”

If we cast a wider net than the *Standards* per se, we can find other critiques of the internalist emphasis in science education. Thomas Kuhn, for example, is famous for his critique of foundationalism in science, and it is fitting that he was nudged toward developing his externalist critique in *The Structure of Scientific Revolutions* by his study of science textbooks. In the first chapter of that book, “Introduction: A Role for History,” Kuhn notes that science is perpetuated from one generation to another through textbooks which typically expunge history and present science as a permanent, universal, timeless truth that may well have been discovered incrementally over time, but which was always true independent of that historical discovery. By de-emphasizing history,
truth and discovery are pried loose from the rough and tumble changeable world and moved to a timeless realm of permanent truth.

Here we see a crucial example of how pedagogy in science, on the one hand, and theoretical, paradigmatic assumptions of science, on the other hand, are inextricably tied. The very process of distilling the history of science out of the knowledge of science to facilitate pedagogic presentation has reified science—such distillations are no longer merely viewed as means of practically and efficiently teaching science, but as the very nature of science. Learning science in this ahistorical way leads to metaphysical and epistemological assumptions about science—assumptions that an understanding of the history of science would undermine.

In other words, the ahistorical approach to science instruction is internalist because it coincides with the internalist tenets of denying the contingency of history and asserting a timeless, universal character for the truths of science. On this internalist view, the truth of science isn’t contingent upon the plastic, changing world; it exists in some timeless realm, like Plato’s world of forms. So while the discovery of such timeless truths may depend on observing the contingent world, the metaphysical existence of such truths is unsullied and independent of such an impermanent, changeable realm. The truths are presented as a fait accompli, and if the process of discovery is discussed at all, it is usually presented as smooth, seamless, and incremental.

Kuhn’s broader argument here is that this incremental, seamless characterization elides not only the political and personal conflict that occurs in science, but also the revolutions that attend shifts in paradigms. For Kuhn, conflicts in paradigms result from differences in theories that are embedded in language. By denying this language
dependence internalists can hold that science always progresses inexorably toward a better understanding of a singular, all-encompassing truth.

The denial of language-dependence and the assertion of the transparency and/or derivative role of language have both practical and theoretical ramifications. In practical terms, language is seldom viewed as a medium of learning or discovery, but rather as a means of transmission of pre-existent knowledge. In the internalist model it is assumed that textbooks can transmit a finished product of knowledge to students, and that students need not write to learn science. This model was corroborated in my interviews with high school teachers, who made very few references to writing as a means of learning or assessment. Actual practicing scientists, however, write copiously; some, such as Thomas Edison, produced massive archives of notes.

To be fair, as we saw in the study of engineering, this de-emphasis of writing could be due in part to the fact that scientists have effective learning technologies other than sentences: graphs, charts, drawings, lab apparatuses, etc. But in a fundamental, theoretical sense, science—in the form of positivism and other guises—has often sought to minimize or eliminate the problems that language poses for foundational objectivity. In the case of positivism, attempts were made to produce a theory-neutral, non-vague "observation language" that could provide objective observation statements (on the order of "red here now") that could be used as an objective foundation to build objective scientific theories. If this could be done, then the conflicts between paradigms could be subsumed by a theory-neutral, objective, "true" paradigm. Though these approaches failed, science in general still has a strong internalist streak to the extent that scientists hold that a conceptual scheme or internal realm of mental states—beliefs, desires,
intentions, and so forth—exists anterior to an external realm of objects and events. Hence, knowledge and truth are anterior to language and thus not relative to it or dependent on it.

My concern here is how these internalist assumptions affect science pedagogy in general, and in particular, writing, reading and the role of texts. In one sense, presenting science as a completed, ahistorical product is defensible as a heuristic device, since the immediate goal of such texts is to facilitate the learning of scientific theory, and it often useful to ignore the vagaries of history and revision in order to foreground the structure of the discipline (in a similar sense, English majors don’t usually read the drafts and revisions of Hemingway stories). However, as we have seen in the Standards, although there is a place for learning the finished product of science, there is also a need to understand the process of actual scientific inquiry and discovery.

In making the claim that science instruction has been internalist I do not wish to characterize recent science instruction as exclusively internalist. I will be arguing for a shift in degree in specific contexts from a more internalist approach to a more externalist approach. But central practices of science education are externalist, though they are often undermined by dominant internalist tenets. Consider the laboratory exercise—a consistent tool in secondary science education—which is in one sense an obvious externalist exercise. But even when lab work is pursued there is a tension between the internalist view, which stresses the importance of the received knowledge of science, and the externalist view which emphasizes the process of inquiry.

In my high school labs, for instance, my peers and I were well aware that although we were doing a lab, there were certain answers that we were supposed to get,
and that we would be evaluated on how closely we arrived at those answers. The process of the lab was not of primary importance; the product—arriving at correct results—was. Consequently, from my and my lab partners’ perspectives it was more fun and interesting to figure out how to cook the data properly at each step so that you arrived at the correct results than it was to actually carry out the experiment and report the data correctly. Of course, from the teacher’s perspective getting the “correct” answer was a way of determining whether the lab had been carried out “correctly.” Nevertheless, the emphasis on correct results indicates where the ultimate commitment lay: the role of the student was to recreate a process which was deemed part of a static canon of scientific knowledge. In such an approach students don’t engage in legitimate inquiry, they rehearse elements of received knowledge.

Such a rehearsal is precisely what the *Standards* wish to de-emphasize when they recommend against “Focusing on student acquisition of information” (52) and “Asking for recitation of acquired knowledge” (52); “Getting an answer” (as opposed to “Using evidence and strategies for developing or revising an explanation) (113); and “Concluding inquiries with the result of the experiment” (as opposed to “Applying the results of experiments to scientific arguments and explanations) (113). Cooking lab data in such a context, it could be argued, was at least true inquiry in the sense that it wasn’t the lock-step rehearsal of a received, “correct” exercise. It was an original solution to a problem: a recognition of the true priorities in the exercise and the means of satisfying them.

Two further externalist points can be made. First, as an alternative to cooking data, it might well be more instructive for students if they were asked to explore and
explain how it was that their execution of the lab rendered “incorrect” results—such an
exercise could well bring a more thorough understanding of the lab techniques and the
phenomenon it was designed to explain. Second, in actual scientific inquiry it often isn’t
the case that “correct” results are the goal. It is true that one tool of science is
reproducing results, but more often it is the case that a certain result isn’t anticipated as
“correct” (though some results might be thought “good” and some “disappointing”). Or
it may be the case that a scientist focuses on an explanation of anomalous results.

Another example that might help draw the distinction between externalist and
internalist emphases involves my education in calculus. I had a fine teacher, in most
ways, at a small liberal arts college who encouraged multiple approaches to solving
problems and who in many ways pursued a constructivist approach to education. He
once gave us an essay, I believe it was titled “Mathematics as a Creative Art,” which
argued among other things that people had an incorrect understanding of Math. Math, the
author claimed, isn’t about arithmetic or getting minor details correct or following
predetermined steps correctly; it’s about creativity in the same sense as that of writing
poetry or composing music.

I wrote a somewhat exasperated rebuttal to the article, pointing out that not only
did my grade in calculus depend overwhelmingly on my arithmetic correctness
(inevitably dropping a negative in an equation resulted in being marked down), but that
the larger approach to calculus instruction we were pursuing was not conducive to
creativity. When, for instance, we would learn the mean value theorem, the proof of the
theorem would be presented to us, and we would learn to apply it. We could, of course,
have been presented with the problems which had prompted the development of the mean
value theorem, and been asked to speculate about how to solve them. Then, even if we
didn’t solve them by developing the theorem (or some original alternative), we would
have a different appreciation of the theorem when we did learn it. If we weren’t
advanced enough as students to devise the mean value theorem in response to the context
that prompted its construction it would seem sensible to alter the course so that we began
with less difficult mathematical contexts that would allow us to devise such solutions to
problems.

My teacher was very understanding. His claim was that the status of these
calculus courses as prerequisites for other science courses required him to get through so
much content that he had no time for such an exploratory approach to math (thus, the
emphasis was on acquiring large amounts of the finished products of the field of
mathematics). Eventually we decided that there should be math courses for non-majors
that weren’t less difficult, but which took a more exploratory approach. Note that the
Standards clearly take an externalist line on the matter, arguing against “Doing few
investigations in order to leave time to cover large amounts of content” and arguing for
“Doing more investigations in order to develop understanding, ability, values of inquiry
and knowledge of science content” (113).

Developing Externalist Software

Given, then, the justifications for a more externalist approach to secondary science
education, Janet and I were faced with the problem of developing software that would
reflect externalist tenets. There were several considerations that we wished to address:

1) The technological level of software that we could realistically use given the
current hardware capabilities in the high schools we proposed to work with.
2) The extent to which software that we used would have to incorporate existing curricular content in the high schools we proposed to work with.

3) The affordances provided by the software. Just what did we want the software to accomplish: what tasks should it facilitate? How would reading and writing function? Could there be effective “externalist” software?

My initial inclination was to ponder the role that writing could have in such software. This inclination was motivated by my sense that the new paradigm outlined by the Standards cries out for writing. Consider again the emphases the Standards call for with regard to assessment:

- Assessing what is most highly valued
- Assessing rich, well-structured knowledge
- Assessing scientific understanding and reasoning
- Assessing to learn what students do understand
- Students engaged in ongoing assessment of their work and that of others

(p.100)

Writing, I would argue, reflects what is “highly valued” in science, such as “rich, well-structured knowledge” and “scientific understanding and reasoning.” It also reflects in a concrete form—and thus allows teachers to learn—what “students do understand” as opposed to what they do not know. Furthermore, it is an excellent medium to engage students in an “ongoing assessment of their work and that of others,” both through peer response and self-analysis of drafts. Writing makes a student’s thinking visible both to him or herself and to others, and unlike more fleeting media like oral exchange, writing allows a rigorous, detailed analysis at every level of organization.

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Consider also the aptness of writing with respect to the teaching standards:

- Understanding and responding to individual student’s interests, strengths, experiences, and needs
- Focusing on student understanding and use of scientific knowledge, ideas, and inquiry processes
- Guiding students in active and extended scientific inquiry
- Providing opportunities for scientific discussion and debate among students
- Continuously assessing student understanding
- Sharing responsibility for learning with students

Unlike “objective” tests such as multiple choice and true/false, writing excels as a medium for “understanding and responding to individual student’s interests, strengths, experiences, and needs.” Nothing else lays bare student thought more effectively, and sequenced writing can help guide students in “active and extended inquiry.” Peer response or co-authorship encourages the sharing of responsibility for learning among students and promotes discussion and debate. And unlike end-of-chapter objective tests, writing facilitates the continuous assessment of student understanding.

And finally, much of the table outlining the new emphasis on inquiry in the science content standards almost cries out for writing:

- Investigations over extended periods of time
- Using evidence and strategies for developing or revising an explanation
- Science as argument and explanation
- Communicating science explanations
The precision and complexity involved in the science of pursuing an extended inquiry, developing an explanation, and communicating the explanation to others requires writing for several reasons. The memory cannot manage and remember the various data and explanations generated by such inquiry—writing (in the broad sense which includes linguistic and visual forms) is the most expedient (perhaps the only) means of preserving and manipulating such information. Furthermore, although media such as oral exchange and internal cogitation are useful as tools for critical thinking, writing is a crucial tool for capturing such thinking so that it can be reviewed, developed and revised (by one's self and others) over extended periods with the precision required by science.

In addition to these happy congruities with the standards, writing has other advantages in a secondary science classroom:

- Writing isn't outrageously radical. It is already practiced extensively by scientists in many forms—from note-taking to article-writing. Most high school teachers could employ writing in their teaching without extensive training.
- Writing has already been widely associated with computers: most students are comfortable with the idea of writing at the keyboard.
- Because it is an external tool, writing is an excellent medium to pursue an externalist revision of science education. Writing makes thought visible and
thereby facilitates a wide variety of externalist activities—from personal development of thought to public expression of thought.

- As a group, girls in high school have been stronger in writing than in science. Writing might well provide many girls with a tool more amenable to their learning style.
- Writing is not a temporary tool for learning science at the high school level. Writing remains central to science regardless of the level at which it is pursued.

Given all of these reasons, Janet and I were interested in computer technologies that would incorporate writing, and we reviewed a variety of current innovations and approaches.

We were most interested in an approach that was being pursued with National Science Foundation (NSF) funding through the Education department at the University of California, Berkeley. At that time, the project was called “KIE”, an acronym for “Knowledge Integration Environment.” The software operated on a stand-alone Mac platform. KIE combines the use of the Internet with a software environment and an inquiry-driven pedagogy. The goal of KIE is to use software to guide students in using the Internet as a means of exploring a science subject in a manner that allows them to integrate and apply their knowledge. In an early paper outlining the approach the designers of the approach note that

Teachers often understandably rely on tried-and-true methods, such as using lectures and textbooks, which can promote beliefs of “teacher or book as authority” and “science as a static field” instead of the active, understanding-focused learning and dynamic view of science that we would like students to see as they participate in science classes. To remedy this situation, the KIE software and curriculum helps students use the Net to work on large projects designed to help them integrate their ideas. (Bell 1)
The goal is to avoid a superficial treatment of many topics that results in merely abstract and superficial understanding of scientific concepts, and instead pursue topics in-depth that are relevant to students’ lives, while providing guidance to help students develop an integrated understanding of the topic.

To achieve this goal, KIE employs an approach called “scaffolded knowledge integration,” which attempts to “create activities and tools that develop the abilities of students to sort and distinguish among a multitude of ideas” (Bell 3). Scaffolded knowledge integration involves four main components:

1. Identifying new goals for learning
2. Making thinking visible
3. Encouraging lifelong learning
4. Providing social supports

The first component involves finding topics that relate to the experience of students and encouraging students to actively test, revise and reformulate scientific explanations (Bell 3). The second component concerns making “alternative models accessible to students” (Bell 3). The examples given for instances of thought made visible are “two students debat[ing] about theories” or when a student reads “a debate about two natural scientists” (Bell 3). The third component involves encouraging students to take responsibility for reaching their own conclusions and developing their own techniques for monitoring their own performance. The last component involves “orchestrating productive social interactions in the classroom while guarding against situations which would support gender stereotypes or status effects” (Bell 3).
The software designed to complement these goals employs several tools (see http://wise.berkeley.edu/WISE/demos/frogs/, or if an Internet connection is not available, see figure 4). The Deformed Frogs Mystery project is a flagship project constructed by the Berkeley team that designed the software (see “Credits” at the bottom of the left frame for more information on the team). The screen is divided into two frames. The left frame gives an overall view of the project by listing the major steps that are taken sequentially through the project (e.g. “What’s the problem?”, “What’s your opinion”, etc.). Each of the major steps has substeps that appear when the major step is selected (if you are looking on the web you can click on any of the steps to see the graphic that represents the substeps). The left frame also contain buttons for Amanda the Panda (the panda head at the top) and the Evidence Notebook (the notebook image just to the right of the panda). At any point in the project students can use either Amanda the Panda to get hints and advice, or use the Evidence Notebook to take notes.

The right frame shows the current view as each successive step is taken in the project. Several aspects characterize the projects designed by the Berkeley team. The projects are consistent with the Standards in that they are inquiry-driven (the students decide between two hypotheses that explain the frog deformation), they connect to current issues (the frog issue is current), and they attempt to address issues relevant to students (presumably students would have some interest in the fate of nearby frogs). In an attempt to foster the goals of life-long learning the projects include live web links in the hope that web use is a skill that can be used throughout life.

22 These examples demonstrate that, curiously, the designers of SenseMaker do not regard writing as an interesting example of “Making thinking visible.”
But there is one further tool developed by the Berkeley team, SenseMaker, which we found particularly attractive. SenseMaker isn’t used in the Frog project, but it is the primary reason we were drawn to the WISE software, because it externalizes—through visuals—the early stages of thought in the writing process (see figure 5). While students read pieces of evidence (such as “Cuvier” in the window titled “Influential Scientists”) they can drag and drop the pieces into a variety of categories (such as the windows titled “Pro” or “Con”) determined either by the students themselves or by the project designer. I will return to this feature in more detail momentarily in the context of our project.

In sum, the WISE software had a generally externalist orientation and looked promising for our project. While it didn’t highlight writing, in the sense that writing isn’t viewed as something to be developed (as in a long essay) or given to a teacher for response or assessment, it did provide a tool for note-taking (the Evidence Notebook). Furthermore, SenseMaker provided a novel writing tool that could be integrated with writing in the projects.

**Choosing the Subject**

We met with Greg Wieland, a science teacher at Grandview Heights, a local high school, to discuss what sorts of projects might complement his upcoming courses. He was interested in evolution, so we began two projects, one addressing the definition of evolution, and one addressing Darwin’s theory (Janet focused on the former, and I focused on the latter). In order to approach Darwin’s theory in a manner consistent with the recommendations of the *Standards* and with our own externalist theoretical commitments, we chose to situate the project historically: students would imagine
themselves as Darwin, with only the evidence available to Darwin, trying to make sense of the relationships among species.

The goal here was not just to show that science is relevant to current problems (in the way that the Frog project does), but also to show how science develops historically, and how social and cultural factors influence that development. We also approached the project in this manner because part of the goal of the project was to help students think explicitly and reflexively about the process of developing such a theory, and we thought that it would be easier for them to think initially about someone else's process rather than their own. The controversial nature of the subject of evolution also lent itself to such an approach, because the historical distance given by a consideration of the issue in the 19th century gives the material an emotional and intellectual distance that promotes reflection. In other words, the students’ own beliefs about evolution were not being scrutinized; the beliefs and intellectual process of Darwin was being scrutinized.23

In addition, this approach allowed us to finesse the problems posed by the conflict between religion and evolution. As teachers we let the students determine where and how they felt religion might conflict with evolution, and assessed them on the basis of their justifications. As our students discovered, there are positions that can be held that minimize such conflict. It is possible, for instance, to hold that evolution was simply the mechanism chosen by God to create the species. Such a position is supported by the remarkable consistency of the creation account in Genesis with Darwin’s theory.

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23 I should note here that this approach does require some sophistication, in that students have to remember not to use evidence that became available after Darwin developed his theory. Happily, it seemed that students were quite capable of forgetting what they had learned about evolution previously.
Adapting the Software

In our initial construction of the Darwin project, we decided to construct four categories of evidence that would be analyzed by students: "Observations," "Cultural Influences," Influential Scientists," and "Personal Influences" (see figure 5 or go to http://wise.berkeley.edu/WISE/demos/darwin/top.html). If the student felt the evidence would have led Darwin to develop the theory of natural selection, he or she would drag and drop the evidence piece into the “Pro” window. If the evidence would have led Darwin away from the theory of natural selection, the student would drag the evidence piece into the “Con” window, and so forth for “Mixed” and “Irrelevant.” After sorting all the evidence, students then ranked the importance of the evidence using the color-coding feature in the software (if you click on the button that precedes the title of the piece of evidence a series of color selections is offered). Students then wrote five-page essays explaining why the most important evidence they selected in either the “Pro” or “Con” categories was so crucial to the development (or impeded development) of Darwin’s theory.

One of the advantages of this approach, from our perspective, is that it managed to be simultaneously innovative and familiar. We have already seen that the standards call for new emphases in assessment, which are largely met through the use of writing. The use of a fairly conventional essay as the capstone of the Darwin project allows teachers to employ a somewhat familiar form in an atypical context—a science class. And as we have seen above, the use of a conventional essay meets the new emphases called for by the Standards, especially in assessment. But the Darwin project also introduces a more radical innovation in the form of SenseMaker. SenseMaker innovates in the margin between reading and writing—an area sometimes referred to as
prewriting—where conventions are less constrained than they are in finished essays. However, SenseMaker complements the more conventional finished product of the final essay, allowing students to employ their categorizations and rankings to organize their essays. Of course, eventually, SenseMaker could be developed to facilitate the writing of more innovative hypertext essays, but we feel that currently employing such radical innovation in high schools would push the envelope too far.

The nexus between reading and writing became a particularly intriguing component of the Darwin project. In the initial version of the project (constructed with slightly different software on a stand-alone Mac platform) we decided to use fairly long excerpts (1,000 words and more) from a variety of sources. We decided this partly because we wanted to avoid a form of "MTV Education" that could result from having lots of short evidence pieces that didn’t appear to require an extended span of attention. In light of the Standards and our own theoretical interests, we also wanted to foster an appreciation of the complex strategies required in the process of extracting relevant information from the nuanced contexts of historical primary texts—an ability rarely if ever called upon in traditional science education. So, for example, to have a student assess the influence of Cuvier on Darwin we found online texts of Darwin’s Voyage of the Beagle and On the Origin of Species, searched the term “Cuvier,” found what Darwin said about Cuvier, and excerpted those sections of the texts for students to read. We did not assume, of course, that what Darwin had to say about the influence could necessarily be taken at face value—such issues are a part of the complexity of examining primary historical texts.
However, after the initial construction and piloting of the software at Grandview we moved away from lengthy pieces of evidence for four primary reasons:

1) **Collaborative reading on the screen**

At Grandview the students shared computers during the projects. Sharing was necessary because there were fewer computers than students, but such collaboration was very useful both because they helped both with the technical logistics and the content of the project (frequently students were prompted to discuss matters as well as write about them). However, sharing of the computer proved to be a problem when the evidence pieces were longer than one screen in length, because if students read at different speeds they could not read the evidence simultaneously. Shorter pieces of evidence allowed the activity to be more collaborative because whatever needed to be referred to was available for mutual viewing on the screen.

2) **Copyright/citation problems**

Copyright proved to be a particularly vexing problem. To produce the Darwin project quickly we needed to draw primarily from extant material, but using whole pages off the web proved unwieldy because they varied too widely in presentation and content and we felt that in an unedited form they would bog the students down. We were perfectly willing to give credit for the material, but it usually needed to be edited for the purposes of the project. Consistently, we found ourselves plagued by the difficulties of differentiating our wording from that of the author’s. It made little sense to completely rewrite the text in our own words (even if we had time) since much of the initial wording was often adequate. Further, the extensive quotations, ellipses, and citations only increased the opacity of pieces of evidence that were often already challenging for
students. However, if we distilled the content of pieces of evidence down to a few sentences or paragraphs we found the issue at stake in the evidence was often brought into focus for the students, and we weren’t involved in extensive editing (often, in fact, such distillation rendered the content common knowledge, and no citation was necessary).

3) Ambiguity of how to sort the evidence due to variety of content

Students had to choose to sort evidence into the categories “Pro,” “Con,” “Mixed,” or “Irrelevant.” When evidence pieces were long, there were often some elements that would have led Darwin to the theory of natural selection, and some which would have led him away from such a theory. Consequently, much of the evidence was justifiably sorted by students as “Mixed” not because a single element within the evidence was ambiguous, but because there were multiple, conflicting elements in the piece of evidence. For example, one extended piece of evidence reviewed the ideas of Carolus Linnaeus. Linnaeus categorized apes closer to humans than anyone had before (which would presumably support a theory of natural selection), but he was also committed to static, theologically preordained categories for species (which would undermine a theory of natural selection). Thus, the piece of evidence could very likely be placed in “Mixed,” and the justification would have to be split. Consequently, long pieces of evidence undermined the subtlety of the distinctions that the sorting in SenseMaker was intended to foster, and it was more difficult for students to take (and keep track of) notes that pertained to particular elements within the piece of evidence. It was, in our view, more effective either to split the Linnaeus evidence into two or more parts, or pare it down to one point.
4) Pace of the reading

We became increasingly convinced that the power of the electronic medium we were working with was its ability to foster mental, visual, oral, and manual activity on the part of the students. Part of the success of that activity was the pace at which it occurred. Extended pieces of evidence engendered passivity rather than activity in the students. While it may be the case that sophisticated readers and writers can remain active mentally when they read extensive texts, that activity is due to the extensive internalized categories that they have developed that allow them to sort and assimilate the material in their minds as they read (so they are "writing" as they read, in the sense that they are actively organizing information in the manner described in cognitivist studies such as those of Flower and Hayes). With the Darwin project, such internal categories and such mental, internal activity is externalized: it is made visible through the categories provided on screen. Students are constantly doing something: thinking where to categorize evidence, moving evidence pieces into categories, writing notes to support and explain their categorizations, talking to one another about differences about how to categorize evidence, or thinking how their notes might fit into a longer essay.

We discovered that as the evidence pieces were reduced in length, the nature of the reading changed: reading and writing were collapsed into a continual, active process, and that process was sustained from the moment they started reading to the moment students finished their essays. Further, students were able to pursue the entire process in one working environment. We felt that, at least in certain projects, sustaining this continual, active process was more important than providing more extensive, nuanced pieces of
evidence, and more important than allowing students unfettered, live access to Internet sites. In this regard our approach differed from that of the Berkeley team.

Further, we did not feel that shorter pieces of evidence led to shallower thought. What makes a transition between two things shallow, presumably, is a lack of substantive connection between them. But connections—and the explanation of connections—are continually foregrounded in the Darwin project. What has changed is the conventional boundaries of the text, not the degree of connection. It could be argued, in fact, that the degree of connection has increased for the reader, since the making of active connections is encouraged as much or more by the environment of SenseMaker than it is by a traditional science textbook.

As we thought about this phenomenon of reading and writing collapsing into a single process, we noted that indeed the crucial element to the phenomenon was the software, which allows writing and reading to be externally conflated in a way that was previously impossible. In recent history, reading has been associated with books and writing with paper and writing implements. Although such tools can be used alternately, it would be difficult to intermingle reading and writing as seamlessly as the WISE software allows. Further, we could not think of any good reason to keep writing and reading separate: it seemed, rather, that the separation has occurred because traditional writing and reading technologies encourage such separation. Any attempt to conflate writing and reading using these traditional technologies usually requires mental, internal bridging of the
technologies (the sort of recursive thinking researched by cognitivists such as Flower and Hayes). 24

It might be said, in rejoinder, that people often write in books, and thus collapse reading and writing externally in traditional texts. However, even when this is done, what is written can’t be externally organized in categories, viewed panoramically, edited, and pasted into a finished essay. Furthermore, writing in books usually requires the ownership of the book. In high school, writing in textbooks is usually forbidden, presumably because the students don’t own the texts, which must be reused, and the writing would impair or distract subsequent readers. One wonders, however, how much the prohibition might also be due to cultural assumptions such as those of Kuhn reviewed above: the view that the knowledge presented by the book is considered permanent and inviolable, something statically “out there” which must be passively and reverently received, not actively manipulated and interacted with.

I have also observed that even when the institutional strictures against writing in books dictated by schools and libraries are removed—when, for instance, people own books and can afford as many as they desire—most people still refrain from writing in books. The computer, however, makes the violation of a text inconsequential: endless copies can be produced easily, and comments by readers can be added or removed without such negative consequences. The WISE software simply encourages and organizes such activity. In a sense, the computer, and software such as the WISE SenseMaker, enables the sort of flexibility that writing initially provided oral cultures: it

24 Attempts to combine reading and writing using various pre-computer technologies have been attempted in composition. For one extensive list of such tools see Primeau 408 ff.
externalizes (and thus reduces from a necessary dependence of internal memory and manipulation) the processes of composing and thinking.

A wider issue at stake here is whether students might become dependent on tools such as SenseMaker, and whether they should ever set aside such external tools and learn to read “internally.” In one sense students are not necessarily dependent on the teacher to set up categories for sorting, since it is the case that students can create their own categories and windows on the computer, and could adapt the tool to a wide variety of situations. Students might well become dependent on the tool itself, however. This situation is similar to the recent controversies concerning the use of calculators in math classes and during math tests. Many held that unless certain calculations could be done internally then students didn’t really “know” them. But it has become more widely accepted that if the tool for such calculations is always available then it isn’t necessary to learn them “internally.”

A problem with such debates is that it is often assumed that “dependence” is necessarily pejorative term. Or, put another way, it is assumed that there is some utopian state of non-dependence that can somehow be found in the purely mental or internal. But we are, of course, already deeply “dependent” on external tools in order to write (in the traditional, external sense of the term). If we were concerned with internal “independence” we would return to oral culture, where alphabets, paper, writing implements and other external tools are unnecessary. But even in oral cultures, aside from a dependence on external social relations, there is a dependence on tools. As Ong and Havelock have argued, memory was enhanced in oral cultures by a variety of techniques, primarily rhyme, rhythm, and alliteration, which are external tools in the
sense that they depend upon physical components of language—language as a material medium.

Further, without “external” familial and social contact with other people, language could not be nurtured in the young or perpetuated across generations. Are we therefore dependent, in a negative sense, on external social interaction? Is there any superior “independent” state for humans? Not only does such an independent state appear to be impossible in practical terms, but even if it is offered as an ideal worth pursuing as far as possible, it valorizes a form of atomistic hyper-internalism that has little to recommend it. It would seem, rather, that there are different tools, and better and worse forms of dependence on those tools. It has often been claimed, in fact, that what distinguishes humans from non-humans is the use of such tools. Our dependence on such tools would thus seem to be an inextricable part of our identity.
EPILOGUE

When I first began writing this dissertation I considered not writing about computers, not because computers are unimportant, but because I felt that it was important that computers and electronic texts be considered in the context of the roles that technology has already played in composition. Such a consideration, from a pragmatic viewpoint, requires that our concerns about technology be connected to the history of theory and practice in composition. My interest in using SenseMaker as a prewriting tool in the Darwin project, for example, was motivated and informed by my understanding of the use of visuals in engineering writing and prewriting. The use of such visuals in engineering is not something that was caused, or brought to light, by computers. Furthermore, the incomplete understanding of the role of such visuals in composition, is, I have argued, a product of our own commitment to an overly-internalist approach to technology that has a history independent of computers. What is needed to develop a fuller understanding of such non-linguistic technologies—and of technology in general—is a broader view of technology; a view that encompasses both theory and practice and the relationship between the two; a view that will enable the manufacture of connections between uses of visuals in engineering writing and uses of visuals in electronic texts designed to facilitate prewriting.
It will, I think, be very difficult to integrate computers into our field if we treat them as something that sprang full-grown from the head of Zeus. Technology—if not computers—has had a long gestation in rhetoric and composition, and a consideration of that gestation could inform the full spectrum of our work. What I have hoped to illustrate are the advantages of treating technology broadly in a framework that foregrounds the interaction between internal/external, means/ends, mental/material, and a host of other related dualisms. The framework is broader than any particular technology, and my application of the framework to three particular material technologies—the engineering design report, film, and electronic texts—is intended to be illustrative of how the framework can facilitate thinking about technology in particular contexts. I focus on material technologies because these are the technologies least-theorized within composition. However, the conception of technology used by the framework is broad and pragmatic—it is defined on the basis of activity. Though Dewey avoids giving a formal definition of technology, Hickman notes that Dewey's operational definition can be “said to be the appropriate transformation of a problematic situation, undertaken by means of the instrumentalities of inquiry, whatever form those instrumentalities may take” (45).

One consequence of this definition—and of the theory I have tried to build using such a broad definition—is that it is intended to address issues of writing and pedagogy in any situation, including teaching that doesn't employ engineering design reports, or film, or electronic texts. In any classroom situation there are technological choices being made, and positions are taken on how to pursue various activities within the range of possibilities of the internal/external spectrum. As I outlined in the chapter on film, how
and when to teach grammar can be pursued in a more or less internalist manner, and a
decision to build an entire writing class on grammar most likely reflects a highly
internalist, foundationalist approach to writing instruction. How and when to employ
visuals by using overheads or a chalkboard raises technological issues, as do questions
concerning how and when to use group work or collaborative writing. Everything
associated with teaching and learning requires technological choices; I have not
developed these issues specifically, but the framework can address them.

One obvious way in which to pursue the implications of the framework for
pedagogy in general is through a consideration of the ratio of internal and external
symbols employed in a class or in a particular assignment. For example, Pierce, as we
saw in chapter three, went so far as to claim that iconic, indexical, and symbolic signs
should be employed in equal proportions (Wollen 142). This claim, however, smacks of
foundationalism, in that it implies that there is a universal proportion or ratio that holds in
all contexts. It would seem better to realize that the ratio of such signs has significant
consequences, and that we should be concerned to consider these ratios as we teach
without reifying a perfect, timeless, ahistorical proportion of types of signs. By keeping
in mind the four results of extreme forms of internalism and externalism—the forwarding
of foundationalism, limitation of language, elision of experience, and severing of the
subject—we can avoid excesses such as Peirce's.

These issues in teaching are crucially tied to research. My goal over the previous
pages has been to pursue an interaction between theory and practice that informs both.
From my perspective such interaction is one instance of the interaction between the
internal and the external—an interaction that should never be stifled, but should be
closely monitored and guided by constant attention to costs of limiting language, eliding experience, and severing the subject. By foregrounding such interaction, such a framework precludes extreme forms of internalism and externalism that shut down such oscillation and attempt to build foundational systems at the cost of limiting language, eliding experience, and severing the subject. Rather than merely treating these issues only abstractly, I have tried to attend to both theory and practice and their interaction. I focus, in other words, on how assumptions and implicit theories about technology affect pedagogy, whether that be how we respond to papers, what media we use to present texts, or how we teach the processes of reading and writing.

One area in which my research has been affected by the framework I am forwarding is the form of the dissertation itself. Though this dissertation is in one sense the work of a single author, it is collaborative in that it builds on the work of a variety of collaborative projects. Dissertations in English departments are not typically collaborative enterprises, a situation which reflects the highly internal assumptions that prevail concerning the production of such documents. On such a model, academic research is a solitary, atomistic activity, and individual inspiration, genius, or intelligence is often presumed to be the source of successful writing. A more external model highlights not only the interaction between people, but also the interaction between disciplines, and considers both an indispensable part of academic work. Collaboration is an emergent technology of the dissertation. In this sense this dissertation reflects the same trajectory as the field of composition in that it moves away from a highly internalist position by first foregrounding the social. Perhaps eventually dissertations will not necessarily be published under one name, and perhaps the more material form of the
dissertation itself will be altered to reflect a more externalist medium such as the hypertext form of SenseMaker, but the collaborative components of this dissertation do represent an initial move toward externalism in the genre.

In addition to the form of the dissertation itself, each of the chapters that apply the pragmatic theory of technology has implications for research in the field. The chapter on the engineering design report points to a need for research methodologies that can address the substantial non-linguistic, visual components of writing that occur in non-English fields. Peirce's semiotic theory, for instance, might provide a useful basis for categorizing non-linguistic comments that speech act theory could not accommodate. Most importantly, the chapter points to the pitfalls of assuming that research on writing can be founded on the study of a particular genre or genres in English. Composition has indeed moved away from the highly internalist assumption that good writing could be founded on the study of the sentence, but in many ways the foundation of grammar has been replaced by the foundation of genre, which is wider, but insufficiently wide to incorporate genre differences between disciplines.

The chapter on film highlights the need to not only consider the position of texts that we teach on the internal/external spectrum (such as our use of film as a more external text), but to also consider the presuppositions of teachers and students concerning the spectrum. It was our experience that ways in which such presuppositions intersect was crucial to an understanding of how students reacted to film in our course, and how we needed to modify the course so that it effectively addressed its audience.

The chapter on electronic texts attempts to employ a pragmatic theory of technology as a means of analyzing a whole curriculum—namely, the secondary science
curriculum in the U.S. After finding the current curriculum overly internalist, the
software that we developed as a means of pursuing a more externalist approach to science
education led us to a particular interest in the relationship between media technologies
and the connection between reading and writing. Again, however, as was the case with
the engineering design report, research in this area would require methodologies that
address the external, non-linguistic visuals that are employed in SenseMaker and so many
other texts on the Internet.

In retrospect, then, within the field of composition social constructionism has
provided a useful beginning to the development of a theory of technology in its
development of connections between the mental and one aspect of the “external”—the
social. And our understanding and development of external technologies such as
computers is crucially tied to our existing theories and assumptions about theory and
technology. However, numerous obstacles to the development of an understanding of
other “material” aspects of the external exist in the theory, practice, and research
methodologies within the field of composition. And though I intend the theory that I
have developed to be broad enough to address any approach to teaching, I believe it
would be a mistake not to entertain the more external media that I have explored. It is
my hope that we will begin to alter our internalist biases so that we do not mis-place the
technology of the computer in the way that Plato mis-placed the technology of writing.
Social Elements of Writing
(a writing convention adopted by certain groups which may have varying degrees of material, external indicators)

Genre

Material elements of Writing
(paper, pens, computer screens, data files, etc. Note that some genres such as hypertext are dependent on a particular material medium).

Social Elements of Writing
(ties to groups that make them your audience, interaction with those groups, etc.)

Goody's Definition of External: those elements of writing which occur outside of the head in the \textit{a posteriori} world

Goody's Definition of Internal: those elements of writing which occur in the head (the mental, the cognitive, the \textit{a priori})

Fig. 1 Internal/External Spectrum
• Few Discourse Communities
• High Levels of Commensurability

• Many Discourse Communities
• High Levels of Incommensurability

Range of Social Constructionist Theories

Kent’s Definition of External

Kent’s Definition of Internal

Fig. 2 Social Construction and the Internal/External Spectrum
Genre
(a writing convention adopted by certain groups which may have varying degrees of material, external indicators)

Material elements of Writing
(paper, pens, computer screens, data files, etc. Note that some genres such as hypertext are dependent on a particular material medium).

Social Elements of Writing
(ties to groups that make them your audience, interaction with those groups, etc.)

Externalism

Internalism

• Marx
• Technological Determinism

• Expressivism
• Strong Cognitivism
• Weak Social Constructionism
• (Plato, Kant, Descartes)

• Dewey/Vygotsky
• Strong Social Constructionism
• Weak (Social) Cognitivism
The Deformed Frogs Mystery

Demo Version

Notes and other personal work will NOT BE SAVED!

The Story Thus Far...

Across North America frogs are being found that have major physical deformities. Some frogs have deformed eyes. Others have misshapen or multiple legs -- or they are missing their legs altogether! Scientists have not yet determined why frogs are being deformed, but they do have some specific ideas. In this project, you will explore this mystery by examining the evidence and build an argument about what you think might be happening.

There are a number of potential causes for the deformed frogs. In this project, you will be introduced to two hypotheses scientists are investigating.

- THE PARASITE HYPOTHESIS
- THE ENVIRONMENTAL CHEMICAL HYPOTHESIS

In later projects you will explore these hypotheses in detail. You will then be asked to defend one of these two hypotheses during the classroom debate.

To begin working on the project, start with the What's the problem? activity.

Figure 4. The Frog Project
Figure 5. SenseMaker Page in Darwin Project
<table>
<thead>
<tr>
<th>Compliments</th>
<th>Percentage of Comments by Engineering Professor</th>
<th>Percentage of Comments by Teachers of Technical Writing in Dragga’s Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>93</td>
<td>8%</td>
<td>9%</td>
</tr>
<tr>
<td>18</td>
<td>2%</td>
<td>12%</td>
</tr>
<tr>
<td>387</td>
<td>33%</td>
<td>23%</td>
</tr>
<tr>
<td>179</td>
<td>15%</td>
<td>40%</td>
</tr>
<tr>
<td>56</td>
<td>5%</td>
<td>8%</td>
</tr>
<tr>
<td>83</td>
<td>7%</td>
<td>5%</td>
</tr>
<tr>
<td>351</td>
<td>30%</td>
<td>3%</td>
</tr>
<tr>
<td>total</td>
<td>1167</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 1. Kinds of Comments by Engineering Professor and Dragga’s Technical Writing Teachers

<table>
<thead>
<tr>
<th>Comments on Linguistic Elements</th>
<th>Comments on Graphic Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compliments</td>
<td>74</td>
</tr>
<tr>
<td>Criticisms</td>
<td>12</td>
</tr>
<tr>
<td>Directives</td>
<td>197</td>
</tr>
<tr>
<td>Questions</td>
<td>71</td>
</tr>
<tr>
<td>Suggestions</td>
<td>27</td>
</tr>
<tr>
<td>Explanations</td>
<td>57</td>
</tr>
<tr>
<td>Observations</td>
<td>194</td>
</tr>
<tr>
<td>total</td>
<td>632</td>
</tr>
<tr>
<td>percentage</td>
<td>54%</td>
</tr>
</tbody>
</table>

Table 2. Engineering Professor’s Linguistic and Graphic Comments
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Jeske, Jeffrey M. “Using the Short Art Film as Model.” Writing Instructor. vol. 4, no. 1 (Fall 1984). 7-23.


Mauro, Tony. "Church-state Suit Could Nix Plan for Internet in Schools." *USA Today* June 15, 1999. 1A


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