Literacy and Composition

Getting Basic:
Exposing a Teacher's Deficiencies

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Writing

This article traces the evolution of a teacher-researcher's conception of her work as both scholar and teacher in basic writing. She questions how her pedagogical goals and practices should change in light of her research within a developmental education program. It is her realization that these questions require a deeper reflection on and articulation of the theories that inform both basic writing and developmental education, and their impact on teachers and students. In particular, she emphasizes the importance of challenging the still dominant, though often implicit and unintentional, deficit models.

Last year, at my first research presentation in my new job at the University of Minnesota's General College (GC), I told my colleagues I was wrestling. In my classroom, in my thinking, and writing, and reading, I was wrestling with the question of how my teaching of writing should change in light of the fact that I was teaching basic writing (BW) in a developmental education (DE) setting. Should I spend much more time explicitly and directly teaching something called "academic discourse?" Would I spend more time "correcting" rather than responding to their writing? Should I stop having them write in multiple forms–poetry, dramatic monologue, because those wouldn't be immediately or directly relevant to the rest of their university writing, even if I believe it would help them develop as writers? How would I balance teaching them the conventions and expectations that I knew would be imposed on their texts, with teaching them to simply write, to become more comfortable and confident as writers in any given form?

My research project grew out of these subsequent questions. However, I now am questioning that question itself. What was it that prompted me, in spite of 11 years of teaching writing at every level, from basic writers to senior-level writing majors to English as a Second Language students to doctoral students, to even imagine I should abandon what I have learned about writing development simply because I was now in an institutional setting formally marked as "developmental" or "basic?" Why was it that, implicitly, I was adapting my standards to those imposed from without, and to standards I know do not enable and support the development of writers when they are used as the primary basis for teaching or assessing writing? Why was it that I was suddenly so attuned to watching out for what my students lacked? What they could *not* do?

Last year I was just beginning to think about how I myself had internalized and was struggling with the deficit model which informs, still, so much of our work in basic writing and developmental education. This model, which identifies students according to what they "lack" in terms of preparation or skills or abilities, leads us to approach our students as exactly that, *lacking*. We see them, meet them for the first time even, already seeped in assumptions about all that they *cannot* do. I did not imagine that I would do this. I did not even believe I was doing it at the time I was doing it! But I kept saying things to Tom Reynolds, my colleague and Co-Director of the GC Writing Program, "these students are not 'real' basic writers!" "These students are not at all like the basic writers I had out East." And even, "where are the 'basic' writers around here?" Why was I always so surprised? Because, the undercurrent here, the subtext, the unspoken theory about basic writers and developmental education that I was implicitly buying into, was that the primary characteristic of our students is their lack, is their deficit.

We know this underlies the institutional impulse to separate them out. In fact, the same institutional logic separates us from the institution. We, as faculty, have also been diagnosed as *lacking* in the university culture and have existed in the sometimes precarious margins; because we foreground our teaching and invest time and attention in our classes, it is assumed that we cannot also be real scholars, our research can-

not be as rigorous or as productive or as legitimate. Because the university economy values the "tangible" output of research over the less tangible production of quality learning and teaching, the forms of our labor have historically been less valued, if not invisible, and sometimes even called into question altogether. As Deborah Mutnik (1996) said of basic writing, which is also applicable to developmental education in general:

> The disempowerment of Basic Writing [developmental education] teachers has the same socioeconomic roots as the alienation and despair of many Basic Writing [developmental education] students. Marginalized teachers play an important role in any analysis of academic borders, especially the low status of Basic Writing [developmental education] classes, frequently staffed by part-time, temporary, and female faculty. (pp. 29-30)

For the faculty at GC, one of our projects during the past year has been to consider the various theories underlying both pedagogy and scholarship in developmental education. Because many of us come to this work from disciplinary affiliations, rather than an originary grounding in developmental theory and pedagogy, we have been interested, in both local and national discussions, to flesh out these questions: is there a dominant theory or philosophical framework informing our work as developmental educators? Has that theory been clearly and explicitly articulated? Or have we worked without the benefit of a shared, visible conceptual framework? Furthermore, of what use is a theory? What value is there in claiming and consciously adopting a theoretical framework? My own comments above show me that what Donald Graves, a composition scholar, once said in passing is indeed true: "You can't get out of bed without a theory." Or, in my case, you can't step into your basic writing class without one, even if you don't know you've got it. In other words, theories are not just formal clusters of abstract statements distinct from us, but also less formally shaped or articulated beliefs and ideas that guide our actions.

Regardless of whether we are aware of it or not, some underlying assumptions, some narratives, guide our everyday actions as teachers and writers. I was reacting to and acting on larger cultural narratives, or theories, about remedial students, about underprepared students and about what we should be teaching them, about what they need or lack, and how to best go about providing that. I did not consciously adopt that narrative. I did not intentionally devalue or demean my students and their abilities and potential. In fact, in other contexts—at a presentation last year, in our teacher development meetings within GC's writing program, in discussions with people who questioned my decision to leave a doctoral-granting English department to come here to GC—I was actively contesting that narrative. Still, my teaching was affected by it, or at least my thinking about my teaching was. I was considering whether or not to abandon what I knew about how writing happens and how writers develop simply because of the institutional, disciplinary, and cultural categorizing, labeling, and separating of these students.

I also came to those questions and to that narrative of my students and their deficit because of my reading in basic writing and developmental education. Or maybe because there is something called Basic Writing, separate from something else called Composition. Even that separation suggested to me that something was going to be qualitatively different here. I also came to it through discussions with people about what they do in their General College writing and writing intensive (WI) courses. That is, I came to adopt part of the theory not through inquiry into the larger ideas or formally articulated beliefs, but through looking at people's practices. Practice itself has come to be central to both basic writing and developmental education. On the one hand, that is a signal difference that I want to value because I believe that, especially when pedagogy is at the center of our research, it is important to be aware of the context where our work takes place, to be attentive to the different demands, pressures, and realities we encounter in our institutions and our classrooms. However, as my own blindness above indicates, and as Stephen North (1987) observes of Practitioner Inquiry, it is often fundamentally "reactive: The Practitioner needs to decide what to do as a means to an end determined by someone else, imposed from outside, beyond the bounds of the teacher's immediate relationship with the students" (quoted in Horner & Lu, 1999, p. 21). Practitioners are concerned with

> what has worked, is working or might work in teaching, doing or learning writing. However, practitioners needs to know *what* to do, not nec-

essarily *why*. This bedrock pragmatism is habit-forming. Practitioners tend to become habitually impatient with complicated causal analyses, which in turn makes them relatively cavalier about such analyses, even for the purposes of inquiry. (North, quoted in Horner & Lu, p. 21)

I think North's (1987) and Graves' point here is that we may come to some actions without much reflection. We may come to an action without any consideration of alternatives. We encounter the action as "natural," as "just the way things are" or "the way they need to be." This has been part of the wrestling within and in relation to composition since its beginnings: the seeming quandary of studying and theorizing, of critically inquiring into that, writing, which has *appeared* to be or has been culturally and institutionally understood to be "self-evident," "natural," or inscrutable, but transmissible. The assumption in this chapter, then, is that we profit from stopping to take stock of–or, as Gramsci (1987) suggests, to critically inventory–our choices and the frameworks that inform them. One of my aims, then, is to identify and critically reflect on the beliefs that guide pedagogy in my own teaching as well as those that animate or constitute what is called "Basic Writing." Critical reflection requires, of course, attending to the specific contexts (i.e., social, disciplinary, institutional, cultural, material, historical) within which theories are shaped and operate. A second related aim is to develop a partial map of the field and to orient myself as teacher and scholar, within that landscape. Obviously, I hope to invite others, new and veteran writing and developmental education teachers alike, to orient themselves as well, to make conscious choices about where we are and where we would like to be, as well as how we are going to get there.

I want to find an answer to that question I found that I kept posing, "how should my teaching of writing change in light of the fact that I am teaching 'basic' or 'developmental' writing?" Now I have in some ways moved to explore and critique the assumptions underlying the question itself. At least in terms of how I was initially, tentatively answering it: my teaching should somehow become more "basic" was my intuitive, practitioner's response, a response informed by theories I hadn't examined or consciously adopted, in fact, by theories I was contesting on other fronts. A

theory that was also contested by my students who showed themselves, in multiple ways, to be far more capable than I had expected or given them credit for—from producing a public newsletter for a nonprofit agency in our community service writing course, to analyzing our readings, to engaging in rich and lively discussions about the complicated issues and texts we were working with. In other words, in various contexts and in multiple ways, my students behaved and spoke as writers, they did the work of real writers; they did not behave or perform in ways our culture has come to associate with basic or remedial or pre-writers. What was missing in my early formulation of the question was attention to both the macro and the micro, as well as the inevitable and mutually-determining relationship between the two. This attention to macro and micro strikes me as essential. As my own ignorance demonstrates, when we work without an awareness of both the macro and micro and the relationship between them, we are doomed to miss part of the picture. As Hull, Rose, Losey Fraser, and Castellano (1991) put it,

> moving between the micro-level, close examination of oral and written communication and the macro-level investigations of society and culture–seeking connections between language, cognition and context. Without the microperspective, one runs the risk of losing sight of the particulars of behavior; without the macroperspective, one runs the risk of missing the social and cultural logic of that behavior. (pp. 321-322)

Thus, my research began in answer to a now complex question and began as a longitudinal case study of writers as they move through their university careers. I collected all of the writings done in the first year from seven students who will meet with me for interviews, and continue to pass on to me their writings, teachers' responses, and the assignments that prompted those texts. I was also curious to hear from the students about what they believed enabled and fostered their intellectual and writerly abilities. My hunch was, of course, that development is a much more messy and nonlinear, recursive process than we, in our composition courses, our WI courses, and the institution itself, generally allow for, and I was interested in gaining insight into how we might more effectively work with that mess, how we might learn

from these students' writings and reflection in order to fully support and not fight against development in our classrooms.

My future research aims, then, to synthesize or create a conversation that connects questions of pedagogical theory and pedagogy practice. First, I think the question of how we teach basic writing is still an important one. Because of the assumptions about our work and our students, because of the pressures on us and our students to "perform," because of the demands placed on us and our students to assume the position (e.g., of successful generic student, of successful generic writer, of effective teaching of an entity known as, but not really known at all, academic discourse), we are not free—as sometimes I was while housed in the department of English—to experiment without attention to boundaries and borders and external expectations and pressures. Even should I choose to challenge those, I must acknowledge them and consider how such a challenge will empower or support my students, because I am always aware that their position in our university and its culture is still seen as marginal, is still understood as provisional, and is still identified by lacks and deficits. I am not centering around how my teaching should change because of the faulty assumptions I carried with me last year, but rather how my teaching is changing as I learn from and with my students here, as I come to better understand the expectations brought to bear on their texts by others, and as I study, reflect on, and revise my work in these classes, with these students. Also, I am curious about studying what the literature in basic writing and developmental education tells me about who I am teaching and about how, what, and why I should be teaching. For me, the relationship between these components—the who, what, how, and why of teaching or teaching writing—is the site on which I can synthesize questions of theory and practice. I am deliberating over how I initially answered these questions, studying the literature in our fields for the answers to be found there, and studying my own classroom in order to understand how my experience working in particular sites is affecting a revisioning, a re-seeing of the answers to these questions. That is, I am no longer extracting the how from the what, who, and why. This means, I hope, that I am embedding my practice in a conscious theory and formulating that theory in relation to the study of my practices.

Mina Shaughnessy (1976) offers a useful articulation of one of the major shifts in how I am conceptualizing this project. She says,

> We are much more likely in talking about teaching to talk about students, to theorize about *their* [her emphasis] needs and attitudes, to chart *their* development, and to ignore the possibility that teachers also change in response to students, that there may in fact be important connection between the changes teachers undergo and the progress of their students. (p. 234)

What I hope future research in basic writing and developmental education can explore, then, is how we develop as teachers in light of learning from and with our students, rather than how we evolve as teachers by acting on pre-existing, unarticulated assumptions about who our students are, what they need, why they need it, and how to best deliver. Revisioning or reseeing has been central to all of my research thus far (Lee, 2000), as both a kind of organizing metaphor and a process worth continually engaging in, for teachers, students, institutions, and culture alike. Our research should not simply describe what is, or prescribe better practices for working within existing conditions, but rather should generatively imagine ways of intervening in and reforming what is. Our work as developmental educators, in and outside of our classrooms, should enable and support the revisionary efforts of others involved in this work.

Let us move to some particulars now. First, we have the question of how the legacy or tradition of research in BW gets read, represented and misread, and misrepresented. There is a tendency, I think, on the part of us "young guns" (i.e., new faculty, or those of us new to work in developmental education) to gloss over that which was radical about earlier work in our field because instead we shine the light on what, in today's context, seems regressive, accommodationist, and repressive. Because we are frustrated to find ourselves in a situation all too similar to that of our forerunners, we blame them for not being radical enough, not seeing enough, not doing enough, and not fighting enough. Still, I think we need to turn our critical lens more often than we have *outward*—to critique the institutional and cultural discourses that have so much influence over how our work is understood and what is

expected, often implicitly, of us and our students (i.e., miracle work, really). As Hunter Boylan and Barbara Bonham (1994) in developmental education and Sharon Crowley (1998) in basic writing point out, the number of programs and curricula for developmental education and basic writing, and the proportion of students assigned to them, has remained largely stable for 150 years. There are not *more* basic writers now than before. Students are not less prepared now than before. This has not changed. The other thing that has not changed is that we have not been able to claim disciplinary status and a vocal, equal, and viable role in the institution because the attitudes about us and our students remain unchanged, and—although a developmental program like General College is an exception—the support for and understanding of our work, in the institution as well as in the popular imagination, has not changed.

For the purposes of my research, I am therefore hoping to spend less time ungenerously reading the existing literature for its deficiencies and gaps, and more time reading it for what it can offer me, both in terms of understanding where we have been and for understanding what we need to do in order to get where we want to be. Here, to illustrate the kind of reading I mean, are two quotes, one from Shaughnessy (1977) and then Mutnick's (1996) reading of Shaughnessy. Shaughnessy warns us to be mindful of not asking students:

> to look at a piece of writing as something that *contains* its meaning as a pound of sugar might be said to contain its weight. The text stands outside, then, separate from the reader, impersonal and invulnerable. When the student writes his [*sic*] paper, it does not occur to him that he is a writer producing reading, he remains a writer producing writing. This alienation of student writer from the text robs him of important insights. (p. 223)

Further,

> Teachers promote a narrow and inhibiting view of perfection by ignoring all stages of the composing process except the last, where formal correctness becomes important, and by confronting students with models of good writing without ever mentioning the messy process that leads to clarity. *The messiness is indeed writ-*

ing [italics added]. . . . the composition classroom should be a place where the writer not only writes but experiences in a conscious way the stages of the composing process itself. (pp. 79, 81)

And now, here is Deborah Mutnick (1996) assessing the contributions of Shaughnessy:

> the problems Shaughnessy addressed were linguistic ones: how to induct these students, these outsiders, into the discourse of the university and by extension, dominant culture. Despite the democratic impulses that guided such efforts, the pedagogical focus on standard language, particularly surface level errors, as the key factor in academic success masked the underlying problems of racism, classism, and other forms of social inequality that necessitated open admissions in the first place. From its inception, Basic Writing has served contradictory functions, giving students a chance to develop reading and writing abilities that are then often foreclosed by inferior instruction–skills, drills, rote exercises and an overemphasis on error. (p. 8)

Both of these scholars produce important and radical insights into our work, yet it strikes me that I did not read quite the same Shaughnessy as Mutnick did. It also strikes me that I wrote similar statements about Shaughnessy's work when I first read it in graduate school. At the time, I was putting pressure on that text to be radical in ways I would validate, and I missed what is indeed radical about it. The text has not changed; what has changed is the knowledge I bring to it, and my own context in which I read it.

For Shaughnessy to make space for and give legitimacy to the messy process of writing and to writing as a process of *making*, not simply transcribing or containing already existing meaning, is an important intervention in the dominant assumption that the central purpose of BW is to clean up our students' writing, or that, within DE, our central mission is to "fix" perceived deficits. To foreground and insist on attention to the *whole process* of composing, a process that many students have never been introduced to and are unaware that all writers undergo, is a profound shift from earlier models that attended primarily to drills-and-skills and correctness.

At the same time, Mutnick (1996) emphasizes the macro-context that informs our local decisions, and reminds us that standards, and our ways of reading and assessing, are not inevitable or neutral, but rather are situated, constructed, and linked to a variety of extra-curricular conditions. Therefore, Mutnick presents an incredibly important insight: we have *choices* about how we read and assess, choices about the standards we construct. Here, her text builds on Shaughnessy's (1977), addressing the pressure we all feel in BW to somehow ensure that our students produce error-free prose, or to see it as the sole indicator of competent, effective writing, even though we know that is impossible. It is impossible because all developmental studies show that, as writers develop, they continue to make new mistakes and even to fall back to making old mistakes because they are conquering new forms, more complex ideas, longer texts, and new vocabularies and concepts. I remind myself: writing is messy; learning is messy. Not only the writing of a single text, but the development of writers as a lifelong process; not only the learning that goes on within a single course, but learning *how* to learn, how to be a successful student—this is messy business.

As I am researching what others have to say about teaching writing, teaching basic writing, teaching developmental education, as I am studying my own practices and their effects, one of the things I realize is that we just do not know enough about the writing demands placed upon our students throughout the university in order to enable us to effectively prepare them specifically for those demands. What we do know is that those demands are multiple and varied. We know that, even as we all refer to academic discourse as though it is a stable and unchanging and known entity, it is anything but that. We also know that most teachers are not doing the work of teaching students how to meet the particular rhetorical demands they assign to them, assuming instead that those demands are self-evident or already learned. However, as Herrington and Curtis (2000) note in their longitudinal ethnographic study that followed four students all the through their university careers:

> Explicit instruction…involves more than requiring, explaining or even modeling the *hows* of composition. It involves full explication of the *whys* as well. As Francois's confusion and Nam's question, "what is an essay?" [as well as

Stephen's question, "what the hell do you want from me?" (p. 388)] imply, there is nothing "natural" about the essay or about other written forms…All four students [in our study], from their first to last semesters, encountered a truly dizzying array of writing assignments and teacher expectations about them. Depersonalized reports for psychology and sociology; similarly depersonalized literary analysis, on the one hand, and highly personalized pieces, on the other, for comparative literature; self-contextualizing social inquiries and critiques for anthropology and education; "objective" summaries and arguments for philosophy as well as sociology. While some teachers described precisely what formal rules they expected students to follow . . . , few if any explained why those rules existed, what purpose they served and what significance they held, or how they differed from other conventional demands outside or even inside their own disciplines. (p. 387)

This leads me to think carefully about what it is I can and cannot adequately and effectively hope to accomplish in my first and second semester courses. It leads me to realize the importance of a continued effort to educate faculty from all disciplines about how writers actually develop and about how to use writing productively—for learning and for representing what has been learned—in their courses. It reminds me that I cannot teach my class in isolation from the rest of my students' courses, as some sort of feel-good recess where we are all excellent and excited writers. But it also means I cannot aim simply to prepare them for the wildly divergent set of demands they will face and for the ineffectual, even if well-intended, pedagogy they will encounter. However, this is not to say our task is impossible or so unpredictable as to be immune to preparation and deliberation. Herrington and Curtis (2000) go on to remind us about something we probably know about teaching writing, or anything else for that matter; it is something incredibly simple, a principle borne out in my own pedagogical theory and practice.

> Each student [in our study] reported learning most from instructors who gave them positive recognition as thinking persons behind and within their prose; each reported learning far

less—or nothing at all—from those who did not. Teachers who dismissed or demeaned the students' own felt presence within their writing—whether it was there explicitly or not—were resisted, perhaps actively or passively, but always resisted. And that included instructors who turned writing into a simply "academic" matter…And each [student] demonstrated that, without implicit or explicit invitation from their teachers to be heard within their written forms, they disengaged from the task as well as the text, writing less or less coherently, and learning less in the process. (p. 361)

This is so obvious a point that I think we often overlook it, whether in theory or in practice. We forget to talk about how important it is for writers, and any writer in any writing situation, to believe that what they have to say will be heard, read, engaged, and will matter. We often ask students to write simply as a performance, to prove that they have learned what we wanted them to learn, and read what we asked them to read. We then correct how they went about proving it. How much more effectively might our time be spent responding to, or conversing with what they have said, and what they are thinking? What if we spent time drawing them into a conversation between two writers, two readers, and two thinkers? Much of my own course is organized around providing precisely this sort of occasion, among students, between myself and individual students, between students' texts and the texts we read.

This, then, has become a central thread of my research project. Treating students as *writers*, as Shaughnessy (1977), Mutnick (1996), Sternglass (1997), Haswell (1991), and Herrington and Curtis (2000) have all emphasized, is crucial to our success in helping them develop as writers. This is an absolute turn-around from focusing on what they need, what they lack, and what I must give them. I do not suggest we should ignore the weaknesses in our students' writing, nor that we should simply celebrate all of their work unconditionally and uncritically. To do so would be disrespectful of the effort and time they put into their work. It would be to *not* engage their writing. But I wonder how we can revision what it means to engage students' writing, so that, even in the midst of the pressures of a stack of papers or of so much to cover in our courses, we commit time to studying and concentrating on the writing they produce. How can we treat it as writing that matters, writing that deserves to be engaged, and writing that says something? How can we center our courses around providing this element which, in every case study I have read, is deemed by students and researchers alike to be central to their motivation, commitment, and development as writers?

This bucks the trend indeed. It directly challenges and revises the dominant myth that what students lack is knowledge about correct prose or about what constitutes error or error-free-ness in prose. It contests the notion that our students are best served by being corrected. I think most of us work daily in our classes to contest the dominant myths about underprepared students. I think we work hard and successfully to help our students learn and to provide them with a sense of what "the game'" is and how to play and even, as Gee (1999) suggests, with the empowering belief that sometimes they have the right to "call" the game because the rules are fundamentally unfair. But what I don't think we have done yet is take a public enough stance on this. We are so often fighting simply for our survival, or have spent our time sharing practitioner knowledge with one another in order to meet the exigencies and demands of our daily work in the classroom, that we have not had the time or the luxury to claim more space, in the university or in our culture. We have not been able to demand a revisioning of the space we do claim: it is not a "privilege" for these students to have been "granted" access to the university, at least not any more so than for any other admitted student. It is a responsibility of the university and its faculty to provide not only this access, but the means to ensure all students' success. Sometimes, this means we have to challenge more vocally the standards to which we and our students are held. Other times it means we need to re-educate more actively and work to change the institutional culture and the popular imagination (i.e., the media, legislation, stereotypes).

Here, for instance, are how some researchers in BW and DE have articulated the need to demand a reciprocal relationship between our local missions, institutions of higher education, and our society at large. Shirley Brice Heath (1983), who did an ethnographic study of three communities (i.e., two working class, one White and one Black, and one White middle class) in North Carolina identified specific lin-

guistic features in preschoolers that predicted their performance in school. She traced those features to the oral behaviors displayed and passed on in their home communities. Heath's hope was to use this knowledge to enable teachers to examine and influence their teaching practices so as to benefit *all* communities. In other words, understanding the literacy practices students brought with them to the classroom could help teachers understand individual learners' strengths and needs rather than teaching to a generic or universal student. Teachers who participated in Heath's study as students in her class did indeed change their teaching practices as they came to possess a deeper understanding of and respect for the context within which different learners are embedded, such as in their homes, communities, and schools.

Eventually, however, the increased pressure to conform to standardized tests and so-called objective assessment measures led to ever-dwindling teacher autonomy. Consequently, Heath (1983) says, many teachers were forced "to choose either to leave the classroom or to revert to transmitting only mainstream language and cultural patterns" (p. 368) in spite of their knowledge that this would not ultimately be as successful for most students. She concludes,

> unless the boundaries between classrooms and communities can be broken, and the flow of cultural patterns between them encouraged, the schools will continue to legitimate and reproduce communities of people who control and limit the potential progress of other communities and who themselves remain untouched by other values and ways of life. (p. 369)

Here also is Martha Marinara's (1997) cautionary conclusion upon examining what she calls the disappointing legacy of basic writing thus far, in which the basic writing course has effectively become

> an introduction to academic discourse, an introduction to what a scholarly conversation is about and looks/sounds like. The university doesn't change; the knowledge and work that is most valued by the university doesn't change....Instead, the narratives of [traditionally underrepresented students], rather than acting as a transgressive collective, are subtly shaped to fit representations of cultural knowl-

edge that serve to reproduce the academy intact. The academy effectively shields itself from the transformation it would realize if it recognized that when students learn, they create meaning from past experiences, making connections with rather than merely assimilating new knowledge…The university's role as a change agent is incomplete and unspectacular. Rather than reconstructing the culture of the academy so that it is more enriched, academic literacy as a gatekeeper to education only gives access to standard rhetorical conventions and thought…Change is not enacted on notions of academic excellence or epistemologies, but on those students labeled "remedial" or "basic." (pp. 4-5)

This leads me to the final question I have posed for my research, as well as a question I believe we should prioritize in our research on developmental education: instead of wondering how I should be changing my students so they can be successful in the university, and instead of just wondering how my teaching should change so I can help my students develop as successful writers, I want to foreground how the university itself, and yes, the popular imagination as well, should be changed by the presence and participation of these traditionally underrepresented students. Without pursuing a fundamentally reciprocal notion of change, wherein the institution, its representatives, its students, and the prevailing culture explicitly respond to and impact one another, I fear we are doomed to simply keep on keeping on, fighting our forerunners and one another, rather than truly creating a more democratic and vital society, both within and outside of the university.

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Bakhtin's Notion of Dialogic Communication and a Discourse Theory of Developmental Education

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This article explores Mikhail Bakhtin's theory of dialogism in relation to Dana Lundell and Terence Collins' recently proposed Discourse theory of developmental education. Built on ideas put forth by James Paul Gee, the role of developmental educators in such a theory is to help students add Discourses to their primary, home Discourses. It is important to note and theorize the role of communication when working with students within this framework. Bakhtin's writings on the dialogic nature of communication offer an expanded, socially involved notion of student-teacher exchange. Building communication around this model values student experience and secures the student-teacher relationship as one that necessarily recognizes students as fully able communicators.

One of the more important challenges facing developmental educators is how to build on the literacies that students bring with them to college. No longer a new insight, students communicate effectively, rationally, and intelligently in a number of linguistic registers and textual forms, with various purposes determined by local circumstances (Heath, 1983; Rose, 1985). Some of this practice may intersect with "standard" written English as usually mandated in school settings, but some may not. This situation has left educators asking new questions about how to prepare students for success in college and beyond. Instead of asking how teachers can better convince students to leave behind their home languages and behaviors associated with literacy in favor of those that will give them success in school, many literacy researchers have begun to see education as implicated in the larger project of individuals developing a wide assortment of literacies. For many, an improved task for literacy instruction is to give students practice in and knowledge of historically standard forms such as the formal essay while also encouraging them to draw on and develop literacies unrecognized, and often undervalued, by the academy.

Discourse Theory and Bakhtin's Notion of Dialogic Communication

Dana Lundell and Terence Collins (1999) have addressed this situation, implicitly, in their attempt to theorize developmental education, after the ideas of James Gee (1996, 1998, 1999), as one of students taking on new "Discourses." In this view, we acquire at home, and then bring to school, a "primary Discourse," which "forms our language uses and defines for us the basic terms of human interactions" (Lundell & Collins, pp.12-13). Primary Discourse shapes us into participants in the world who use "culturally specific vernacular language" (p. 13) with accompanying "interpenetrating patterns of values, 'knowledge,' language, beliefs, roles and relationships" (p. 13). Gee's (1999) term of "authentic beginners" (p. 1) describes students who have not successfully brought together their primary Discourse with those "secondary" Discourses of the school (Lundell & Collins, p. 14). Crucially, secondary Discourses are acquired only by way of successful mediation through one's primary Discourse (Lundell & Collins, p. 13).

Gee's Discourse theory leads Lundell and Collins (1999) to suggest a number of tentative approaches and directions for developmental educators: basic respect for student Discourses, which are closely tied to identity; repeated, "meaningful" (p. 17) practice of secondary Discourse practices as a way to acquisition; an unmasking of the correct practices of secondary Discourse so that students understand what they are to do in order to take hold of that Discourse; construction of secondary Discourse knowledge on student knowledge carried from the primary Discourse; and a building of a critical awareness of how primary and secondary Discourses are related to one another.

Lundell and Collins describe, along with Gee, a scenario that accounts for the various sites of academic and nonacademic literacy and student ownership over any one Discourse. Their view is convincing in its valuation of students' non-school literacies (the vernacular) as they come into contact with school-based literacy. But what is the process for taking on new Discourses? Their theory suggests, but does not elaborate on, a basic *communicative* ground on which the acquisition of Discourses occurs for students. Indeed, although Discourses encompass entire "ways of being in the world" (p. 19), it is communication among students and masters of secondary Discourses that facilitates acquisition of those Discourses. Each of the directions suggested for developmental educators by Lundell and Collins points to a kind of communication that must occur if students are to be successful in their attempts at acquiring secondary Discourses. Together, the directions suggest that the kind of communication that needs to occur is a complex, dialogic one. Developmental education has traditionally been the domain of nontraditional students (Payne & Lyman, 1996). If these students are to successfully acquire new Discourses, then communication that encourages exchange within a number of different registers will have to provide the basis for such learning.

Mikhail Bakhtin's (1981, 1985) theory of the dialogic offers developmental educators a way to picture teaching as a communicative act with students that demands recognition of the wider context of that communication. When joined to the Discourse theory of Lundell and Collins (1999), it provides a way to imagine what takes place at the intersection of primary and secondary Discourses. As students seek to acquire a secondary Discourse, the information that is ex-

changed and the practices that are acquired occur in a process made clearer by Bakhtin's theory. Although first proposed in relation to literary texts, Bakhtin's theories hold broader significance for many communication processes. In particular, an examination of the basic Bakhtinian notion of the "utterance" (1985, p. 120) opens a sense of possibility for a necessarily broader definition of communication within the act of teaching than that afforded by traditional deficit models of developmental education.

A Widened Notion of Communication Within the Act of Teaching

Traditional models of developmental education assumed that students brought deficits of various sorts with them to college and that the task of educators was to impart the needed knowledge so that they could "catch up" to their peers. Bakhtin's (1985) notion of the utterance, a necessarily relational act embedded in social relations, suggests that this model may have closed off much of the richness of the teaching situation by framing the student-teacher exchange as one that relied on a more or less monologic model of knowledge transmission. Teaching writing, for example, has traditionally been defined as an erasure of deficits through the transference of rules that were not understood or attended to by students in the past (Berlin, 1987).

From Lundell and Collins' standpoint, on the other hand, communication would involve exchange of language to be understood as issuing from two different Discourses, two different ways of living in the world, each respectable and coherent. Communication within this scenario would also appreciate words and language as rich with meanings that may not be easily translated across Discourses. Furthermore, the two languages of students and teachers would inform and respond to the other; secondary Discourses would become informed by students' primary Discourses, as well as the reverse. Making the negotiation of the difficulties involved in such exchange a primary goal of education, the project of teaching would involve constant attentiveness to language on this level.

Bakhtin's (1985) communication schema is best understood as an ongoing series of essentially social acts, or utterances, that take place as language events. Utterances involve three forces acting equally to pro-

duce the communication event: the speaker, the "hero" (Bakhtin, 1989, p. 399), which can be understood as a productive, forceful, almost personified subject, and the listener. In his revised notion of the traditional speaker-message-listener model of communication, Bakhtin gives a social significance to the utterance that arises both out of the immediate situation as well as the identities and histories of each of the three interacting elements. In Bakhtin's (1985) words, [t]he concrete utterance…is born, lives, and dies in the process of social interaction between the participants of the utterance. Its form and meaning are determined basically by the form and character of this interaction" (p. 401). Charles Schuster (1998) has likened Bakhtin's theory to a whirling, planetary "orbit" (p. 3), each of the three elements acting on the others in order to create communication. Determining the significance for any utterance involves analysis of both the immediate situation of communication and the socio-historical roots of that utterance. For developmental educators interested in a dynamic interchange with students and the materials of education, Bakhtin offers a model of communication that assigns value to *all* the players in that exchange.

When thinking about the implications that Bakhtin's theory holds for developmental education, particularly Lundell and Collins' model of acquisition, it helps to imagine education as Bakhtin's multi-layered scene of communication. As teachers help students to acquire a secondary Discourse, students face a situation in which they seek to communicate with teachers about the various habits and expectations of the secondary Discourse. This is an exchange that must recognize the student's move as a communicative act of vast complexity. Too often, perhaps, teachers recognize student utterances, and here the term can be used broadly to include the many familiar forms of educational "communication" such as tests, projects, papers, and speeches, as emanating from a position of intellectual paucity or educational failure. In Bakhtin's (1989) view, such utterances carry far more complex meaning stemming from their social embeddedness. As participants who understand that this complexity exists, teachers and students create a space in which the communicative exchange occurs not only on the level of evaluation as conceived of from within the overriding secondary Discourse of education, but also as from within a framework of wider social realities and ideologies that have also created such utterances.

The dialogic opens up communication as a social act in a number of ways that can be demonstrated by considering the particular area of writing instruction. In order to demonstrate how deep the social significance of any one utterance may be, it helps to think of texts produced by students as a familiar site of analysis. Some researchers who have sought to apply Bakhtin's ideas to the area of student writing have limited their analysis to features of student texts. Thomas Recchio (1998), for example, analyzes a student text in terms of four "discourse modes" (p. 200) that he finds, each, in Bakhtinian terminology, "interanimating" (p. 204) the others. An effective teaching strategy, Recchio claims, would be to make the student aware of these modes as competing for control in the piece of writing and as in need of consciously making use of the modes in order to produce what the paper lacks, a sense of coherence.

But a wider construction of the scene of writing around Bakhtin's ideas is also possible. Construing dialogism in terms of a broad notion of textuality, Nancy Welch (1998), for example, discerns multiple "voices" in a student's text and sees discussion of the text as an opportunity to "recognize those forces that have shaped who the student is and how he or she writes" (p. 223). Where Recchio uses dialogism in order to arrive at a more informed notion of dealing with student deficits, Welch sees the teaching situation as one in which the teacher is helping the student "take charge" of her text but also of "the person she is and the person she is becoming" (p. 223). In framing the situation to include the student as a person and learner with an identity beyond the immediate task of the paper at hand, Welch shows how a Bakhtinian notion of the radically social nature of the communicative utterance represented by the paper obtains value in teaching.

Welch and Recchio both deal with multiple presences ("voices" or "modes") in student texts, but it's also important to see how, from a Bakhtinian perspective, texts invite discussion around the contexts that produce them. In this sense, the social sphere that envelops the immediate communicative situation also informs and constitutes the act of communication represented in the student text. As an illustration, I recently gave an assignment to my basic writing class that asked them to write about the relevance of *The Narrative of the Life of Frederick Douglass* (1993) for

us as readers today. One of my students got stuck fairly quickly, I learned in a conference, because he felt that Douglass' text involved the history of another race and so had little to do with him. He had started the paper by pointing to Douglass' learning experiences, but did not know where to go from there. His paper could be said to have "lacked" precisely at the point where learning the demands of the secondary Discourse represented by my class did not filter through his primary Discourse. Nevertheless, he had told me earlier in the course about the opportunities that he enjoyed in his job at Home Valu to learn skills that he considered valuable. Through conversations related to earlier writings based on that experience, we worked out that he did indeed have connections to Douglass, whose experience was, of course, thick with learning opportunities that he created in the face of no freedom. From my perspective, the student was learning to deal with the Discourse of college writing, inventing and practicing language that links important ideas like opportunity and freedom to particular texts like Douglass' *Narrative*. From his perspective, the student was learning to take on the practices of college writing through his own experience as a worker. More to my point, we worked with what was not in the draft by establishing a line of communication around the text of his experiences.

Although I do not claim that the exchange with my student led to a better piece of writing, our conversation took place around a wider notion of revision than what would generally be described by writing process theory. In fact, though, such conversations do make students better writers by enlarging their knowledge of the contexts that shape the writing done at the college level and by joining the context of the student's life to a deeper, more informed sense of audience. In Lundell and Collins' (1999) words, "the acquisition of a new Discourse is easiest when the process assists the learner in coming to know better what it is that he already knows on related matters, to know better what it is one has already mastered in the primary or other extant Discourses" (p. 16).

Application to Developmental Education

Higbee and Dwinell (1997) have performed research that shows how successful developmental education students point to smaller classes as meaningful

to them when looking back on their experiences in the University of Georgia Developmental Studies program. I believe that such conversations like the one I describe here, and which are made possible in those smaller classes, play a large role in establishing lasting connections to educational institutions more generally. Bakhtin's formulation of the utterance as a thoroughly social construct gives a theoretical basis for making such a move.

Moreover, my interaction with the student also demonstrates how it is possible to engage the larger project pointed to by Lundell and Collins (1999) of disclosing the nature and values of higher education. Douglass' story of self-education, my student's story of meaningful education happening for him in his job, and my assignment all point to a reading not only of Douglass' text but of the education available to Americans. Our discussions made use of and discussed the terminology of education as a social construction. Not simply a matter of what might "fit" or "fix" his paper, we talked about educators acting with specific interests in mind, politicians acting within a debate over school funding, and about the role of students in maintaining the system. Establishing communication at this level, above the immediate tasks of the class, is important if students are to understand that Discourses operate within and as systems of power. Lundell and Collins also point out that awareness of primary and secondary Discourses as such allows students to see their relative strengths within each and presumably make appropriate decisions based on that knowledge. One can imagine, as well, how this "metadiscourse" might extend into the areas of student services.

In addition to the above, Bakhtin's rich formulation of the concept of the utterance provides a possible underpinning to the Discourse theory task of building on student knowledge. According to Bakhtin, the utterance is best conceived of as an act that is not originary, but rather responsive. In Michael Holquist's (1990) words, it "is always an answer to another utterance that precedes it, and is therefore always conditioned by, and in turn qualifies, the prior utterance to a greater or lesser degree" (p. 60). Bakhtin emphasizes the responsive quality of utterances in order to disengage readers from the idea that any piece of language holds meaning in itself.

Responsivity is important for a number of reasons related to teaching developmental students. One is that

communication of and between student and teacher takes place within a frame understood to be one of constant exchange. When students seek to gain knowledge of and practice a secondary Discourse, the expectation that there will be back-and-forth communication assures students that the promise of education is real. Teachers who see communication as primarily one-way toward students ignore the need for clarification, explanation, and other communicative acts that are essentially two-way processes. This is especially important when considering that the language of a secondary Discourse is arrived at only by way of the primary one. If teachers are to understand and appreciate students as fully able communicators, then responsivity is important to build into a model of communication.

Another side of responsivity is that it frames language events as essentially historical. For teachers and students to understand that utterances obtain meaning through the long line of utterances that came before is to open up the act of teaching to historical scrutiny. Bakhtin (1981) is emphatic on the point that much is available to be read into language utterances:

> All words have the "taste" of a profession, a genre, a tendency, a party, a particular person, a generation, an age group, the day and hour. Each word tastes of the context and contexts in which it has lived its socially charged life; all words and forms are populated by intentions. (p. 293)

This is a potentially powerful view of language for developmental education. When communicating the expectations of the secondary discourse, for example, teachers need to hear the many utterances of past years that reside within those expectations. In the field of writing, it would involve the repeated statement of rules for correct language use as announced by speakers able to define it for others, for example. From the student perspective, it might involve the confusion, anger, and resentment over past exclusionary educational practices, whether through explicit utterances of the past or through silences that speak as loudly. Such deep reading into the significance of particular utterances is not beyond what Bakhtin theorizes as the full, and really limitless, range of social factors that lie behind an utterance.

Conclusion

Bakhtin's model of communication enables developmental education practices to be conceived as more fluid, layered acts. Assumptions of an always-active communication network and a deep social significance encourage and facilitate the act of acquiring new Discourses. Although much more could be drawn from Bakhtin's theory and applied to the model, the basic design of the model demonstrates its usefulness to developmental education theory.

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Developmental Writing Instruction: The Intersection of Basic Writing, ESL Writing, and Traditional College Composition

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Basic writing programs as well as English as a Second Language (ESL) writing programs are increasing in number at state colleges and universities throughout the country. Freshmen who enter composition classes in these programs have received little attention in research compared to traditional freshman writers. Students in developmental writing programs are frequently assumed as having to acquire academic skills that traditional college freshmen students already have mastered. However, by stressing basic writing skills, we may end up doing these students a disservice in their academic writing development by removing them further from traditional freshman writers, which is the exact opposite of the ultimate purpose of basic and ESL writing programs. The composition skills needed to communicate effectively in an academic context are acquired slowly through acculturation, which is a process that is likely to be very similar for all freshman writers.

One of the major problems in the field of college composition and academic writing in general is that English as a Second Language (ESL or L2) composition and native English freshman composition (first language or L1) traditionally have been treated as two entirely separate fields of ideology, pedagogy, and research. Additionally, L1 college freshman composition has recently divided into the sub-areas of traditional college composition and developmental or basic writing. This development is partly due to the current influx of less traditional college students entering the academy and needing to learn how to participate in academic written discourse. Traditionally, English (L1) composition has been associated with typical English studies involving literature and traditional rhetoric, whereas ESL (L2) writing has been part of applied linguistics, accommodating itself to the prevailing standards of research in that field (Santos, 1992). However, in the cross-cultural context of the English language, we cannot afford to keep these areas so sharply divided in the college composition classroom, and it may be that we need a consensus about how to approach the teaching of English composition cross-culturally, whether that is L1 or L2 (Connor, 1996, 1997; Larsen, 1997; Lisle & Mano, 1997; Santos, 1992; Severino, 1997; Smith, 1981; Sternglass, 1998). In short, although composing and second language acquisition usually are considered two separate fields of research and pedagogy, they will have to merge for teachers and learners of English composition in the college classroom (Raimes, 1985, 1987).

This chapter will synthesize some ideas from traditional theories of rhetoric and college composition, as well as contrastive rhetoric and the acquisition of secondary academic discourses, and discuss how we possibly, through the intersection of these areas, can bring together the fields of traditional composition, basic or developmental writing, and ESL writing. These sub-areas of writing and composition research have been treated too exclusively—almost as entirely different fields. However, the current focus on language as communication should bring the study of rhetoric and traditional composition closer to both ESL writing and basic writing. This should be the case as communicative competence in a given language, or language variety for that matter, involves social and cultural skills as well as traditional linguistic skills (Prior, 1998; Sternglass, 1998). For this purpose a certain knowledge of the theories behind such concepts as culture, reality, and audience seems important in all sub-fields of writing instruction. Within traditional rhetoric studies language is universally acknowledged as an ambiguous system, which is not surprising given the interactive relationship between culture, language, and rhetoric.

This chapter will by no means attempt to provide an ultimate explanation or conclusion as to how the study of rhetoric and the teaching and learning of traditional composition, basic writing, and ESL writing are related. It will, however, offer some views on how different theories of rhetoric can be used successfully in writing instruction in all these areas. In other words, the very common and much debated theory of contrastive rhetoric, an ESL writing stalwart, can and should successfully merge with the more traditional rhetorical theories of L1 composition research for the benefit of the field of college writing in general (i.e., traditional freshman composition, basic writing, and ESL writing). Ultimately, the convergence of these subfields seems only a natural development given the status of English as the world's lingua franca for international and cross-cultural communication.

Troyka (1987) has bemoaned the fact that basic writers have been overlooked in college composition research, and it seems that the same can be said of ESL writers (Kim, 2000; Raimes, 1991). Troyka (1987) partly attributes this to the fact that these groups represent a nontraditional population of college students. However, with the surge of interest in and need for developmental programs at state universities, whether it is basic writing or ESL, this population now constitutes a very large part of the total number of freshman composition students, and therefore it is important to explore whether these students have similar problems and concerns in the acquisition of academic writing skills (Kim, 2000). Consequently, composition instructors need to consult a broad spectrum of the literature and research in order to fully explore the issues related to the intersection of traditional college composition, basic writing, and ESL writing. This will involve research on contrastive rhetoric and ESL writing (L2 context), as well as traditional rhetoric and its influence on native English college composition, and especially how it affects the recently emerged basic writing (L1 context).

Rhetoric and Contrastive Rhetoric in Writing Instruction

We know from previous research within the field of contrastive rhetoric that different languages and cultures exhibit a range of rhetorical styles and structures for presenting ideas in writing (Connor, 1996, 1997; Grabe & Kaplan, 1989, 1996; Kaplan, 1966,

1987, 1988). Some awareness of such rhetorical differences is important and valuable for any composition teacher. Professionals within the area of ESL teaching are likely to be familiar with the characteristics of different rhetorical patterns of composition, dominating in different cultures, which were first identified by Kaplan (1966) more than 30 years ago. Those patterns seemed to convince teachers and researchers that there is such a thing as "second rhetoric acquisition" involved in the process of learning to write in a second language. But at the same time, literature on World Englishes (Kachru, 1984, 1990; Smith, 1981) has presented a different perspective on the issue of contrastive rhetoric and ESL writing as well as L1 English composition. Seen in the light of English as the world's lingua franca, it might be that we should start considering the entire field of composition, L1 and L2, as much more integrated. English is in the process of becoming "deethnicized" and "denationalized," and this seems a very important aspect to consider in composition research, as this deethnicization is likely to influence both research and teaching on ESL writing and native English writing (Loveday, 1982).

Consequently, such knowledge of different rhetorical patterns should not be limited to differences between languages. This can be illustrated by Gee (1996), for instance, who has argued that secondary discourses within the L1 can present just as many obstacles and complications for students as can second language differences. Gee defines secondary discourses as "those [discourses] to which people are apprenticed as part of their socializations within various local, state, and national groups and institutions outside early home and peer-group socialization" (p. 137). According to Gee, these secondary discourses are often the more formal ones, such as the ones required in academic settings, and consequently also college composition. This view is supported by Geisler (1994), who has stated that academic fields usually move student writers away from their "home culture toward the more formal culture of the Academy" (p. 168). As many basic or developmental writers often are referred to as latecomers to academia, they will need training in such formal second discourses, much like the ESL writer will need training in the second language.

These are important issues with which many researchers in the basic writing field find themselves wrestling today. As a matter of fact, as early as 20

years ago, David Bartholomae (1980) went as far as to compare basic writers with second language learners in the way that they can be considered to be at a certain stage on the interlanguage continuum. This theory is supported by Lisle and Mano (1997), who have argued that distinctions traditionally drawn between ESL students, speakers of nonstandard English, basic writing students in general, and more traditional college composition students are inadequate and much too simplified. These distinctions are too simplified because even monolingual native English speaking students use a "contact variety of English" (p. 13) that does not necessarily work for academic purposes. Consequently, most freshman student writers, regardless of background, share the process of acquiring a secondary discourse for academia or academic culture.

At the same time, Connor (1996) has stated that as the globalization of discourse patterns occurs, composition teachers and researchers should learn more about levels of adequacy and acceptability of both first and second language writing and the inevitable intersection of these two areas. Contrastive writing research will benefit extensively from the insights of researchers of cross-cultural English, regardless of whether that is between languages or between different social or cultural groups within the same language. Many researchers and scholars (Connor, 1996, 1997; Kachru, 1984, 1990; Leki, 1997; Silva, 1997; Smith, 1981) have argued that more of this kind of cross-cultural composition research on expository, argumentative, and persuasive styles is needed on a larger scale, in order to possibly be able to define what is an appropriate goal for written English composition for cross-cultural academic purposes. This may also help foster a general or universal acceptance and understanding of multiple or alternative rhetorics and culturally different rhetorical styles.

Contrastive Rhetoric and the College Composition Classroom

It is by now a generally accepted fact in cross-cultural composition research that the writing of a non-native speaker can present a different rhetorical pattern from traditional English prose. As rhetoric is a mode of thinking for the achievement of a designated end, it is concerned with what goes on in the mind in terms of analysis, data gathering, and interpretation, and therefore rhetoric is predetermined to a certain degree by norms and values, which may appear differently in different cultures (Connor, 1997; Kaplan, 1966, 1987). In other words, it is the writer's frame of reference that determines what is written down on the paper in a composition situation.

Kaplan's (1966, 1987) ideas, it should be mentioned, have been widely contested and debated, although their influence and importance in taking contrasting analyses from the sentence level to the more universal paragraph and full text level cannot be underestimated. For example, one of the criticisms of contrastive rhetoric has been that Kaplan's identification of discourse patterns in different cultures could seem somewhat ethnocentric, as it was based on Western or American rhetorical patterns as the norm. However, most of the criticism explains that it is not the theory itself that should be contested, but rather the way it often has been misinterpreted by language and writing teachers (Leki, 1991). For example, Raimes (1991) and Connor (1996) have argued that Kaplan's initial or original theory of contrastive rhetoric erroneously made teachers infer that transfer from a first language usually was a negative influence on second language writing, which is not necessarily always the case. As Connor (1996) argues: "It is time to analyze the achievements of contrastive analyses of composition in order to determine its universals as well as its cross-cultural particulars" (p. 6).

With above implications in mind, it seems most valid that Loveday (1982) has called for a degree of mutual tolerance and willingness to accept different rhetorical patterns. This is supported by Raimes (1991), who has stated that with both native and non-native English composition, we will have to stop and question "the value of prescribing one form of text . . . as the one privileged form of text, presented as the most logical and desirable, with which other learned systems interfere" (p. 418). We may need to move away from composition as colonization and recognize the value of the alternative rhetorics that non-native English writers and other culturally diverse students may bring to the college composition classroom and not "treat them only as features that interfere with effective communication" (Raimes, 1991, p. 418). Lisle and Mano (1997) also champion this view, and go on to say that even though we may already have acknowledged the new multicultural and multiethnic background of our students, and consequently a similar multicultural na-

ture of rhetoric and composition, there seems to be a gap between professional talk and professional practice—the practice being what goes on daily in the composition classroom. According to Lisle and Mano (1997) "most composition and rhetoric instruction remains monologic and ethnocentric" (p. 12), mostly because the majority of rhetoric textbooks still ignore the interests or even existence of culturally diverse students.

Furthermore, second language writers are often told that the problem with their writing is that it is "out of focus," "lacks organization," or "lacks cohesion," as they simply violate the expectations of a native English speaking reader (Kaplan, 1966, p. 45). These are phrases originating in the initial theory of contrastive rhetoric, but given the complications discussed above, the problem facing an updated or more current theory of contrastive rhetoric, then, is to question who exactly this native English speaking reader is. It seems that such a reader too often is assumed to be a representative of the Anglo-European majority culture of the academic world, most often because, as Lisle and Mano (1997) point out, the majority of rhetoric and composition textbooks "uncritically endorse familiar Euro-American rhetorical conventions. Although they demonstrate a desire for fresh approaches, they seem trapped by tradition, failing to address the serious challenges that ethnic diversity poses to our assumptions about language and rhetoric" (p. 13). As a consequence of this national and ethnic diversity of logic and language, Prior (1998) calls for more research in the world of academic writing that provides "close attention to, and progress in, studies of communication, discourse and rhetoric" (p. 3).

In fact, all this can be linked with Linda Flower's (1992) comments on writer-based prose. She has noted that although student prose may often be inadequately structured for the reader, it does possess a logic and structure of its own just like composition in different languages and different cultural contexts. This structure serves important functions for the writer's effort to think about a subject—a strategy for dealing with information. Flower (1992) concludes: "If we could see writer-based prose as a *functional system*—not a set of random errors known only to English teachers—we would be better able to teach writing as a part of any discipline that asks people to express complex ideas" (p. 23). Exactly the same can be said about recognizing cultural differences when teaching composition in a second language or basic writing setting.

If we bring together all the aforementioned views and comments, it seems that if we as writing instructors and researchers strive toward promoting a more common knowledge of contrastive rhetoric within the general field of composition, and not only among those concerned with ESL writing, we may become more effective in closing this gap between professional talk and practice (Lisle & Mano, 1997). At the same time, it is important to remember that contrastive rhetoric is not a methodology for teaching, although some of its findings can be applied to the teaching process (Grabe & Kaplan, 1989, 1996; Kaplan, 1988; Leki, 1997). Indeed, with the increasing number of international and culturally diverse students enrolled in American colleges, and the increasing number of all students regardless of culture, taking part in academic discourse communities in the cross cultural context, it is equally important for the teacher of L1 English composition courses, as it is for the ESL (L2) teacher to be aware that different rhetorical structures and styles exist.

In the final analysis, contrastive rhetoric can serve as a reminder to writing teachers that what seems to be perceived as inadequacies in a student's writing performance simply is a result of coming from a cultural tradition that is not rooted in what most of the time is considered appropriate academic discourse by the dominant culture. In order to address this problem, Lisle and Mano (1997) have suggested that we work on finding approaches to composition instruction that emphasize the cultural knowledge that diverse students bring with them to the university.

Contrastive and Traditional Rhetoric: Applications in ESL Writing and Basic Writing

Sandra McKay (1992) has stated in the introduction to her book, *Composing in a Second Language*, that part of the problem of teaching composition in general, and ESL writing in particular, is due to the lack of consensus of what composition actually is, which is something that researchers of basic writing (L1) often find themselves debating as well (Bartholomae, 1993). Recurring terms such as "thinking process," "style," "organization," and "form" reflect the complexity of the process of composition (McKay, 1992, p. vii). Current research that has been

focusing on writing as a dynamic and recursive process involving activities such as generating ideas, planning, evaluating, and revising is interesting the cross-cultural and ESL context as well as in a basic writing context, as there certainly are cultural differences in how individuals go about these tasks—both between languages and between different cultures within the same language. In the basic writing field this becomes an issue as well because we often will find classrooms including a wide variety of cultures although the students may, or may not, share English as their first or native language.

In any event, a shared knowledge of rhetoric and writing seems to be fundamental for success in an academic writing situation, and the more that can be learned about cultural differences as well as language and dialect differences, the more effective we can be as writing teachers. The necessity of such knowledge can be illustrated by Leki (1995), who has pointed out that not only writing teachers, but even more so subject area teachers, show a disturbing degree of confidence in the universality of their judgments of ESL student writing. According to Leki's (1995) research, most instructors seem to believe that their definition of good writing represents the norm for the entire academic community, and very often that norm has to do with the correctness of form and grammar rather than content, development, and support of ideas. Consequently, Leki (1995, 1997) calls for a need for more faculty awareness of different student backgrounds and differing assumptions about writing that faculty are likely to hold. With such awareness will come a better preparation of students and their writing in academic contexts, which is essential with the increasingly diverse college student population, including ESL writers and native English speaking, culturally diverse writers. Leki's point is very similar to Sternglass' (1998) lament that writing instructors frequently have preconceived opinions about the so-called basic language skills of second language and second dialect college writers, and therefore, in teaching these students, end up paying more attention to language technical skills rather than content in their writing, which is a disservice to the students.

This is where some knowledge of contrastive rhetoric could become a very important and useful tool for any writing teacher, although currently almost exclusively ESL teachers seem to be familiar with such research, which is unfortunate. Connor (1996) has acknowledged that "contrastive rhetoric research owes much of its current revival to the important role that the teaching of writing plays in undergraduate education in colleges and universities in the United States" (p. 59). The teaching and research of composition at the college level have simply helped transform contrastive rhetoric, and this has begun to make it more visible for other researchers and professionals, not only those concerned with ESL (L2) writing.

Furthermore, given that the importance of traditional rhetorical theories in relation to ESL writing has generally received very little attention, and seen in the light of the new cultural diversity of college composition discussed above, it seems relevant to consider traditional rhetoric and contrastive rhetoric together in college composition instruction for the benefit of both L1 and L2 developmental writing. Berlin (1984) has stated that for effective composition and communication to take place a writer must have reasonable social control over the language in use, which is often just as much an issue for a native English speaking, academic newcomer (i.e., new to the college community and discourse) as it is for an ESL writer (Sternglass, 1998).

At this point, I would like to turn the above discussion of contrastive rhetoric around and suggest that in order to successfully incorporate theories of contrastive rhetoric into the broader field of writing instruction, we need to look at it not as an alternative, but rather as a supplement to more traditional theories of rhetoric. As a starting point here, I am reminded of James Berlin's (1984) views on the concept of "reality." He states that "[e]very rhetoric has its base in a conception of reality, of human nature, and of language" (p. 1). Rhetoric is, he continues, ". . . ultimately implicated in all a society attempts. . ." and, moreover, ". . . it is the center of a culture's activities" (p. 2). If this is the case, one would think that academic writing would create quite a few problems for a basic writing student who has to wrestle with this new academic culture and learn to create the type of discourse deemed appropriate in such a setting. The world consists of numerous different cultures, which consequently would have as many different rhetorics, which again would lead to almost just as many realities. These realities and rhetorics, then, are something to be aware of in both the ESL classroom, which seems

to have been the case, and the basic writing classroom, which seems to *not* have been the case. This is exactly where knowledge of contrastive rhetoric gains its importance and can expand into native English composition. Prior (1998) also has acknowledged this by stating that it is important for any student writer to become aware of social, cultural, and historical conventions of written language that may vary from context to context. In the final analysis rhetoric can be paralleled with communication, which in turn links up with the current emphasis on communicative competence in second and foreign language teaching and learning. Again, this focus on communicative competence could successfully be expanded into the basic writing classroom.

Perelman (1982), another rhetorician, has argued for a "new rhetoric" (p. 45) acknowledging and stressing awareness of different rhetorical styles in communication and argumentation, whether these are between cultures or academic disciplines. As teachers we should practice this awareness in the composition classroom. Consequently, Perelman's new rhetoric argument seems to further emphasize that it is important to bring ESL and English L1 composition closer together, as both are concerned with communication through writing. As argued by Connor (1996), classical, traditional rhetoric has "given researchers and teachers tools for analyzing invention and text strategies of persuasion and argumentation cross-culturally, with the 'new rhetoric' providing a focused examination" (p. 64). All this seems important in considering L1 and L2 college composition as two parts of an integrated whole, and crucial for the teaching profession to deal with when discussing and researching the problems and concerns novice writing students may have.

The Composition Curriculum: Teaching and Assessment in ESL Writing and Basic Writing

In order to fully explore the intersection of L1 and L2 developmental composition, it is important to consider the curriculum within these two sub-fields of writing instruction. Given the above discussion of research on contrastive rhetoric and literature on composition and traditional rhetoric, it seems inevitable that we also try to integrate L1 and L2 writing in terms of the curriculum.

Curriculum Content and Pedagogy

Unfortunately, most research on curriculum making and pedagogy within the field of writing has followed the same trend of treating L1 and L2 writing as almost mutually exclusive. At the same time, the terms curriculum making and pedagogy within the general field of education sometimes seem to have been considered too much as separate entities in terms of theory, practice, and research. Doyle (1996) has stated that "the meeting point between these two domains has always been somewhat fuzzy" (p. 486). He attributes this partly to the fact that the terms are associated with separate phenomena: "curriculum making" specifies *what* is to be taught, content selection and arrangement; whereas pedagogy generally refers to the human interaction during actual teaching or, in other words, the *how* of instruction. As a result of this distinctiveness, Doyle (1996) asserts that much work and research "within each domain has gone on as if the other did not exist" (p. 486). However, it seems essential that we find a common ground for curriculum making and pedagogy in L1 and L2 college composition given the convergence of skills needed in both.

Alderson, Clapham, and Wall (1995) have stated that validity and reliability should be among the overarching principles when we are designing a way to teach and assess our language learners and their writing. In terms of assessment it would be safe to say that essay writing will almost always present itself to be one of the most subjective areas of instruction. It is often the responsibility of the teacher to clearly state what the requirements and objectives are in different writing assignments, and hopefully this will minimize students' confusion about what is expected in terms of their academic writing performance. However, very little research has been addressing how expectations of form and content are communicated between teachers and students (Prior, 1998). In these terms, the tasks of the ESL student writers should not be significantly different from those of native English speaking college composition students, whether these are basic writers or not. Almost all writing students will have to face the fact that composition to a large extent is much more subjective than their calculus or geography class. For instance, one consequence of this subjectivity is that the freshman writing instructor teaching basic writing or ESL should be able to take a more significant role as a curriculum maker than other

teachers. In the classroom, this would mean that the writing teacher should not only partly control the *how*, but also a good slice of *what should* be taught, and consequently should create a healthy fusion of the curriculum and the classroom pedagogy.

All this corresponds well with Clandinin and Connelly (1996), who have stated that college teachers have more autonomy and "influence over their work and course design" (p. 385) than teachers on other educational levels. College composition certainly is no exception. However, Alderson et al. (1995) bring up a point that may lead us to believe that this fusion will not work as well when we are talking about college level ESL writers. They state that the problem is that ESL writers may have difficulties with the conventions of technical use of such words as "discuss" or "illustrate," which are commonly used terms in assignments for college composition classes. Therefore, we need more rigid attention and set goals for working with vocabulary items and other technicalities when teaching ESL writing (Alderson et al.). Although it is true that while evaluating ESL student writers, we need to make sure they know what these terms involve, it is very likely that L1 basic writing students often have similar difficulties with such terms.

Many native English speaking students come out of high school and have never had to do much essay writing, much less had to deal with what it means to "discuss" or "reflect" on a particular writing prompt; these terms represent to them an unfamiliar academic discourse. For example, I continuously have to stress to my basic writers and regular freshman composition students what these terms mean and what is expected in such an assignment. On the other hand, I have often had ESL students with fairly extensive writing experience in their own language who would have no problems with the terms, as long as they knew the actual lexical translation, simply because they had developed some academic skills in their native language or culture. So, in that respect, it seems that the novice composition students are very similar regardless of whether they are regular L1 college composition students, basic writers, or ESL writers. Consequently, what happens in the writing classroom for all these groups of students should not be significantly different. In short, the research and the shaping of the writing curriculum and the pedagogy should be considered very similar for all these college composition learners.

Additionally, ESL students often may have to face other, more program-specific complications. In order to illustrate this further and show how it relates to the intersection of research, curriculum making, and pedagogy for within any type of college writing, I will draw on some of my experiences in the Intensive English Program at Southern Illinois University (SIU), especially the part of the program called English for Academic Purposes (EAP), which is the last step in the program before the students enter regular credit bearing courses. Looking at Doyle's (1996) definitions, the curriculum or content in this program has already been strictly written out in the program handbook. The positive aspect of this practice is that it at least ensures some kind of plan or general standard according to which the students' writing will be assessed. However, the written products of the students are graded analytically according to a very rigid scale, as opposed to holistic scoring, which is the norm in most L1 college composition including basic writing. This assessment, then, is instrumental in deciding whether these ESL students are ready to move on to regular L1 composition classes. Although holistic scoring may be questioned in terms of its validity in ESL writing (e.g., Tedick & Mathison, 1995), it seems that such inconsistency in using analytic and holistic scoring in ESL and L1 writing respectively does not allow the ESL writing teacher the same autonomy and flexibility in both the content and the process as the L1 writing teacher, which in turn may constitute a disadvantage for the ESL writer compared to the L1 student writer.

One of the main reasons that the ESL program at SIU and most other programs like it tend to have stayed this rigid for so long is probably the influence of the ESL writing textbook. There is a plethora of textbooks on how to organize and structure ESL composition classes, and they all address issues that they consider are important for ESL writers. Most of them end up focusing heavily on a rigid structure and organizational issues (i.e., the somewhat outdated five paragraph essay) as well as sentence level problems rather than higher order skills that are generally recognized by the L1 writing field as necessary for effective college composition. It is common for an ESL writing program to adopt one of these textbooks and base the curriculum of its writing course on it.

On the other hand, most traditional L1 college composition programs are de-emphasizing rigid structure and sentence level issues in writing, and tending to

focus more on critical thinking, involving issues such as stating and developing arguments and using supporting details. L1 basic writing seems to be split between a rigid structure similar to ESL writing and the more progressive approach of traditional college composition. In any event, in an approach emphasizing content, development, and critical thinking, the teacher is left with more freedom to choose a thematic direction of the course and use this to select a textbook, which often is an anthology containing a number of readings concerning the course focus. Through this critical reading of texts, the teacher is allowed more flexibility in terms of writing specific content for the course and consequently is much more in charge of his or her own curriculum in the writing class. There still are some overall curricular issues to address, but the teacher and the students avoid the confining feeling that Venezsky (1996) refers to when discussing a "*prescribed curriculum*, which is textbooks and other curricular materials that define or prescribe not only the content of courses but also the sequence of topics and quite often the pedagogical strategies to employ in teaching them" (p. 439). Such a strategy does not leave the class or the teacher with room for much creativity in the learning situation. Unfortunately this may still be the case in some basic and ESL writing programs.

The Importance of Higher Order Skills in Composition

The bottom line is that whether we are talking about ESL writing students or students with English as a native language, we will always have to make sure that the learners know the requirements of a writing assignment and that they possess the background knowledge needed to complete it. However, by having the background knowledge come from within the composition class, it becomes easier to control and assess writing only, and consequently it also leaves the teacher more in control of the writing class curriculum. At the same time, the more holistic view of writing assessment in regular L1 composition classes seems to call for more individuality and creativity in the students, which tends to help the learning process as they are actively involved in it and are encouraged to think critically about content. In his discussion of curriculum and pedagogy Doyle (1996) touches upon this issue when addressing the importance of tasks in the classroom (i.e., immediate interpretative demands):

[T]asks frame both pedagogy and curriculum…if, for instance, a teacher asks higher order questions during class discussions but holds students accountable in written work only for knowing definitions of key terms, it is unlikely that students will, over time, pay much attention to classroom discussions. (p. 504)

As a result of the reliance on textbooks and rigid structure of composition, it seems that, in many instances, higher-order thinking is left out of ESL writing classes (Raimes 1991), and according to Sternglass (1998) often also basic writing classes, whereas the freedom allowed teachers in traditional or regular L1 composition classes promotes higher-order skills and critical thinking, and therefore provides a healthier, and maybe more effective, learning environment. For the same reasons, then, it seems that the ESL writing teacher becomes more of a curriculum consumer, concerned only with pedagogy, whereas the regular L1 composition teacher becomes a curriculum maker, concerned both with shaping the curriculum and with classroom pedagogy; and worse yet, L1 basic writing teachers may find themselves somewhere in between these two extremes.

In 1860, Herbert Spencer argued that children and students "should be *told* as little as possible and induced to *discover* as much as possible" (as cited in Pinar, Reynolds, Slattery, & Taubman, 1996, p. 73). What Spencer argued about curriculum making and pedagogy some 140 years ago is still a progressive idea and should be an important issue in the field of college composition, regardless of whether for traditional L1 college composition, basic writing, or ESL writing. College composition instruction should end up being very much on a trial and error basis: learning by doing. The instructor should take more the role of a coach or tutor who is guiding the students through the acquisition process—rather than correcting the students and determining or dictating their learning process. This should also enhance student motivation as the learning process will seem more applicable to each student's own individual situation and therefore improve the outcome. However, the continuous rather rigid outlook of many ESL composition and some basic writing courses seems to put these writing students at a disadvantage by not providing these opportunities to the same extent that they are provided for regular composition learners.

However, recently we have been seeing scholars and researchers of L1 basic writing focus more on overall global skills in writing instruction. Bartholomae (1993), for instance, has emphasized the importance of the integration of reading and writing skills in order to develop the critical thinking and reflection that is necessary for successfully performing the type of academic writing and discourse that is required on the college level. Bartholomae's philosophy is, basically, that a course in writing is a course in reading and vice versa, which means that students should learn how to work on what they read through writing. His premise is that students may show reluctance and uncertainty in talking about and reacting to what they read, but when teaching written composition, our aim should be coaching students in these tasks, and thereby helping them develop as writers and critical readers and thinkers.

As a result, critical reading further becomes a focus of academic writing instruction through presenting students with challenging texts in order to empower and provide them with the tools necessary for analyzing and responding to what they read. Bartholomae (1980, 1993) holds that instead of focusing on writing in isolation, we should make it an issue to have the students read a lot, not only concentrating on what our students read, but focusing more on what they can learn to do with what they read in terms of producing their own argument and reactions, and reflecting on it in writing. This view is also reflected in much of the empirical research done with basic writers in recent years, and Schriver (1992), among others, has called for scholars to conduct more research on the thinking processes and experiences of student writers and readers in cultural contexts. At the same time, both Prior (1998) and Sternglass (1998) remind us that composition instruction and academic writing should not be looked at in a vacuum. Freshman writing instruction should rather be considered an important step in helping these students acquire academic discourse—parts of a learning, acquisition, and enculturation process into academia that takes time. This approach to writing instruction can be further illustrated by Gee (1989), who has stated that "discourses are not mastered by overt instruction, but by enculturation (apprenticeship) into social practices through scaffolded and supported interaction with people who have already mastered the discourse" (p. 7).

According to Bartholomae (1993), basic writing students have been short-changed, even though there seems to be a current interest in the field of developmental education. He calls for a need to define exactly what kind of phenomenon the designation basic writing represents, rather than just consider it a course of instruction. Bartholomae (1980, 1993) and Shaughnessy (1976) hold that we simply know too little about the students who are placed in such classes and programs: we know little about their performance as writers, we know little about their prior experience, and preciously little about how they themselves experience their basic writing classes. Teachers just assume that basic writers fail to perform effectively what other conventional freshman writers are successful in doing. We need further details on their supposed lack of success in academic writing.

Additionally, in composition research, both Bartholomae (1980) and Williams (1981) have lamented the early over-emphasis on mechanical and grammatical correctness and "error hunt" that often seems to occur in writing instruction in high school English classes, as well as in developmental writing classes in college. By reducing student writers to working with isolated sentence level issues, we neglect the fact that these students bring with them diverse experiences that can help them develop academic writing skills, and much the same can be said about ESL writers (Leki, 1995). In other words, a preoccupation of teaching sentence level skills will most likely only stifle and alienate these students further in their acquisition of critical writing and thinking skills (Kim, 1997; Williams, 1981), as it does not help them develop the language of written academic discourse. As a result, college freshmen often exhibit limited confidence in terms of their writing skills.

The problem with this type of practice has been expressed by Perl (1979), who has stated that students will begin to "conceive of writing as a 'cosmetic' process where concern for correct form supersedes development of ideas. As a result, the excitement of composing, of constructing and discovering meaning, is cut off almost before it has begun" (p. 333). However, if we in developmental writing classes (basic as well as ESL writing), focus on critical thinking skills as a tool for these students to reflect on the extensive and diverse experiences they bring with them to their college classes, we should be able reinstate the excitement of composing into these students. Consequently,

their awareness of academic writing standards can be developed through their own experience, which is likely to be more effective than trying to teach the students narrow technical skills.

These ideas can be further illustrated by Yeh (1998), who talks about student writer empowerment through acknowledgment of different cultural and social backgrounds of students in academia. When sociocultural issues are taken into account, it becomes clear that isolated sentence level instruction and grammatical drilling and exercises will not be sufficient for the successful learning or acquisition of academic writing.

This is similar to ESL learning, where attention to cultural and social issues is essential for the ESL learner in order to acquire the necessary skills to perform and communicate academically in English. In fact, Johns (1995) credits the emphasis on communicative competence within the ESL writing field to the process movement in the general field of college composition, as this process approach has helped steer ESL pedagogy and research away from looking at academic writing as merely an afterthought in the teaching of reading and spoken language into becoming a separate and legitimate field that may hold similarities with the general field of college writing involving both L1 and L2. If we look at college writing in this more global context, mastering the discourse of academic writing as well as *writing in context* will essentially be the same as gaining *communicative competence* in that particular type of discourse.

Summary

An attempt to combine research in traditional rhetoric and L1 composition with research in contrastive rhetoric and L2 composition will benefit all subfields of college writing instruction, especially developmental writers in basic and ESL writing programs. The composition skills needed to communicate effectively in an academic context should be acquired slowly through acculturation (Sternglass, 1998), which is a process that is likely to be very similar regardless of whether we are dealing with basic writers or ESL writers. Bringing L1 and L2 writing instruction and research closer together this way should also help us move toward some kind of standard or consensus for teaching written English composition in academic and cross-cultural contexts. Early research within the field of English college composition was almost exclusively devoted to examining products and processes of native writers, but with the current intercultural outlook of the English language, we will have to take second language and "second culture" writers further into consideration in future research.

With all these implications in mind, it seems inevitable that there also is a need for bringing the requirements, curriculum, pedagogy, and assessment of ESL writing and native English college composition in better synchronization with each other. In her chapter on "Recommendations for Instruction," Sternglass (1998) emphasizes that acculturation to academic writing conventions takes time, and early instruction is crucial. Consequently, it is naive to believe that we can turn students into finished writers in the course of a freshman writing class or class sequence of a semester or academic year, regardless of whether we are working with traditional students, basic writers, or ESL writers. The acculturation process could take several years, which means that composition instructors can only initiate the process by providing the students with tools for future use. Such tools should involve critical reading and critical writing immediately from the beginning of this process. For that end, Sternglass (1998) argues that "students in basic writing classes . . . should not be treated differently from students in so-called regular composition classes . . . all students should be exposed to the challenges central to their development as thinkers and writers" (pp. 297-298). This, among other things, means that no students should feel that they are in a particular writing class because they lack the basic skills that other students may have.

As Williams (1981) has argued, writing teachers tend to categorize developmental writers as a group of students who simply need help in overcoming mechanical and grammatical errors and improving their language use and vocabulary. By reducing basic writers and ESL writers to working with these isolated issues, we neglect the fact that these students bring with them diverse experiences that can help them develop academic writing skills. Urzua (1987) has expressed similar concerns and concluded that when ESL students were given more freedom and control over their writing topics and learning to communicate content, their voices came through more strongly and the writing became more effective on all levels from content

and development to grammar and other surface structures (see also Savignon, 1983). In other words, it seems the tendency is to emphasize higher-order skills such as critical thinking, content, and student experience in traditional freshman composition classes, but when it comes to basic writers and ESL writers, we may tend to get preoccupied with teaching more basic, technical writing skills on the sentence level, which is likely to alienate these students further from academia, as it does not help them develop the rhetorical language of written academic discourse (Kim, 1997; Sternglass, 1998; Williams, 1981).

In short, through this type of disservice, we may be separating and removing developmental writers (L1 basic writers and ESL writers) further from traditional freshman writers, which is the exact opposite of the ultimate purpose of basic writing and ESL writing programs.

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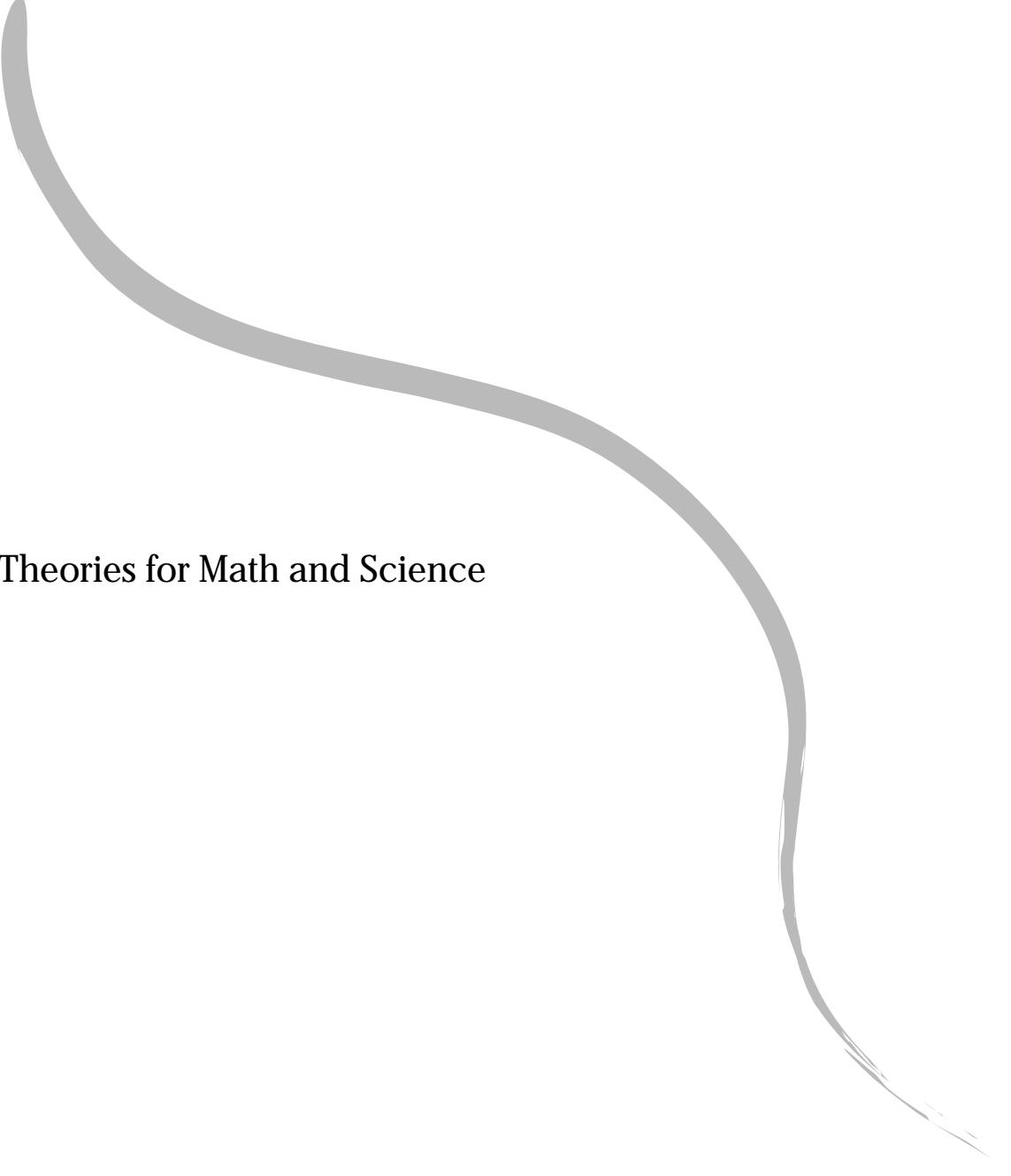
Theories for Math and Science

New Directions in Science Education for Developmental Education

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Despite decades of reform, science remains a hostile neighborhood for most students in developmental education. To remedy this, and thereby increase the number of students considered to be the "best and brightest," I propose that science instruction move from objectivist teaching to constructivist learning by changing what and how science is taught. These changes include (a) emphasizing discovery-based activities; (b) supplementing discovery-based instruction with tutoring, cooperative learning, and interactive learning; (c) addressing the social and cultural aspects of science; and (d) emphasizing communication skills and multiple ways of learning. These changes will increase the success in science by all students, especially those in developmental education.

Throughout the past century, science education has been repeatedly "reformed." For example, following World War I, science education was reformed to help students participate more effectively in democracy. Many of the most popular science textbooks of that time, such as George Hunter's (1914) *A Civic Biology* (the textbook made famous by the Scopes "Monkey Trial"; see Moore, 1998a), had titles that emphasized the connection of science with society. Ironically, few people noticed that this goal—that is, helping people participate in government—was denied to many disadvantaged students, ethnic minorities, and women.

The next wave of science education reform was triggered by the Soviet Union's launch on October 4, 1957, of Sputnik I, the first orbiting artificial satellite. This event announced to America that nature's secrets—unlike political secrets—could not be concealed and that the United States had no monopoly on the laws of nature. Worried that the United States could not compete in a technology-based world (Gabel, 1994), policy-makers spent millions of dollars to put science education back in the hands of scientists. Much of this effort involved sending thousands of high school teachers to universities for graduate degrees and summer training, as well as hiring scientists to develop curricular materials to equip teachers with the latest scientific information (e.g., the Biological Sciences Curriculum Study; see Majumdar, Rosenfield, Rubba,

Miller, & Schmalz, 1991; Moore, 1998b). Funding for science increased dramatically as science became increasingly popular; thousands of students wanted to be scientists and astronauts. However, science also became very competitive; challenges such as "Are you good enough for science? If so, you may be good enough for NASA!" became common. Teachers began to select the "best and brightest" students, but paid relatively little attention to the individual needs of students or the social constraints of science and teaching (Hurd, 1970). Many students—especially women, ethnic minorities, and those from financially disadvantaged backgrounds—continued to be denied access to science and the benefits of reform (Anderson, 1983).

In the 1980s, students' poor scores on standardized tests again caused policy-makers to worry if the United States could compete in international markets (Education Commission of the States, 1983; National Commission on Excellence in Education, 1983). The resulting wave of science education reform focused on educational standards and teacher preparation (Hurd, 1983) and ultimately led to programs such as *Science for All Americans* (American Association for the Advancement of Science, 1989). *Science for All Americans* described skills that all students should possess such as an understanding of the key concepts of science, a familiarity with the natural world, an understanding of the interdependency of science and technology, and the ability to use knowledge and skills

to enhance the quality of one's life. In most cases, however, "all Americans" continued to exclude students in developmental education programs.

More recent attempts to reform science education have involved "systemic reform" aimed at producing "a coherent system of curriculum controls" (Fuhrman & Malen, 1991, p. 244) that emphasize standards for teaching and learning science. When these programs were implemented, many educators hoped that the much-publicized "science education crisis" had been addressed. As in the past, however, those hopes were largely unfounded, for today's "college science courses [remain] notorious for poor teaching," and "the vast majority of college students are not ... learning science" (Leonard, 2000, p. 386; also see Lord, 1994; Seymour, 1995). Although science can be an attractive place for many of the best and brightest students, it remains hostile to most at-risk students, especially minorities and women.

Many of the groups of students who have been repeatedly ignored by the various reforms of science education are students who are disproportionately represented in developmental education programs (Atwater & Brown, 1999; Minicucci, et al., 1995). The promise of "science for all Americans" (e.g., National Research Council, 1996; National Science Foundation, 1996) has remained elusive. As noted by Donmoyer (1995), it has been "easier to give something to everyone rhetorically than it is in reality" (p. 34).

How Science Education Often Excludes At-Risk Students

Many science programs continue to exclude large numbers of students, especially at-risk students in developmental education. This exclusion results from several long-standing and deeply entrenched biases regarding *how* and *what* science is taught:

1. Science virtually everywhere is taught with an objectivist approach based on knowledge being a commodity that can be imparted. Objectivists rely overwhelmingly on lectures because they believe "they can open the student's head, pour in knowledge, close the student's head and then have the student take a test" (Leonard, 2000, p. 386). This objectivist approach, even when instructors describe their teaching as "hands on" and "student centered," is based almost exclu-

sively on declarations of "facts" rather than on science being a discovery-based process influenced by culture and society (Roychoudhury, Tippins, & Nichols, 1993, 1995). Large, impersonal, and pedagogically monolithic courses emphasize and reward the memorization of these facts, an approach that is reinforced by eight-pound "introductory" textbooks and instructional approaches that give little consideration to alternate ways of knowing or teaching. This is important, because the lack of appropriate learning-strategies, especially student-centered strategies, is the largest variable that contributes to attrition of students in science classes (Cannon, 1999). Although the objectivist, lecture-based approach to teaching science minimizes the cost of delivering a course, it is inconsistent with how science is done. Moreover, it often discriminates against students, especially those in developmental education, who have alternate ways of learning.

2. Students able to compete effectively within the narrow objectivist approach to science are deemed to be the best and brightest students. Not surprisingly, these students are seldom from developmental education backgrounds. On the contrary, they are usually younger versions of the scientists themselves.

3. There is a strong selection-pressure for students who fit the narrow, prescriptive criteria of most science courses, and an equally strong selection-pressure against virtually all other students. These selection pressures often discriminate against students who comprise developmental education populations. As a result, science usually continues to be presented as it always has been presented—namely, from a narrow perspective that excludes or stereotypes women and minorities (Figure 1) and, in the process, alienates many students in developmental education (e.g., Harding, 1991; Kahle & Meece, 1994). Clearly, if this approach to teaching science continues, few new groups of students will benefit (Atwater & Brown, 1999).

4. Scientific knowledge is portrayed as being independent, unbiased, and free of personal, social, and cultural influences such as gender, race, and class (Harding, 1991; Longino, 1990; Moore, 1997). This portrayal of science gives little or no consideration to nurturing, contributions by and topics of interest to women and minorities (e.g., minorities as role models in science, prenatal care; see Atwater, 1994; Howes, 1997; Kahle & Meece, 1994), alternate ways of learning, or whether the "facts" of science could be biased

by culture or society. Indeed, any consideration of these aspects of science is often ridiculed as political correctness or a lowering of standards.

5. Science is often taught as being independent of other ways of knowing. This positivistic "one best way" of teaching science often creates problems for developmental education students, especially women (Barton, 1997, 1998), for it de-emphasizes relationships and connections while promoting domination and "command of nature in action" (Francis Bacon, as quoted in Fox-Keller, 1985, p. 34). Similarly, many American Indians learn science best by identifying relationships and changes, observing, and evaluating science in a large context. Although scientists often study natural phenomena within such contexts, science is often taught in a reductionistic way in which natural phenomena are studied out of context (Atwater & Brown, 1999).

The products of these biases are disappointingly predictable: Despite decades of reform, students in developmental education continue to face many unnecessary obstacles in science (e.g., many programs increase boys' confidence, while decreasing that of women; see Vasquez, 1998). Not surprisingly, then, many "at-risk" students avoid science; for example, women are less likely than men to take courses in chemistry, calculus, computer science, and other sciences. Similarly, more than 40% of students who enter college with an interest in science opt for other majors (Astin & Astin, 1993).

The compensatory "add 'at-risk' students and stir" programs implemented to address earlier wrongs have often failed because they have placed the responsibility for science education reform on those already marginalized by science, especially those at-risk students in developmental education. As a result, most students in developmental education continue to feel implicitly inferior and unwelcome in the neighborhood of science. Perhaps these problems are to be expected; after all, the lack of success in science classes by at-risk students has not been due merely to their absence from science classrooms. On the contrary, it has been largely due to what and how science is taught. Because these aspects of science education have not changed significantly, most of the long-standing obstacles to at-risk students remain.

Figure 1. The media has often stereotyped the contributions of women in science. For example, when Maria Goeppert Mayer (a professor at the University of California at San Diego) won the Nobel Prize for Physics in 1963, the headline in a local newspaper emphasized her maternal rather than her professional status. Photograph and article reprinted by permission of *The San Diego Union-Tribune.*

New Directions for Science Education in Developmental Education

For science education to be inclusive, we must proactively rethink the nature of science and shift the emphasis of reform from the alleged deficiencies of developmental education students to the deficiencies and biases of science and science education. Only this type of reform will make science accessible to all, including those students who have long been silenced by and excluded from science.

The science education reform that I suggest requires a philosophical change from the current objectivist approach to a constructivist one in which knowledge is constructed by learners rather than imparted by teachers; that is, I advocate a pedagogy through which learners build knowledge based on discovery-based experiences rather than exclusively on

authoritative sources such as teachers and textbooks (Roth, 1994). These constructivist approaches stimulate learning by *all* students because they immerse students in science, show students how relationships and knowledge are situated within the discourses of scientific knowledge and authority, and demonstrate to students the cultural, social, and historical aspects of science, in the classroom as well as in society (Hiller, 1995). Constructivist teaching is also a powerful way of helping students understand science, challenge ideologies that justify inequalities, break silences, and discover the liberating power of science (Barton, 1997, 1998), for it can enhance learning and success by at-risk students. Indeed, just as a change in teaching style and philosophy can enable at-risk students to learn the same science curriculum as traditional students (Minicucci, et al., 1995; Woodward & Noell, 1991), so too can comparable changes such as those described here enhance the success of developmental education students in science. These changes must include changing how and what science is taught.

Changing How Science Is Taught: Emphasizing Discovery-Based Learning

The National Science Education Standards try to improve science education by encouraging that "inquiry into authentic questions generated from student experiences [be] the central strategy for teaching science" (National Research Council, 1996). Discovery-based activities enhance learning because they make the teaching of science more consistent with the practice of science. Although no one pedagogical approach or technique can meet all students' needs, discovery-based learning can be a great educational equalizer, for it gives students the autonomy to learn science by pursuing questions and investigations of their own design (Costenson & Lawson, 1986; Sundberg, Armstrong, Dini, & Wischusen, 2000; Welch, Klopfer, Aikenhead, & Robinson, 1981). Despite these benefits, however, little discovery-based learning occurs in most science classes (Edwards, 1997). Indeed, most of today's science activities are "cookbook" activities that involve little or no creativity, critical thinking, discovery, or engagement.

I urge science teachers to use more discovery-based ways of teaching science. There is much evidence that this will increase learning by all students, especially by students in developmental education programs. For example,

1. When developmental education students are exposed to discovery-based instruction, they score significantly higher on tests that evaluate scientific knowledge than do students given only traditional instruction (Mastropieri & Scruggs, 1993). Discovery-based teaching enhances learning (Cannon, 1999; Leonard, 2000; Leonard & Penick, 1998; Lord, 1994; Roth, 1994; Seymour, 1995).

2. Most students prefer and learn more from discovery-based activities, despite the fact that they often find these activities more challenging than traditional ones.

3. Students want to design their own experiments, even if such activities require more work (Edwards, Luft, Potter, & Roehrig, 1999; Morrow 1999). When immersed in discovery-based learning, many students better understand the purpose of their work and learn more (Morrow, 1999).

4. Experimental studies, philosophical discussions, and instructors' testimonials show that students learn more when exposed to constructivist, discovery-based experiences (Cannon, 1999; Lawson, 1988; Leonard, 2000; Seymour, 1995).

Although discovery-based learning is a powerful way to learn science, it must occur in a larger context that is supplemented by activities that reinforce learning and success, such as personalized tutoring and mentoring, summer research experiences, cooperative learning, open-ended learning experiences, and interactive methods that decrease the distance between the student, the teacher, and the subject being studied (e.g., see Lord, 1994; Project Kaleidoscope, 1994). These techniques are especially helpful to developmental education students, for they help students learn more, feel more confident about themselves, become more motivated to learn, and become more receptive of diversity (Johnson & Johnson, 1987). Each of these teaching techniques makes students a potential teaching resource and enables them to ground their perspectives in experience. However, like other pedagogical tools, these techniques must be used properly to enhance learning. For example, consider cooperative learning, which has become increasingly popular as teachers have realized that traditional instruction in science often (a) encourages students to work alone

and in competitive atmospheres (Johnson & Johnson, 1987), both of which can alienate large groups of students; and (b) fails to teach students the importance of and skills necessary for working in groups to solve problems. There can be pitfalls with cooperative learning; for example, the group work involved in cooperative learning can be greatly influenced by race and gender (Rosser, 1997). Moreover, effective cooperative learning requires building positive interdependence and teaching cooperative skills. There is a big difference between merely putting students into groups and designing teaching strategies that help students to learn cooperatively.

Changing What Science Is Taught: Expanding The Pool Of Best And Brightest

Classrooms are not homogenous; on the contrary, they are mosaics of diversity. Consequently, teachers must select curricular contexts and instructional strategies that engage and address this diversity. The traditional "one-size-fits-all" approach to science teaching does not fit all, nor does it necessarily always identify or reward the most capable or promising students.

To increase the success of at-risk students in science, and thereby broaden the pool of best and brightest students, I suggest that teachers change *what* science is taught by considering the following:

1. Design science courses that actively involve students and their experiences in the guided construction of knowledge in relevant, nurturing, meaningful, and inclusive ways. In addition to increasing students' knowledge of and experience in science, this approach helps students see themselves as part of science. This approach to science education differs significantly from the objectivist survival-of-the-fittest approach typical of most science courses and programs.

2. Instead of merely transmitting facts, expand the kinds of observations beyond those typical of traditional science courses and research. Do this by defining science within the discourse of human agency and in its larger contexts of culture, society, community, and authority. To accomplish this, teachers must understand the needs, norms, and discursive practices of their students.

3. Make learning more accessible by applying principles of Universal Instructional Design, an in-structional philosophy based on a flexible and customizable curriculum. That is, recognize that cultural styles affect learning, and that different students learn in different ways (Atwater, 1994; Leonard, 2000). Expose students to multiple ways of knowing and doing science that reflect social, historical, and political contexts in which science is learned and done (e.g., how federal funding often guides science down self-serving paths; see Howes, 1997; Hubbard, 1990). Emphasize that science is connected to and influenced by other ways of knowing and doing that permeate all aspects of society.

4. Explicitly address the social and cultural biases of science that limit how and what science is taught and learned. Science, and therefore the "facts" produced by science, is not value-free. Rather, science—a human endeavor subject to human bias, ambitions, and social conditions—has a cultural history that often promotes White men and ignores or stereotypes others, as depicted in Figure 1. Although the blatant sexism and racism of the 1960s and 1970s have largely disappeared from textbooks, such biases continue to appear in more subtle ways (e.g., women and minorities are highly represented in illustrations but are absent from the written text; the roles of women and minority scientists are often omitted or included only as a token mention; the concerns of women and minorities are often overlooked; see Dujari, 2000; Kahle, 1985; Kramarae, 1980; Rosser & Potter, 1990; Whatley, 1988). These biases are found in most depictions of scientists (e.g., in films, books, movies, and cartoons; even science cartoonist Gary Larson portrays scientists as men), and often extend to science policy. For example, before 1993, when President Clinton signed legislation requiring the National Institutes of Health to include women and minorities in all of their clinical health studies, there was no federal policy to adequately enforce the representation of these two groups in public health research. As a result, scientists and science teachers often lacked data for a variety of important phenomena that affect women and minorities (e.g., the contraction of AIDS by women; see Link, 1998). Whenever possible, teachers must expose and eliminate these biases by screening textbooks and all other aspects of their courses for stereotypes (e.g., racial, gender-based, socioeconomic), language that is offensive to particular groups, and other features that might distract students from learning (e.g., see Nedergaard, 1990; Rosser & Potter, 1990).

5. Recognize that students must discern a new culture if they are to learn science. A student's ability to discern this new culture is determined largely by the extent to which she or he can "understand, investigate, and determine how the implicit cultural assumptions, frames of references, perspectives, and biases within [science] influence the ways in which knowledge is constructed within [scientific disciplines]" (Banks, 1982, p. 21). If this is ignored, students and teachers will often be left feeling as if they've walked "into a dark cave from which there is no exit" (Reichert, 1989, p. 10).

6. Explicitly and repeatedly show students the contributions of women and minorities in science, and discuss how our knowledge and perception of science might be different if science were dominated by women and minorities (e.g., Galupo & Gasparich, 2000; Zacks, 1999). This will help students develop a critical consciousness through which they can challenge the status quo of the political, social, and cultural dimensions of science.

7. Develop personalized mentoring programs that address students' primary concerns (e.g., advising, career opportunities, self-image, and self-confidence). Such programs, when properly designed, organized, and evaluated, can have a positive effect on students' decisions to pursue, appreciate, and enjoy science. Effective mentoring programs benefit everyone, especially women, minorities, and at-risk students in developmental education (Association for Women in Science, 1993; Grant & Ward, 1992).

8. Teach students to communicate their ideas effectively to others. These communication skills can be enhanced by a variety of techniques, such as using "one-minute papers" that summarize students' learning and concerns, student-led discussions (with faculty supervision), e-mail, and journals in which students write about what they are learning (Hedges & Mania-Farnell, 1999; Moore, 1997). All of these pedagogical techniques increase interactions between teachers and students by transforming the impersonal and monologue-like lectures typical of most classrooms into a more personal dialogue between students and teachers. These dialogues, in turn, help students listen to, contribute to, and work through an ongoing discussion of their observations, relationships, and ideas. Stimulating a dialogue between students and teachers

not only gives students increased access to teachers, and vice versa, but also helps teachers understand and address students' concerns about their learning.

For developmental education students to succeed in science, teachers must change their approach from an objectivist "survival-of-the-fittest" approach to a constructivist one involving discovery-based learning, different ways of knowing, and nurturing. These changes in how and what science is taught will not only enhance learning and promote success, but will also help students appreciate the liberating power of science for solving problems, addressing inequalities, and understanding our world.

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Theoretical Views and Practices Supporting In-Context Developmental Strategies in the Physical Sciences

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Physical Science

An increasingly diverse group of entering freshmen who are viewed as having the potential to compete in a degree program and ultimately complete a bachelor's degree are demonstrating serious needs to improve their study skills or strengthen some areas of their basic content knowledge or both in the physical sciences. Several strategies that encourage students to develop and practice effective study skills within the context of a degree-credit physical science course are made possible by adapting course structure and content organization. Strategies include highly repetitive practices of testing and feedback, short-answer type exams requiring extensive use of quantitative information, bridging between the familiar and the unknown, emphasis on the holistic view of the subject, and hands-on practice of the processes of inquiry.

Many American colleges and universities are continuing to experience an increasing need to serve freshmen who are labeled as academically underprepared or less prepared to compete in college courses. Astin, Parrott, Korn, and Sax (1997) found over the past 30 years that the percentage of freshman students who stated that one of the most important reasons for going to college was to improve their reading and study skills has actually doubled, from 22% to 43%. Sax, Astin, Korn and Mahoney (1999) reported in an inventory of freshmen at all institutions that 13% had received tutoring or remedial work in mathematics and over 5% had received similar help in science in high school. When asked if they expected to need special tutoring or remedial work in college, the percentages doubled for mathematics and science at 26% and 10%, respectively.

The widening range of student needs upon entering postsecondary education has placed a strain on the ability of the academic system to accommodate all students equally well. Conflicting views among faculty and administrators raise questions about the appropriateness and impact of a process-oriented curriculum on the quality of the more traditional discipline-based curriculum (Greene, 2000). During the past 30 years, many public universities have adopted variations of a back door admissions policy (Reisberg, 2000) as enrollment demand has increased. This practice allows students who have not met minimum entrance standards to be provisionally admitted for the spring or summer term on a second chance basis where they have an opportunity to show that they can be academically successful. However, due to huge enrollment demands and associated costs, an increasing number of colleges and universities have discontinued this opportunity .

The increase in students requiring additional academic support may be due to a higher percentage of high school graduates going on into some type of postsecondary education because they and their parents are being told by educators, politicians, and executives in the workplace that they cannot command a salary that will meet their needs without a bachelor's degree or a highly specialized job skill. Astin et al. (1997) found that three-fourths of all freshmen reported that one of the most important reasons for going to college was to get a better job. The same survey also points out that nearly three-fourths of the freshmen said that another important reason to go to college was to be able to make more money. This is in contrast with what freshmen reported 30 years ago, when only 50% said that increased income potential was an important reason for going to college. Whatever the reason, a significant percent of new students have lower high school rankings and possibly lower standardized test scores that resulted from gaps in their prior learning.

Sax et al. (1999) point out that a different reason for the increased number of underprepared students is the alarming increase in academic disengagement that is reported by freshmen as they reflect on their high school experiences. Approximately 40% report frequently feeling bored in class compared to 26% from 15 years ago. In addition, 63% reported occasionally or frequently coming late to class compared to less than 50% from 35 years ago. Finally, those reporting that they have overslept or missed a class or appointment nearly doubled, with 36% now compared to 19% from 32 years ago. Sax concludes that this increasing disengagement dramatically increases student need for remediation courses in the high schools and in college.

Another perspective relating to these trends is addressed by Shea (1993) concerning the widening chasm between student expectations and faculty expectations. In one case, the students asked their geology teacher if he was going to give them a precise study guide that outlined the content to be covered, specifically listing the topics that would be in the next test. He said, "No!" He told them that he would briefly discuss the test during the previous class period and that he expected each student would develop any materials and methods of study that he or she felt would be most helpful. The same professor also had a student ask him if he was sure the exam he was taking was for the geology course he was currently enrolled in because the student thought it was too difficult. The upshot of these incidents is that the faculty member blames the student's attitude, and although it is not mentioned, the student likely criticizes the professor's attitude.

The teaching of physical science at the freshman college level is complicated due to a view that physical science and developmental education do not mix. This feeling arises because most physical science courses are highly quantitative and require that the student is already proficient in the required level of math and demonstrates the ability and discipline to read and understand science text materials. To make the point, in some secondary schools, students are required to have successfully completed two years of algebra (i.e., through intermediate algebra) before they can take their first high school course in physics.

College physical science instructors, as cited by Shea (1993), expect that students who enter their classes will be proficient in math, at least at the level specified in the course requirements, whether it be through intermediate algebra, or more likely through college algebra or first-term calculus. Text materials are usually written in a quantitative style that is more difficult to read than ordinary prose. This happens because much of the work in the physical sciences involves highly accurate measurements, precise procedures, and detailed analysis. Because of its precise nature, information often must be communicated in numerical form, such as equations, graphs, tables, maps, or charts rather than straight prose. Instructors do not want, or cannot take the time, to teach the math and other topics from basic science that students are expected to have learned earlier. Many introductory physical science courses are part of a sequence for a major so that an instructor is expected to cover certain content during the term. Often these serve as "weed-out" courses, which most often affect students who are least prepared.

There is a pressing need for colleges and universities to accommodate the ever-widening range of incoming freshmen who require extra assistance in skill building. This points to a strong need for bridging the teaching of introductory physical science with the teaching of developmental strategies. As I examine science teaching journals, much of the emphasis is content-centered, not student-centered. On the other hand, the developmental education journals are more student-centered, but they usually do not address the teaching of physical science. The ideal is to get both groups talking to each other and urge them to collaborate at conferences and through their publications.

It seems that much of the developmental support provided in postsecondary institutions is separate from the content courses in which the students need it. Students may be advised to take certain free-standing study skills courses or basic science preparatory courses before they enroll in the degree-credit introductory physical science course they really want. In many cases this may be necessary.

Gebelt, Parilis, Kramer, and Wilson (1996) argue that students may not be adequately motivated in the freestanding courses, whereas if the developmental work is taught in the context of a course offered for graduation credit they might be more motivated because they recognize the purpose for taking it. They

assert that the achievement of those students who are required to use study skills directly in the context of the course is higher than it is for those who have taken freestanding skills courses at an earlier time. Levin and Levin (1991) emphasize that study skills tend to be learned more easily when there are opportunities for application of those skills accompanied by frequent feedback and reinforcement. Francisco, Trautmann, and Nicoll (1998) found that students were more willing to address their need for help and participate in opportunities to help their study skills when interventions were closely associated with a degree level science course.

A third problem is that taking these freestanding courses lengthens the time a student must attend college before graduating, which increases the cost of education and uses up financial aid. In addition, at some institutions developmental courses are expensive to teach resulting in an additional fee on top of normal tuition costs.

In-Context Developmental Strategies

The previous section provides some rationale for making the case to provide developmental support within the context of an introductory degree-credit physical science course. General College (GC) faculty at the University of Minnesota have experimented with this in-context method of delivery for more than 20 years. Over time many faculty have adapted the general education curriculum to enable academically underprepared students to learn and practice effective study and learning strategies that can help them succeed in working toward a bachelor's degree. During the last decade we have seen steadily increasing transfer rates from General College to degree-granting schools and colleges of the University of Minnesota, which indicates that we are increasingly more effective in serving at-risk students. This leads to the following efforts, along with rationale that supports in-context developmental strategies in physical science courses.

Personal Philosophy

Each teacher develops a personal philosophy of what his or her course should look like and how that course should be taught depending on the content, the nature of the students, and the outcomes and re-

quirements that the course must fulfill. A teacher's beliefs or personal viewpoints are also influenced by the combination of one's background, attitudes, and experiences. Tobin, Tippins, and Gallard (1994) emphasize that teachers' beliefs are pervasive in the classroom and influence the role of the teacher, planning and decision-making processes, and ultimately how a course is taught. They highlight the importance of how the personal theories guide each teacher's practice in the classroom, including how student centered the instruction is.

Mallow (1986) expands on this notion by emphasizing that the teacher's self-perception can ultimately have a profound impact on the student's attitude toward science. The teacher's attitude influences whether or not the student develops confidence in his or her ability to learn science. Mallow also notes that a major contributor to the student's development of science anxiety is the teacher who conveys the message that he or she is elitist and tries to impress the student that he or she is smarter than the student.

Each teacher is unique, so no two teachers will view or design a course exactly the same way. This diversity allows one to teach to his or her strengths and, at the same time, forces one to change and improve how he or she serves students because they are also different from each other. By the time students have completed two years of work in GC, they will have been exposed to diverse areas of knowledge, study-skill strategies, and will have experienced diverse ways of thinking about themselves, their place in the world, and their future roles in society.

A teacher's personal philosophy is guided by the mission of the college and by departmental philosophies. In turn, that philosophy influences the following parameters one establishes for his or her courses. Included are the (a) organization of the course content and order of topics, (b) degree of difficulty and sophistication of the course, (c) types and methods of study skill strategies to be implemented, (d) methods of instruction, (e) level of expectation of student performance, and (f) methods of assessing student progress and achievement.

A physical science course that is designed to help students improve their study skills and their understanding of basic science and mathematics—which at the same time enables them to learn the principles,

concepts, and terminology associated with the particular subject matter—involves adaptations to how content is taught and how student learning activities are incorporated. In practice, the developmental support runs simultaneously with the content portion of the course.

Typically, a class of 40 to 60 students exhibits tremendous diversity in basic science background, scientific and quantitative aptitude, maturity, attitude toward course and instructor, confidence in doing well in the course, and willingness to get involved in the course. My experience with these students is that they usually fit into one of three categories of those who will (a) achieve well academically from the start, will not need intervention, and will earn a good grade; (b) do poorly early, but then will respond to suggested intervention strategies, make changes, and end up with a good grade; and (c) begin poorly, but will not, or refuse to, take advantage of suggested intervention efforts and will fail or do very poorly at the end of the term.

In-Context Developmental Strategies

Any developmental strategies are intended to motivate students to buy into the educational opportunities that lie before them so that they take ownership in their own educational endeavors. Motivation can take on many forms. It can result from the student realizing that a teacher cares enough to provide the necessary help, or a student understanding, for the first time, a concept or procedure that he or she earlier thought was too difficult to master. Student needs arise for many possible reasons, but we should not concern ourselves with the causes or placing blame. In some cases, no one is at fault. Instead, we must do our best to assess their needs and enable students to develop the confidence, competence, and attitudes that will help them overcome or bridge their gaps.

As a teacher, one of my goals has always been to enable underprepared students to learn and develop confidence in new and effective study skills. Continued practice of those new skills, accompanied by some academic success, can motivate the student to become comfortable in using them. In this way, the student is more likely to abandon the old nonproductive study skills that did not lead to earlier academic success. Students need help to buy into the new strategies, and

in some instances students must be taught how to use new study techniques. It is not enough to say to them, "You have to study harder," "You must work harder," or "You must change how you study for this course," and then turn and walk away, leaving them on their own to determine how to accomplish this. In some cases they do not know how to study harder or how to change their behavior.

Frequent Testing

The practice of frequent testing and feedback has been used in GC 1111: Science in Context: Weather and Climate, in which students take an exam each week in the quarter system (i.e., nine per quarter) and biweekly in the semester system (i.e., seven per semester). The repetitive use of study skills associated with mastering short-answer type exams encourages students to practice those strategies that lead to understanding rather than focusing mainly on rote memorization. A typical exam tests content and process that is presented in lecture, text materials, and labs. Each exam is one class hour in duration and is mainly a short-answer type with very few objective questions. Each short-answer exam is only partially factual, with the first being the most factual. With each subsequent exam the questions become increasingly demanding with the questions asking students to draw conclusions based on information from maps, charts, data tables, and diagrams that are available to them during testing. Most frequently the questions contain the words: how, why, when, explain, define, and describe. Some problem-solving questions begin with "Suppose that..." that ask the student to conclude or predict what will happen.

The pattern of testing described above places increasing demands on students to develop and use specific study strategies and increase the level of application of knowledge repetitively week after week. Wambach, Brothen, and Dikel (2000) point out the value of increasing demandingness and frequent feedback as necessary for helping students to become self-regulating, and thereby successful, in their academic endeavors.

Another benefit resulting from this testing practice is the fast start, immersing students in the course very early. In other words, "They hit the floor running." I believe that many of our students do not know

how to handle the dead time that elapses between the first day of class and the first major exam or the time between consecutive major exams. They think they understand what is taught but tend to let certain important learning activities slide, and consequently do not do well on the exams. I believe that it is necessary to shorten that initial dead time as much as possible. Having the first exam during the second week of a 15 week semester allows students an opportunity to recover if they did not do well. If they received a good grade on the first exam, they will be greatly encouraged and motivated.

I have designed the first exam to be quite factual and difficult, but not a "killer." It is necessary to push students carefully into the unfamiliar early in order for them to experience growth. The content tested in the first exam is new to them. If they have studied the assigned material and completed the first lab, they will do well and they will be motivated by a sense that their effort has paid off and that they have learned something new. If they do not do the work, they will not do well. For those who do not do well on the first or second exams, I try to initiate dialogue to diagnose what went wrong. Usually the reasons are apparent, and we discuss strategies to correct the process. Some will conscientiously follow advice while others will not; it is their choice. Those who do adopt new strategies often see an improvement in their grades even though the exams are increasingly difficult. They learn very early what it takes to succeed in the course. Levin and Levin (1991) emphasize that students who receive direct guidance in establishing new and more effective learning strategies are better equipped to succeed academically in future courses. I include the following quote by a former student in the course syllabus: "The course is relatively easy if you take it seriously and do the assigned work. It is a very difficult course if you do not put the effort into it."

The repetitive nature of three classes per week, a two hour lab per week, an exam every other week, and one written critique on current topics due every other week helps students actively establish a weekly routine in the course. They know what to expect each week. This process provides special opportunities for them to develop strategies that help them overcome difficulties they may have with test taking, overcoming test anxiety, note taking, time management, or improving their concentration and attention span.

I believe that frequent test preparation enhances learning. With biweekly testing, students focus most of their attention on what has been assigned over the prior two-week period. It is easier for them to get their heads around the knowledge and processes that will be tested. It also allows for more in-depth testing of the topics compared to what can be accomplished in a one-hour exam covering several weeks of work. It should be pointed out, however, that each exam draws from content studied earlier in the term. If the students understand the earlier topics better they will perform better on subsequent exams.

Higher Order Thinking Skills

Bloom (1956) stresses that even though the gaining of information and knowledge is important, the primary goal of instruction is to enable students to do something with that information and knowledge. It is expected that students will select appropriate techniques, information, and knowledge when encountering a new problem or situation.

Furthermore, Zoller (1997; 2000) maintains that the primary goal of current reform efforts in science education is to strengthen our students' higher order thinking skills. This means enabling students to participate effectively in the decision making and problem solving processes in our society. Likewise, the developmental education program in General College is intended to facilitate students' ability to move into a college-level program and ultimately complete a bachelor's degree. This means that they need to be able to master new knowledge and the applications of that knowledge, as well as compete successfully with other students. Once they transfer to a degree-granting program, they will begin pursuing a major, and must have perfected their own study strategies and basic knowledge to a level at which they have confidence in themselves as competitive students. With this premise, I feel that it is necessary for them to be well acquainted with short-answer exams because they will encounter mostly short-answer and essay exams in their future work. I do not believe that multiple-choice and true-false exams prepare them adequately because of the differing thought processes involved.

Students will encounter heavy emphasis on application if they pursue coursework in the physical sciences. This is the basis for having them use data from

maps, charts, graphs, equations, and tables to make inferences and draw conclusions. This approach helps many students realize that they can do science. Successful experiences of this type may encourage some of them ultimately to consider a degree program in the sciences.

Applications that involve handling quantitative information enable students to think about and view the field, whether it is meteorology or physics, in a way that is similar to that of professionals in those fields. Having this perspective is extremely helpful to novices who wants to pursue one of those fields because they can more easily understand what the professionals are saying as well as understand course materials.

Science in Context

Two in-context notions are addressed in this chapter. What has been discussed so far is study skills in context. What follows is a discussion of content in context or learning about science content based upon experiences with the familiar. In GC we have experimented with the "Science in Context" notion since the mid-1960s to enable underprepared students to learn basic science within the context of something with which they are very familiar. Bloom (1956) makes this notion clear by stating that the abilities and skills needed for critical thinking and problem solving are drawn from one's previous experiences. This requires some understanding of the new situation. It requires prior knowledge or methods that can be used, and it requires some ability to recognize the appropriate relationships between prior experience and the new situation. In GC 1111, the familiar provides the basis that can lead to the application and understanding of new concepts, principles, and terminology from physics, chemistry and biology. As an example, this allows them to infer the whys and hows of the weather. This notion is expressed in the statement: "Each of us knows a lot about the weather, but we know very little about meteorology." Meteorology is mainly the physics of gases, fluid dynamics, energy transfer, and energy transformation. The study of the atmosphere and its weather and climate is loaded with a considerable amount of basic science.

Svinicki (1993-94) expands on the value of connections between prior knowledge and knowledge to be learned, positing that learning is easier and faster if there are more connections. More connections increase the comfort zone between the student and the new knowledge. Also, instruction is aided if all the students in a class have comparable prior knowledge. To some degree, this is true in a course in weather and climate where most of the students share a common understanding of what weather is even though they do not know what causes it. In a weather course, it is often appropriate to explain the science behind some atmospheric phenomenon if it just occurred, is happening, or will be happening soon. As in any course of study, students may have faulty or wrong knowledge. This is very true with how people may explain the hows and whys of weather. Svinicki suggests that it is important to correct those wrong notions when connections are being made between the known and the unknown.

Course Organization

Occasionally, an instructor, in order to better serve underprepared students, may change the course organization and order of topics so that it looks very different from a traditional course in the subject. This is difficult to do but may be necessary in order to help the students make better sense of the subject matter. The traditional small scale to planetary scale perspective of the weather and climate in the traditional course is not always appropriate for some students who would better understand the planetary to small scale instead. Some of the difficulties in changing the perspective include objections from other colleagues and professionals in the field who were traditionally trained as well as introductory textbooks and published lab manuals that may not be suitable materials for a nontraditional audience. Often these published materials assume a level of sophistication of student knowledge and quantitative ability that is above that of a particular student cohort. All of this usually results in the teacher writing new materials for the developmentally based course.

I designed GC 1111 into a course that I believed would be more appropriate for the underprepared student. Earlier discussion describes attempts to incorporate developmental support directly into a degree credit course. The content and topics in GC 1111 have been reorganized beginning with the planetary or global viewpoint and then proceeding toward the small scale, or local perspective. I have written an extensive

set of study notes that serve as the primary study guide for the course. These notes provide a detailed guide to which pages students should read in a traditionally organized textbook.

I believe that many students need to see the whole picture first in order to better understand the parts. Zoller (2000) addresses some of the features that a new model for teaching higher order cognitive skills should include. One of the guiding constructs of such a model is the need for a holistic, systemic, and inter-disciplinary approach. A benefit of this approach is that students are able to grasp and learn how to produce weather forecasts much earlier in the term than in the more traditional course. This is important because we usually are not too interested in past weather, or even current weather, but are much more concerned about what will happen in the future. Being able to predict weather motivates students to actually learn about the atmosphere in more depth. This inquiry-based process demonstrates to the students that they, in fact, can do science. This is a strong motivator.

Methods of Inquiry

A final strategy is based on concerns relating to difficulties some underprepared students encounter with mathematics, and quantitative work in general. During my experience in teaching introductory physical sciences and developmental mathematics, I have observed the frustration of those students who did not master arithmetic or algebra during the elementary and secondary school years. They are turned off by the prospect of having to take courses in those areas again in college. In some cases they had bad experiences for any of several possible reasons. The resulting negative attitude they have towards math, and in some cases, the quantitative demands of the physical sciences, is compounded because taking developmental math lengthens their stay in college and consumes financial aid.

Most often, standard algebra courses place considerable emphasis on the steps involved in simplifying expressions and solving equations with less emphasis on applications. It is discouraging to find that too many students do not understand what graphs, equations, and inequalities are. What do they mean? How do we read them? Where do they come from? In addition, they often do not know how to collect good data, nor do they know how to construct an appropriate graph. In many cases they do not understand the independent and dependent relationships between the variables in which the value of one variable influences the value of the other.

I have had the opportunity to experiment with having students do science in GC 1160: Physical Science Laboratory (no longer offered) and GC 1163: Physical Systems: Principles and Practices by carrying out the steps or processes of inquiry, or what some people call the scientific method or the methods of research. Students begin by observing some kind of physical phenomenon that is actually a result of the interaction of two variables. The phenomenon must be simple and easily understood by students. This allows them the opportunity to focus mostly on the inquiry process itself. Observations consist of taking measurements of changes of the two variables during the interaction between them. Graphs, equations, and inequalities are eventually developed from these simple measurements. The students follow precise procedures to collect the most accurate data. Next they perform error analysis on the data to understand the variability and approximate nature of their measurements. The analysis process continues by constructing a visual picture or graph of the relationship between the variables. Equations or inequalities are constructed from the data and the graph. Graphs, equations, and inequalities are models that define and represent the relationships between the variables. These models can then be used to predict other interactions without having to rerun the experiment. A frequent comment by students who have worked through the inquiry process is, "Oh, that's what it is all about!" I believe that it is necessary for students to have hands-on experience of the observation and analysis processes in order for them to realize what graphs, equations, and inequalities are all about. Even though it takes additional time to complete those initial steps of the inquiry process, it helps students buy into the role and purpose of mathematics in their academic work.

The process outlined here is not restricted to the physical sciences. Obviously this can be a valuable learning activity and should be offered in other natural science, social science, business, and technology courses. The outcome of such an experience can be extremely valuable as students continue their education. The confidence and the insight they gain may

encourage them to pursue degree options that they had thought were out of reach for them. They may confidently enroll in courses that have a heavy research component.

Conclusion

Strong intervention strategies should be available and used during the student's first term of enrollment. Courses that are entry points for new freshmen should be structured in such a way as to identify those individuals who need help very early in the term. They all do not need intervention, nor do they all need the same kind of intervention. Some students may need help in both study-skill development and preparation in basic science content, while others may need help in one of those areas. They should be identifiable very early in their first physical science course so that they can make certain course corrections and ultimately be successful in the course. Success breeds success.

Intervention strategies must be cut back or curtailed in subsequent terms so that students do not get too dependent on them. They should be expected to study and compete on their own, with only a very limited safety net available, before they transfer. The developmental process must be designed to motivate students to develop their strengths and overcome their weaknesses to such a level that they are confident about their own ability to compete academically.

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A Selectionist Approach to Developmental Education

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Developmental students are typically defined as a special population. They are most often served by special courses rather than by mainstream courses taught with more effective and diverse pedagogies applicable to a wide range of students. We argue that the current approach tacitly assumes deficit and is a product of essentialistic thinking. We further argue that selectionism provides a more useful philosophical framework for developmental education. We make an analogy to evolutionary thinking to foster a view of developmental students as products of environments that have selected behaviors unhelpful in educational settings. We conclude that this selectionist focus on the environment shows more clearly how to structure effective developmental education environments.

At the National Association of Developmental Education (NADE) web site (www.umkc.edu/cad/nade/nadedocs) one can view the association's goals and strategic plan. These documents provide a picture of what NADE considers important and how it will work to further developmental education. The definition of developmental education adopted by NADE (1995) appears in the preface of this monograph. This broad definition and goals statement, with its heavy emphasis on the individual, suggests that developmental education is any educational intervention targeted to the specific needs of individual learners and implies that nondevelopmental postsecondary education does not accommodate a wide range of learners.

We believe that the rigidity of conventional pedagogy used in college classes has led developmental educators to conclude that students who fall outside of the "usual" range of college students can be served best by "special" courses. The other possible solution, creating more effective and diverse pedagogy for a wider range of students, is much less tenable given the entrenchment of college faculty in their disciplines and the lack of funds needed to implement sweeping changes in college classrooms. Therefore, despite the broadness of the definition of developmental education, it has mostly been operationalized as courses in reading, writing, mathematics, and study skills. In fact, more than 85% of all educational institutions test and place students into developmental education courses (Lewis & Farris, 1996). Typically, when students enter postsecondary institutions they are classified as ready or not ready for the college level curriculum. If admitted, students who are judged not ready are assigned to courses where they will learn the skills necessary to be fully prepared for college work. These students are often described as having deficits or special needs that must be addressed before they can enter the institution's mainstream.

Many assumptions are implicit in this model. It assumes that students' past behavior in academic situations accurately predicts their future behavior. It assumes that students who have not been successful in academic situations have defects in their abilities, skills, or attitudes that explain their lack of success. It also defines preparedness as a fairly stable quality possessed by students that can be measured. In any case, students placed into developmental courses tend to pass them. For example, Lewis and Farris (1996) report that 79% of students taking developmental education

courses in the U.S. succeed in them. Similarly, Boylan, Bonham, Claxton, and Bliss' (1992, November) national study of developmental education outcomes showed positive results. What we do not know is the proportion of students who could succeed in nondevelopmental courses if the methods used to teach those courses addressed the needs of a broad range of learners. Unfortunately, research suggests that too many students who start college with developmental courses never reach the nondevelopmental curriculum.

Statistics compiled from community colleges in California (Little Hoover Commission, 2000) cast doubt on the extent to which current developmental programs prepare students for the ultimate goal of degree completion. Whereas 85% of these community colleges consider transfer as their primary mission, and 31% of entering students state their goal as transfer to a baccalaureate program, only 3% actually do transfer. In California 10.4% of all community college students enrolled in developmental education courses with 80% completing them successfully, but only 26% went on to take even one higher level course (Little Hoover Commission). Even more disturbing, a study of community college students' patterns of success (Broughan, 2000) found that 57% of working class African Americans placed in multiple developmental courses failed to complete a single course for graduation credit. These outcomes are depressingly similar to what Richardson, Fisk, and Okun (1983) found in the Maricopa County Community College system two decades ago. They reported that few students who entered the developmental education program emerged from it successfully. If these data are representative of the U.S. at large, one could argue that developmental education is not achieving its goals. We think the primary problem is that developmental education is founded on a deficit model that labels students rather than instruction as the problem.

We have argued that the prediction-placement model (i.e., assess deficits in reading and writing and place students into skills courses) by which most of developmental education functions is problematic (Wambach & Brothen, 1990). The moderate, positive correlations between standardized tests, past grades, and future performance make grades and test scores useful in selective admissions situations where not everyone who wants to attend an institution can be ac-

cepted. If a college can only serve 1000 students, it seems reasonable to admit the 1000 deemed most likely to succeed. The decision not to admit a particular student does not mean that individual would not succeed if he or she had been admitted. It means that, given a surplus of applicants, the institution can decide to serve another applicant instead. In fact, in most situations where applicants are rejected, there is some probability the student would succeed if admitted. When students are accepted who fall below the usual admissions criteria, these students are often identified as "deficient" and in need of intervention. They are typically labeled as developmental students.

Some charged with the task of teaching or advising developmental students are finding the concept of "deficit" problematic (Higbee, 1996). Working from post-modernist perspectives, scholars in the field of basic writing have found the entire notion of who is prepared or not to be a complex and political one. For example, Faigley (1992) rejects categorization and stresses the importance of process in basic writing. Iris Young (1990) takes a political perspective and argues that rights and power are not essential "things" but exist in relation to social structures. Although not abandoning the task of teaching students academic forms of writing, they reject the notion that students who do not yet know the forms are somehow defective. Instead, they propose identifying the skills a student already possesses and building academic writing skills on this foundation. Students' prior skills include proficiency with language forms and cultural knowledge not generally valued by higher education institutions. This is consistent with the approach we take here.

Yet the notion of deficit does not go away. In the common discourse of developmental education, students are often described as "developmental" or "underprepared" or "at risk." Reading courses are said to make up for lack of ability or interest in reading, and traditionally structured remedial writing courses strive to improve the inability to write complete sentences. In this paper we will argue that the concept of deficit is a product of essentialistic thinking, the belief that we can know the "essence" of a person. We will propose that selectionism, the idea that useful qualities are selected by environments, provides a more helpful philosophical framework for developmental education.

Essentialism from Aristotle to the Evolutionary Synthesis

Fuss (1989) points out that "Essentialism is classically defined as a belief in true essence—that which is most irreducible, unchanging, and therefore constitutive of a given person or thing" (p. 2). Aristotle's "types" were an early systematization of such essentialist thinking (Sober, 1984). Aristotle characterized things and people as deviations if they were not identical to their type. These deviations were caused by interferences that kept the entity from exhibiting the qualities of its type. Thus, "student" is a type, and developmental students would be seen as deviations from it. Remediation, then, is necessary to restore the deviation to its normal state.

From a biological perspective, essentialism is "a belief that the variation of nature can be reduced to a limited number of basic classes, representing constant, sharply delimited types; typological thinking" (Mayr, 1997, p. 307). In developmental education, typological thinking is evidenced most often through division of students into types by virtue of the stable characteristics they are said to possess (e.g., deficits, skills, learning styles, etc.) and then either helping students overcome the deficit (e.g., a skills course) or finding educational interventions adapted to them (i.e., teaching compatible with their learning style). Fuss (1989) makes a distinction between real essences that "are discovered by close empirical observation" and nominal essences that are "produced specifically by language" (pp. 4-5). We believe that essentialist concepts in developmental education are of the second type because their empirical basis is weak. We will review briefly some pertinent literature and make some proposals that suggest a way out of what we see as a problem for developmental educators.

To understand the pervasiveness of essentialistic thinking in our enterprise, a historical perspective is helpful. Mayr's (1997) history of biology provides parallels to the issues facing developmental education. He points out that Copernicus, Galileo, Kepler, Newton, Descartes, Leibniz, and others developed the basic principles of the scientific method still in use today. Their Christian perspective caused them to view the universe as an orderly "machine" whose universal laws could be divined with the new methods developed during what has come to be called the scientific revolution. The science of mechanics (i.e., movements of planets, etc.) conformed well to the machine metaphor, but it soon became apparent that the mechanistic approach was insufficient for the finer grained analysis necessary for more complex systems. The complexities at the atomic level in physics and the complexities of life in biology demonstrated the importance of random factors and functional relationships between variables.

In biology, two perspectives vied for dominance—Physicalism and Vitalism. Physicalism was mechanist, reductionist, determinist, and essentialist. Its model was the Cartesian machine whose parts operated according to a basic "blueprint." These parts were universal and defined the essential nature of organisms. Vitalism was a reaction to this that was deemed metaphysical by the physicalists because it replaced Cartesian dualism with the concept of a "vital force" that set living things apart from the nonorganic world.

Both views were found wanting in basic ways. Physicalism simply could not explain the complexity that laboratory studies were revealing about life and had no answer for why the machine acted as it did. Vitalism foundered because it relied on essentialist notions such as the preformist hypothesis of egg development (i.e., that the essential structure—a homunculus—was present from the beginning) that were reduced to absurdity by better thinking and advanced optics. Their replacement, Organicism, took the best of both and had the decided advantage of being consistent with Darwinian theory. Its two main features, the genetic program and emergence, are thoroughly selectionist. The genetic program is subject to natural selection and provides the direction that past selection pressures deemed to be most useful.

Emergence is a developmental concept but is very different from the vitalist notion of development as unfolding—the notion that inherent form (e.g., the homunculus) simply has to be let out. Emergence progresses from lower stages through the greater complexity of higher stages. This process too is subject to selection. Development in the old vitalist, unfolding sense thus tends to be essentialist because it implies an unvarying, predetermined process. Development in the progression through stages sense is not essentialist because it is subject to environmental pressures.

The evolutionary synthesis of the 1930s and 1940s united Mendelian genetics and Darwin's theory, putting his two key principles, common descent and natural selection at the center of biology. Darwinian theory postulated two things necessary for evolution, variability and adaptability. A new, more successful species is created because its parent organisms had the genetic diversity necessary for it to be adaptable to changing environmental conditions. Importantly for developmental education, this notion can be applied to individual behavior as well as to species. With this approach, we are accepting Wilson's (1998) challenge to demonstrate points of unity between the biological and social sciences.

The Environment and Radical Behaviorism

The most powerful determinant of evolution is the environment. Natural selection ruthlessly eliminates whole species while it allows some adaptations to survive and even flourish. We are not making a strictly evolutionary argument here but instead are reasoning by analogy. Using evolutionary concepts may strike some as inappropriate in a social context. But we feel justified because Darwin himself borrowed heavily from social science in his thinking (Sober, 1984). We trust that we have been careful enough so that our analogue does not recall the problems of so-called "Social Darwinism," which treated winners and losers in society as the result of natural, unavoidable processes. Our argument is closer to Dawkins' (1989) application of Darwinian thinking to culture and Wilson's (1998) concept of gene-culture coevolution. That is, that the most adaptive characteristic that evolved in human beings is culture and that cultural transmission provides the greatest part of an individual's environment. Because culture accounts for most of what happens in education, the parallels we draw to it are crucial to our argument. We treat an individual's behavioral repertoire (e.g., attitudes, habits, skills, etc.) similarly to how the species concept is treated in biology. Species adapt, continue, or disappear just as an individual person's habits do. Species have variability in the sense of genetic diversity while an individual's behavioral repertoire can take many possible forms. Both genetic traits and an individual person's behaviors may prove to be adaptive or not. Genetic characteristics are inherited while behavioral repertoires are transmitted through cultural mechanisms such as educational institutions. Finally, evolution proceeds over time just as a behavioral repertoire becomes more adaptive as a function of its environment.

In his development of radical behaviorism in the 1930s, B. F. Skinner adopted Ernst Mach's approach to cause and effect (Chiesa, 1992). Mach rejected the mechanistic and essentialistic cause and effect notion of force in physical systems and replaced it with the concept of functional relation. Because "causes" suggest agency, Mach built on Hume's assertion "that notions of agency, force, or necessity of connection are superfluous" (Chiesa, p. 1289). The Machian school also rejected a priori (e.g., Kantian) models (Loving, 1997) and signaled the developments in quantum physics and relativity theory. Skinner's application of Mach's philosophical approach, in concert with a selectionist approach to human behavior, was a radical innovation that is far from mainstream psychology today (Palmer & Donahoe, 1992).

Just as biologists recognize the genetics of species to be highly variable, Skinner conceived of behavior as highly variable (Palmer & Donahoe, 1992). Genes and behaviors are both selected by the environment. Both operate by the process of variability-selection-retention. A subset of behaviors from a large number of possible behaviors is retained because the environment selects them. Thus, there are few mechanistic causes of behavior with only simple mechanisms such as the salivary reflex having identifiable cause-effect relationships. The environment is the closest thing to a causal agent in that it selects and maintains complex behaviors through the reinforcement it provides naturally or through reinforcement contingencies set up by other individuals or the culture. Behavioral repertoires are functions of the environments in which they exist. Conceiving of events and behaviors as products of functional relationships means focusing on the relations rather than searching for causes inside the person that may or may not be subject to manipulation.

In contrast, most of psychology and education conceives of behavior as the product of complex mechanisms. The memory "system," learning styles, and so on, that reside in the person are said to affect behavior. Without a demonstration of their existence apart from their status as hypothetical constructs, they are essentialist concepts. Much of developmental education has taken this approach as well.

Essentialist Concepts in Developmental Education

There are two questions that, if answered affirmatively, can identify an essentialist concept in developmental education. First, does it divide students into neat categories? Second, does it appeal to the existence of a stable trait without strong empirical evidence for its existence? That is, does it have the status of a hypothetical construct?

Ironically, developmental education exists partly because of essentialist thinking. Some students are "qualified" for regular admission while others, perhaps missing a cutoff on some qualification measure by one point, are defined as developmental students. This may be typological thinking, but just as instructors must determine the line between A and B grades, we appear to be stuck with some categorization. However, there are some types of categorization that are not so helpful.

First, within developmental education we often place students in remedial courses because they missed a cutoff score on a reading or writing placement test. This is not only typological thinking but also implicitly assumes the existence of a reading or writing competency that can be validly measured. Second, we may try to match our teaching to students' learning styles. This categorizes students and assumes that students possess a generalized internal filter that seeks specific types of input on some a priori basis. And third, assuming that real deficits exist also assumes that there is something missing in the student and that we can measure it accurately and reliably. How can we escape these three negative aspects of concepts so basic to our field?

A Selectionalist and Functionalist Approach to Developmental Education

Recently we (Wambach, Brothen, & Dikel, 2000) proposed the broad outlines of a theory for developmental educators. This theory does not take the prototypic positivist approach as originally defined by Auguste Compte, "that a real, objective world exists independently from individual perceivers and that science merely discovers the mechanisms of this objective world" (Loving, 1997, p. 448). It is grounded in important, educationally relevant aspects of students' environment.

The theory we proposed (Wambach et al., 2000) utilizes two process-oriented concepts: demandingness and responsiveness. These concepts characterize what is important about the environment rather than qualities of the student. Environments (e.g., college courses, instructional techniques) vary on how much they demand and how responsive they are to students' needs. In this view, there are no essential characteristics about students that developmental educators must identify, measure, or change to help them become successful. This is not to say, however, that students do not differ in important ways. We believe it is useful to research these differences and convenient to name them as traits, attitudes, and so on, as long as we recognize them as ways of responding to the environment rather than as essential student qualities (Wambach & Brothen, 2000).

Just as demanding natural environments "fine tune" species to produce more adaptive qualities in organisms, so do demanding educational experiences select ever more effective academic behaviors. A responsive natural environment rewards positive adaptations with survival. A responsive educational environment provides feedback to students so that effective behaviors are strengthened and retained.

B.F. Skinner demonstrated the utility of a selectionist, functionalist approach for psychology. He also wrote passionately about applying these concepts to education (Skinner, 1984). We think his conceptualization of the individual as a locus of forces is useful in thinking about developmental education. Skinner often spoke of himself and others as a locus of forces (Catania, 1992). These forces provide the context in which behavior occurs. While highly interactive, they can be grouped for discussion as genetic makeup, reinforcement history, and current environment. We believe it is useful to view our students and our task in helping them according to these three forces.

First, the role of genetic makeup in student behaviors relevant to our actions as developmental educators is sketchy. Personality traits (Eysenck, 1998) and general intelligence (Jensen, 1998) are based at least in part on genetic factors. The argument has always centered on how much. It seems to us that genetic

factors specify practical limits to behaviors (e.g., a very short person may never be a basketball star). But we never see such clear examples in our work with students. Perhaps the human genome project (Ridley, 1999) will settle what has always been a controversial issue, but it is not something we have any control over. There are more important things for us to focus on instead. In our own research, for example, we find the less stable, and thus less essentialistic, variable of task effort to be more important for our students' success than academic aptitude measured by scholastic aptitude tests that are highly correlated with IQ scores (Brothen & Wambach, 2000).

Second, our students bring to us a reinforcement history that is 18 or more years long. In this time, students have acquired behaviors they typically use in academic settings. Some of these behaviors enable success in some settings and not in others. Some behaviors have led to success in the past, but need to be modified as new situations are entered. Students have also acquired some behaviors incompatible with academic success such as habitual television watching or substance abuse. They may also have acquired responses to academic environments that interfere with success such as test anxiety, falling asleep while reading, or generalized learned helplessness in academic situations. We think often of our late General College colleague Henry Borow's comment that many of our students have been repeatedly "clobbered" by the educational system. Once again, we cannot control the past, but an awareness of it may prove useful in determining what activities might benefit our students.

Genetic make-up and reinforcement history resist our ability to directly affect them. They also have in common the notion that something is different about students because of their differing genetic programs or reinforcement histories. As long as we view these forces as affected by selection, we escape the essentialist trap and may even find useful ideas for how to do our work better. Some may not agree that genetics or reinforcement history are so important. For them, and us, we suggest an alternative. For the most part, in regards to our work as developmental educators, we can ignore them. The third force, current environment, is where we should concentrate our energies.

Conclusion

Throughout this paper we have made the analogy to evolutionary thinking that environments select behaviors. Central to our argument is that a selectionist approach to developmental education is useful because it helps us view our students in a more useful and optimistic way. Instead of deficits we see students who are products of environments that selected behaviors that may not be helpful in educational settings. If we continue to focus on the environment, the selectionist approach helps us decide what educational environments should look like.

Our task as developmental educators should be to create environments that select new, adaptive behaviors. Instead of viewing students with myriad learning styles before us in the classroom that would be impossible for us to accommodate equally, we see students with different reinforcement histories ready to have new behaviors added to their repertoire. Our (Wambach et al., 2000) theory focuses on current environment. It suggests that we implicitly assume that all of our students are at the same place, even though they actually may not be. It states that the social environments we create in our classrooms should be constructed in ways that foster adaptive educational behaviors. The theory states explicitly that these environments should be demanding and responsive. It is difficult to do both of these when our students have not had prior success with high school courses or with standardized tests. The findings of the Little Hoover Commission (2000) that 74% of developmental students did not progress beyond one developmental education course suggest to us this was because they did not feel challenged. But challenge without responsiveness is a recipe for more immediate failure—the educational environments we create must be demanding *and* responsive.

We (Wambach et.al., 2000) have laid out some guidelines for how demanding and responsive environments should be constructed. Developmental educators currently look to mainstream postsecondary education for teaching models. We believe we must look elsewhere. Until postsecondary education in general is reformed, which is unlikely to happen anytime soon, developmental educators should begin to change

now. We (Brothen & Wambach, 2000) have outlined our selectionist approach in the classroom. We are certain others exist. It is important to remember that even though our classes, or students' entire college experience, may be a small part of students' lives, the environments we create are very likely to make a positive difference in their lives (Pascarella & Terenzini, 1991). We believe most developmental educators do this naturally. We hope this chapter helps us all think of ways to do this more explicitly.

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Applying Theory to Practice: Mediated Learning and the American Mathematical Association of Two-Year College Standards

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This chapter considers theory and research related to computer mediated learning, a student-centered approach incorporating interactive multimedia software, and considers why mediated learning may be one approach to successfully incorporating the American Mathematical Association of Two-Year College (AMATYC) standards into developmental mathematics programs. In response to growing pressure to improve mathematics education in postsecondary courses below the level of calculus, AMATYC published Crossroads in Mathematics: Standards for Introductory College Mathematics Before Calculus *in 1995 in an effort to set standards for intellectual development of students, pedagogy, and content for these courses. Implementing these standards has proven to be a challenge for many developmental mathematics programs. Mediated learning environments, when structured appropriately, may be one avenue for developmental mathematics programs to incorporate the AMATYC standards.*

During the 1980s and early 1990s mathematics education was under pressure to make changes at all levels. The American Mathematical Association of Two-Year Colleges (AMATYC), an organization whose primary mission includes the development and implementation of curricular, pedagogical, assessment, and professional standards for mathematics in the first two years of college, responded by publishing *Crossroads in Mathematics: Standards for Introductory College Mathematics before Calculus* (i.e., AMATYC *Standards*; AMATYC, 1995). This document provides standards for the intellectual development of students, pedagogy, and content in mathematics courses below the level of calculus. Implementing these standards, however, has frequently proven challenging for developmental mathematics programs. Computer mediated learning, a student-centered approach incorporating interactive multimedia software, may be one approach to successfully implementing the AMATYC standards.

Impetus for the Development of the AMATYC Standards

In the years leading up to the publication of the AMATYC *Standards* (1995) a series of publications called for change in mathematics education across all levels. *Everybody Counts* (National Research Council [NRC], 1989) states specific recommendations for changes in mathematics programs from kindergarten through graduate school. In *Moving Beyond Myths* (NRC, 1991) the National Research Council recommends that significant changes be made in the undergraduate curriculum, and in *Reshaping College Mathematics* (Steen, 1989). Lynn Steen proposes an outline for an undergraduate curriculum.

Much of the call for change in how mathematics is taught across all levels was influenced by two factors. First, there was widespread dissatisfaction with student performance in mathematics, especially when compared with international students. *The Mathematics*

Report Card, (Dossey, Mullis, Lindquist, & Chambers, 1988) stated, "Although more students appear to have mastered basic mathematical skills and concepts in recent years, few achieve the higher range of mathematics proficiency" (p. 7). *The Underachieving Curriculum*, (McKnight, Crosswhite, Dossey, Kifer, Swafford, Travers, & Cooney, 1987) stated, "From an international perspective, U.S. yield in mathematics is very low" (p. xiii). The authors describe the mathematical yield of a system as the product of two quantities: the proportion of high school students that is enrolled in advanced mathematics courses and how much mathematics those students know. The second factor that contributed to the call for change in mathematics education was the release of reports such as *A Nation at Risk: The Imperative for Educational Reform*, (National Commission on Excellence in Education, 1983), and *Everybody Counts* (NRC, 1989), which suggested that the United States would be economically disadvantaged if students did not obtain stronger mathematical backgrounds. In response to these concerns, the National Council of Teachers of Mathematics (NCTM) articulated a set of standards for mathematics education from kindergarten through twelfth grade in *Curriculum and Evaluation Standards for School Mathematics* (NCTM, 1989) and AMATYC published standards for postsecondary courses before calculus in *Crossroads in Mathematics: Standards for Introductory College Mathematics before Calculus* (AMATYC, 1995).

The AMATYC Standards for Intellectual Development, Pedagogy, and Content

The standards articulated by AMATYC (1995) provide direction for developmental mathematics programs and a "yardstick" by which programs may be evaluated, as follows:

1. The standards for intellectual development address desired modes of student thinking and represent goals for student outcomes. Students are expected to engage in substantial mathematical problem solving; participate in modeling using real-world data; expand their mathematical reasoning skills; develop the view that mathematics is a growing discipline interrelated with human culture; acquire the ability to read, write, listen to, and speak mathematics; use technology appropriately to enhance their mathematical thinking; and develop mathematical power (AMATYC, 1995, pp. 9-12).
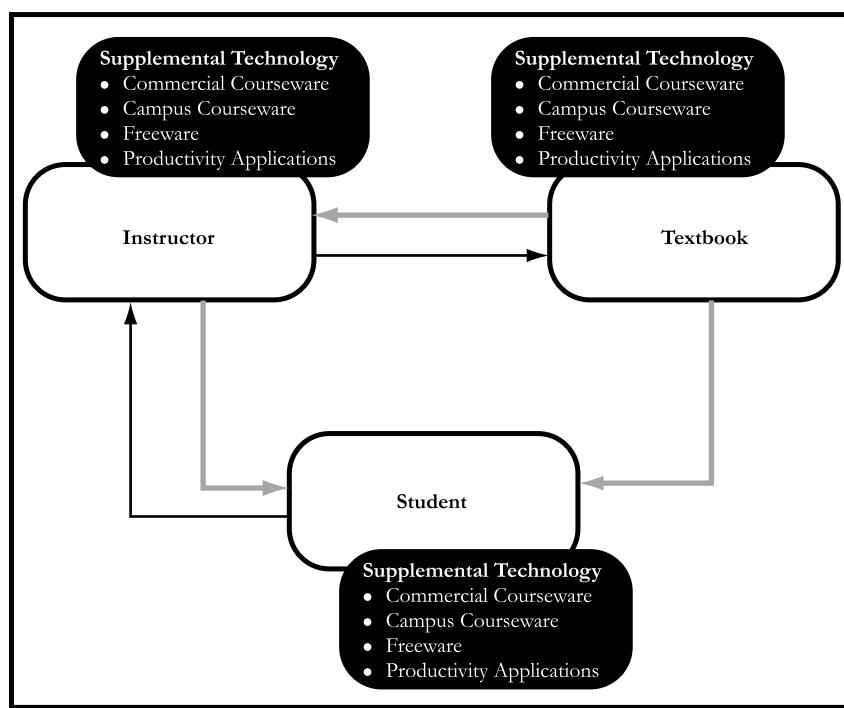

Figure 1. Mediated learning model of instruction and learning.

2. The standards for pedagogy recommend the use of instructional strategies that provide for student activity and interaction and for student-constructed knowledge. Mathematics faculty are expected to model the appropriate use of technology; foster interactive and collaborative learning through student writing, reading, speaking, and collaborative activities; actively involve students in meaningful mathematics problems that build upon their experiences; use multiple approaches — numerical, graphical, symbolic, and verbal; and provide learning activities and projects that promote independent thinking and required sustained effort (AMATYC, 1995, pp. 15-17).

3. The standards for content provide guidelines for the selection of content that will be taught throughout introductory college mathematics. Students will develop number sense, translate problem situations into symbolic representations, develop spatial and measurement sense, demonstrate an understanding of function, use discrete mathematical algorithms, and analyze data and use probability (AMATYC, 1995, pp. 12-14).

The AMATYC *Standards* (1995) describe desired outcomes for developmental mathematics students and programs but do not provide details on how programs should achieve these standards. The document *Crossroads in Mathematics: Programs Reflecting the Standards* (AMATYC, 1999) provides an overview of an array of programs that attempt to incorporate the AMATYC standards but again, not specific blueprints for implementing the standards. It is left to individual developmental mathematics programs and faculty to develop an approach to implementing the standards that best serves their students. An instructional model that an increasing number of programs are incorporating, for various reasons, is mediated learning.

Mediated Learning

Mediated learning is defined as a learner-centered model of technology-mediated instruction (Gifford, 1996). In this model the individual learner is at the center of the teaching and learning enterprise and is given access to and considerable flexibility in the use of a variety of instructional support resources including interactive multimedia instruction and assessment, the instructor, and text.

This allows learners to: (a) exercise more effective and efficient control over their own learning; (b) secure real-time assessment and feedback; (c) secure more information on their own learning through individual and achievement and progress reports; and (d) receive more individualized learning assistance from instructional staff (pp. 18-19). It is technology-mediated instruction because interactive multimedia software is the primary vehicle to deliver the instruction, feedback to student interactions with the technology, and assessment. The instructional staff provides individualized assistance when requested by students.

Mediated learning environments can be structured to support important goals of developmental education, yet allow instructors great flexibility in structuring their courses. Frequent assessment and feedback, for example, can be provided by both the software and the instructor. As students navigate through the software they enter or select responses and receive immediate feedback through the software. They may also discuss with the instructor their reasoning for selecting a particular response or seek clarification of the feedback provided by the software. Feedback is also given to students as they work on, or when they complete, the "checkpoint" question given daily. Students are encouraged to work on these together, which allows them to receive feedback and assistance from classmates.

Another goal of developmental education is to enhance the retention of students. An important step in retaining students is early intervention by the student's instructor and advisor when needed. The computer database provides the instructor with detailed information about each student's success and time on task for each lesson, thus allowing the instructor to quickly assess the progress of each student so that intervention can take place early if the student is not progressing sufficiently. The software allows the instructor to set up courses in a way that lets each student learn in a flexible way (e.g., choice of navigation paths, pace, access to instructor as needed for individual questions). It also allows the instructor to build in a high level of organization and structure (e.g., written objectives for each topic, schedule of homework assignments and exams for the semester, daily checkpoint questions, dedicated times and location for software use and class meetings) that promotes keeping students on track to

meet course objectives. This is another important characteristic of developmental education.

Mediated learning environments necessitate that students and instructors take on different roles than in traditional lecture courses. In the mediated learning model students navigate through interactive multimedia lessons that present the mathematical concepts and skills and provide immediate feedback. Students are able to navigate along a path and at a pace (provided they stay on schedule from day-to-day) that fits their individual preference. The instructor, who is freed up from having to present a lecture, provides support for students individually or in small groups by clarifying explanations provided by the software, assisting students in solving problems using paper and pencil, or engages in tasks that support successful student outcomes such as monitoring student progress, providing feedback and helping students develop good study habits. The text is one form of media, and thus is part of a multimedia learning environment. The text lists the objectives; provides explanations of concepts, procedures, definitions, and other information; and contains the homework problems. The text also serves the important role of making the course material accessible to students when they do not have access to the multimedia software.

It is also worth contrasting mediated learning with the "bolt-on" model of technology-mediated instruction. When contrasted with mediated learning there are two important distinctions worth noting. First, in the bolt-on model the technology is bolted on to the existing components of the traditional learning environment, the instructor, textbook, and the student. Technology of this type is usually designed to support student learning of particular concepts or skills but not to be the primary vehicle to deliver instruction and feedback for the entire course. Second, because of the inadequacies of the bolt-on technology to be the primary vehicle to deliver the course content and provide feedback, the learning environment remains primarily teacher-centered rather than student-centered.

Until recently the technology available for developmental mathematics and other disciplines generally fit the bolt-on description, was used for drill-and-practice, did not incorporate rich multimedia presentations of the content, and provided limited feedback. One consequence of the fact that the widespread use of high quality interactive multimedia software is a relatively recent phenomenon is that much of the existing research is related to first generation technology-mediated instruction, rather than interactive mul-
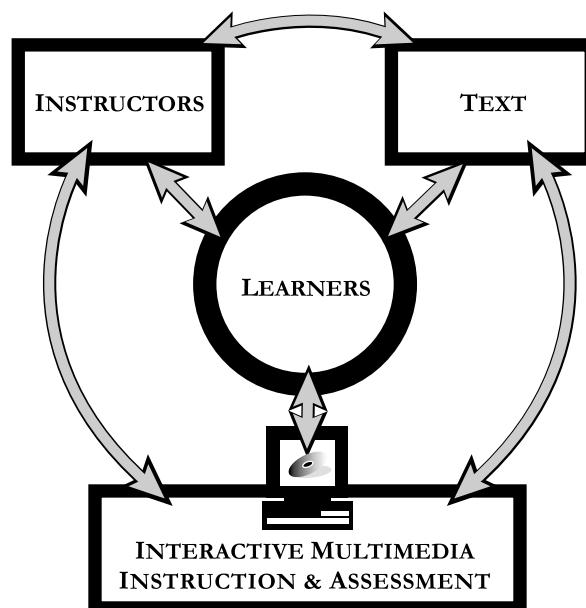

Figure 2. The bolt-on model of technology-mediated instruction in higher education.

timedia software used in mediated learning environments.

Gifford (1996) claims mediated learning enables students to:

1. Exercise more effective and efficient control over their own learning. This is achieved by enabling the student to navigate through topics and lessons over a number of distinct instructional pathways, at his or her own pace, while spending as much time as required working any given topic, exercise, or problem, until the appropriate level of mastery has been achieved.

2. Secure real-time assessment and feedback. This is achieved by enabling the student to receive performance feedback when it is most useful, new instruction when it is required, and extra assistance when it is needed and practical.

3. Secure more information on their own learning. This is achieved by enabling the student to receive individual achievement and progress reports on a timely basis, sufficiently detailed and directive that the individual student becomes more adept at monitoring and regulating his or her own learning progress.

4. Obtain situationally appropriate learning assistance. This is achieved by enabling the student to receive support from teachers or teaching assistants that is informed by detailed assessments of the individual student's strengths and weaknesses, as analyzed and reported by a specially designed instructional support system.

5. Obtain more individualized learning assistance. This is achieved by enabling the student to receive more one-on-one and small group tutoring from instructors and teaching assistants than is feasible in the learning environment dominated by the lecture-presentational approach to instruction. (pp. 18-19)

There is evidence to support Gifford's (1996) claims that mediated learning can be an effective instructional model. The ability to control both the pace of the learning and the navigation path provides students with an opportunity to learn mathematics in a manner that is usually not possible in a traditional setting. Students who "exercise more effective and efficient control over their own learning (Gifford, p.18)" are able to do so because of the interactivity of the software. Najjar (1996) examined the research related to interactivity and stated:

> Interactivity appears to have a strong positive effect on learning (Bosco, 1986; Fletcher, 1989, 1990; Verano, 1987). One researcher (Stafford, 1990) examined 96 learning studies and, using a statistical technique called effect size (difference between means of the control and experimental group divided by standard deviation of the control group), concluded that interactivity was associated with learning achievement and retention of knowledge over time. Similar examinations of 75 learning studies (Bosco, 1986; Fletcher, 1989, 1990) found that people learn the material faster and have better attitudes toward learning the material when they learn in an interactive instructional environment. (p. 131)

Feedback is another key component of the mediated learning model. There is research that shows feedback is important to student self-regulation and self-efficacy (Hattie, Biggs, & Purdie, 1996; Kluger & DeNisi, 1996). Kluger and DeNisi found that feedback should be specific to the task, corrective, and done in a familiar context that shapes learning. In the mediated learning model feedback is available to students from both the software and the instructor. As students progress through the software they are frequently presented tasks that require interaction on their part. Immediate feedback is provided for every student response. If a student answers a question incorrectly on the first attempt, hints or suggestions are provided to point the student in the right direction. Students may then attempt the question again. Following the second attempt, a detailed step-by-step solution and explanation is provided. Students are also able to receive detailed feedback from the instructor during class as they engage in the multimedia lessons, attempt questions using paper-and-pencil, or other areas related to student performance such as course progress and study skills. In the mediated learning model the instructor has the time to provide this type of feed-

back and support throughout the entire class meeting because he or she does not present a lecture.

Reviews of research on the impact of technology-mediated instruction on student learning have consistently found that technology-mediated instruction can have positive effects on student learning (Becker, 1992; Khalili & Shashaani, 1994; Kulik & Kulik, 1991; Niemiec, Samson, Weinstein, & Walberg, 1987). The review by Kulik and Kulik examined 248 controlled studies covering technology-mediated learning in a wide range of courses and learners. In 81% of the studies considered students in technology-mediated settings obtained higher mean examination scores while in the remaining 19% of the studies students in the traditional settings had higher scores. In 100 of the 248 studies there was a significant difference in exam performance, with 94 of the studies favoring the technology-mediated environments.

Interactive Multimedia Software For Mediated Learning.

In developmental mathematics the technology currently being widely used is interactive multimedia software capable of presenting the course content, practice of new skills, and immediate feedback. Multimedia is the use of text, graphics, animation, pictures, video, and sound to present information (Najjar, 1996). Kaput and Thompson (1994) point out three aspects of electronic technology such as interactive multimedia software that "enable deep change in the experience of doing and learning mathematics" (p. 678). First, the ability to interact with the technology, referred to as interactivity, means that a student's actions yield a reaction on the part of the machine, which in turn sets the stage for interpretation, reflection, and further action on the part of the student. The second aspect is the control designers have in creating the learning environments. Kaput and Thompson state:

> One can engineer constraints and supports, create agents to perform actions for the learner, make powerful resources immediately available to aid thinking or problem solving, provide intelligent feedback or context-sensitive advice, actively link representational systems, control physical processes from the computer,

and generally influence students' mathematical experiences more deeply than ever before. (p. 679)

This second aspect of control in creating the multimedia environment provides the opportunity to create an environment that need not be followed in a sequential manner. The third aspect Kaput and Thompson refer to is connectivity. This is technology that links teachers to teachers, students to students, students to teachers, and the world of education to the wider world. Academic Systems Corporation (2000) currently offers the option of browser-based interactive multimedia software for developmental mathematics that includes the ability for instructors to post online notes and a feature that allows students and instructors to exchange electronic messages. Features such as these, coupled with the ability of the software to deliver the course content and provide immediate feedback, is resulting in the Academic Systems software increasingly being used in location-independent instructional formats.

Although considerable research remains to be conducted related to the effective implementation of interactive multimedia packages in developmental mathematics, there is evidence that some programs have been able to improve completion rates and grades using mediated learning. In 1998 Academic Systems Corporation reported on their website (http://www.academic.com) that data on pass rates of 23,000 students in entry level mathematics classes from campuses around the country showed that 52% of students in traditional sections passed compared to 63% of students who passed using software from Academic Systems. In a study at California State University-San Luis Obispo, students who studied introductory algebra, intermediate algebra, or both using software from Academic Systems earned a significantly higher proportion of final grades of C or better in conventional precalculus courses when compared to students who studied the same courses in conventional classrooms (Baker, Hale, & Gifford, 1997). It is worth noting the outcomes of students using mediated learning from Academic Systems Corporation because Academic Systems claims that more students purchase their *Interactive Mathematics* for three courses, Prealgebra, Elementary Algebra, and Intermediate Algebra, than any single textbook title (Academic Systems, 1999).

Discussion

Developmental mathematics programs have been working to implement the AMATYC standards since they were published in 1995. Mediated learning appears to have merit as one means of enhancing student outcomes, at least for some developmental mathematics students. Features such as rich multimedia presentations of concepts, immediate feedback, and interactivity allow students to learn mathematics in ways not possible in a traditional lecture course and give students greater control over their own learning. Students also benefit from greater opportunities to discuss mathematics individually with their instructor and to receive feedback about their work. For students who need greater flexibility in terms of time and location for learning, the mediated learning software allows students access from any location with a personal computer (PC) and Internet access. The features of mediated learning, along with the flexibility that it affords instructors in setting up courses and students in learning, results in instructors being able to incorporate activities into their program that support the AMATYC standards. For example, our daily checkpoint questions promote mathematical communication and reasoning, the use of built-in technology tools and lessons support the use of multiple representations, and our students are actively engaged in the learning process as they read mathematics and interact with the software. In implementation models where students have access to the software outside of class, such as a lab on campus with a tutor available, valuable class time can be freed up to have students work cooperatively on problem solving activities or projects, which further supports implementing the AMATYC standards.

At the University of Minnesota General College we are in the process of developing and validating an inventory to inform students in which course format, mediated learning or traditional lecture and discussion, they will be most successful and satisfied. Students are also assisted in selecting their choice of instructional format through orientation sessions, meetings with advisors, and discussions with mathematics instructors. Through these efforts we attempt to place students in the learning environment that best matches their learning style. There is growing evidence that instruction that allows students to learn using their preferred learning style can lead to improved student outcomes (Higbee, Ginter, & Taylor, 1991; Lemire, 1998).

There has been little discussion in the developmental mathematics community about how mediated learning can support the AMATYC standards. This may be due to several reasons. First, the very process of initially offering instruction involving interactive multimedia software requires significant time and effort to review software options, ensure that the necessary hardware and technical support is available, develop a curriculum plan and an implementation plan, and communicate important information about changes in the mathematics program with others such as administrators and advisors. Second, because mediated learning represents a dramatic shift in how developmental mathematics is taught from the traditional lecture format, many instructors are still feeling their way through the basics of this type of instruction. In the early stages of mediated learning there tends to be a focus on issues such as handling technical problems, learning how to effectively support student learning as they use the software during class, and attempting to develop a course structure that incorporates the benefits of multimedia instruction while at the same time provides an environment that keeps students on task and leads to successful outcomes. However, with experience and thoughtfulness about how to best serve their students, developmental mathematics programs may find that mediated learning can be an asset when striving to incorporate the AMATYC standards into their program.

The standards for intellectual development advocate that students acquire the ability to read, write, listen to, and speak mathematics, engage in substantial problem solving, expand their mathematical reasoning skills, and use technology in ways that enhance their mathematical thinking. The standards for pedagogy state that faculty should foster interactive learning through collaborative activities, model the appropriate use of technology, and model the use of multiple approaches – numerical, graphical, symbolic, and verbal. Unlike many students in traditional lecture courses who sit passively, or at most studiously take notes of what the instructor writes on the board, students in mediated learning environments are actively engaged in the reading, listening, and the working of mathematics. The interactive nature of the software necessitates that students read and attempt to make sense of what they have read in order to enter or select appropriate responses. To facilitate students' abilities to communicate mathematically, and to strengthen their mathematical reasoning and problem solving

abilities, our students are given daily paper-and-pencil "checkpoint questions." Students are encouraged to work together on these by sharing their strategies, explaining their mathematical reasoning, and justifying their answers. Instructional staff provide guidance and feedback when necessary as students work on the checkpoint questions, but also view this as an opportunity to communicate mathematically with students. The instructor does not lecture, making it is possible to have extended conversations with students about their mathematical thinking and reasoning. Even though a mediated learning environment makes significant use of multimedia software, it is appropriate to set aside times when students can work together collaboratively in small groups or through cooperative learning. This supports the standard of interactive and collaborative learning and is supported by research showing that it often contributes to increased academic success (Davidson & Kroll, 1991; Johnson & Johnson, 1989; Thomas & Higbee, 1996).

The standards also encourage the use of multiple representations-numerical, graphical, symbolic, and verbal, along with the appropriate use of technology. Interactive multimedia software incorporates frequent use of multiple representations such as symbolic, tabular, graphical, and written words. This frequent use of multiple representations strongly supports the development of mathematical understanding as defined by Hiebert and Carpenter (1992) in the *Handbook of Research on Mathematics Teaching and Learning,* who state:

> A mathematical idea or procedure or fact is understood if it is part of an internal network. More specifically, the mathematics is understood if its mental representation is part of a network of representations. The degree of understanding is determined by the number and strength of the connections. A mathematical idea, procedure, or fact is understood thoroughly if it is linked to existing networks with stronger and more numerous connections. (p. 67)

The Lesh Translation Model (Lesh, Landau, & Hamilton, 1983; Post, Behr, & Lesh, 1986) describes how translations that form connections between modes of representations can be performed either between modes of representations or within modes of representation. A translation between modes would include translating from an algebraic equation to a graphical representation. A translation within the same mode of representation would include translating from an initial graph to a graph where the scales on the axes have been changed. Interactive multimedia software, with its ability to quickly and easily generate various representations, interactive nature, and built-in tools such as graphers, may help students develop the ability to translate between and within modes of representation, and thus increase the development of mathematical understanding.

Well designed multimedia software may also support the standards when it incorporates real-life situations that model the mathematics under consideration and by forming connections to other disciplines. Engaging students in real-life situations and forming connections to other disciplines that students find meaningful can be a challenge. The use of video, animation, graphics, and sound provide software engineers with the tools to model real-world situations and form connections to other disciplines in ways that aren't possible in a traditional environment. The use of multimedia and built-in tools such as graphers and scientific calculators support the standards of using technology, multiple approaches (i.e., representations) and developing mathematical power. Mediated learning embeds the use of the technology directly into the learning environment, rather than using it in a support role such as in the "bolt-on" approach, allowing students to actively learn, explore, and conjecture with the technology at all times.

Summary

The *AMATYC Standards* (1995) articulate standards for the intellectual development of students, pedagogy, and content for postsecondary courses below the level of calculus. Mediated learning shows promise, based on current theory and research, as a type of learning environment in which the AMATYC standards may be implemented. As developmental mathematics educators gain more experience in mediated learning environments and more research is conducted, specific details about various implementation models for incorporating the AMATYC standards into a mediated learning environment will emerge. At the University of Minnesota General College we continue to have one eye on our mediated learning environment, and the other on the AMATYC standards,

as we continue our research to bring into focus our vision of how to incorporate the AMATYC standards into a mediated learning environment.

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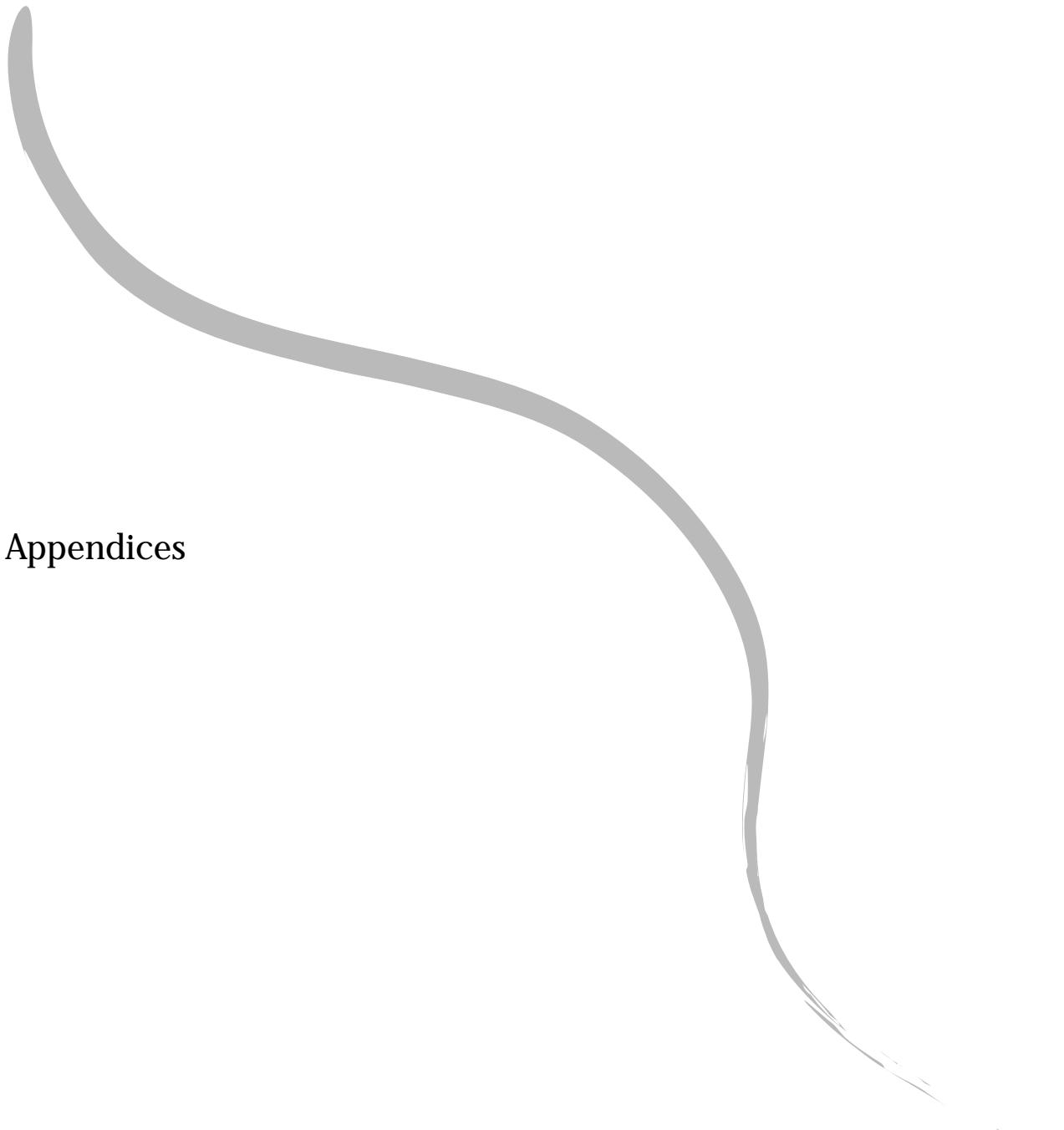
Appendices

CRDEUL

The Center for Research on
Developmental Education and Urban Literacy

Publication Announcements

Proceedings of the
First Intentional Meeting
on Future Directions
in Developmental Education
Now Available

Proceedings of the
Second Intentional Meeting
on Future Directions
in Developmental Education
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Call For Submissions - CRDEUL Monograph Series
Exploring Urban Literacy and Developmental Education

The third annually published independent monograph sponsored by The Center for Research in Developmental Education and Urban Literacy, General College, University of Minnesota.

We encourage and invite developmental educators across the country to contribute to the third independent monograph in a series sponsored by the Center for Research in Developmental Education and Urban Literacy (CRDEUL). The goal of these monographs is to build strong research and theoretical foundations in the field of developmental education from the perspectives of teachers, researchers, and support services specialists.

The third monograph will feature an exploration of issues related to access and "urban literacy," which are at the heart of developmental education in urban settings. It is important to examine the framework of developmental education as it addresses the needs of urban students. In particular, developmental educators need to understand the intersections and impact of such issues as race, class, and gender; second-language acquisition; workforce literacy and training; disability culture; and other issues that may adversely affect traditionally bypassed, disadvantaged, or underrepresented students as they enter college.

Research has suggested that urban students acquire and practice a diverse range of "literacies" or "Discourses" (James Paul Gee, 1998, *Social Linguistics and Literacies*) in navigating their social, family, community, and educational settings. These practices may assist, or sometimes impede, their access to the cultures and literacy practices valued in higher education. As developmental educators, we need to identify these issues and understand how they shape student development and learning along all continuums of education, both before and as they enter college settings. This will further contribute to the development of relevant student learning theories for developmental education, specifically as it can better define the diverse needs and backgrounds of urban students.

Articles for this monograph might explore and expand the following questions:

- What is "urban literacy" as it relates to developmental education theory, research, policy, and practice?

- Which theories might contribute to this definition?

- What are some issues that are unique to urban settings that impact students entering developmental education programs?

- Which other types of "urban literacies" might be identified across the disciplines, as it relates uniquely to issues impacting urban students; and what are some possible multi- or interdisciplinary perspectives we need to address (i.e. multiculturalism, technology access and literacy, urban environmental issues, workforce literacy, and the impact of welfare reform initiatives in higher education)?

- What are some student stories that might illustrate the kinds of "urban literacies" we need to acknowledge in our work and begin to serve better in our programs?

- What K-16 connections and continuums of learning should we address in the field?

- Which programs and community relationships have been forged in the field that uniquely address issues of "urban literacy" and developmental education?

- How does "urban literacy" relate to access and policy debates in higher education?

Submissions (see attached form) must be postmarked by **February 16, 2002**. Manuscripts will be forwarded to the editorial board for peer review. Authors will then be notified regarding the status of their proposals and receive recommendations and feedback by April 5, 2002. Manuscript revisions will be due by June 15, 2002. The final publication goal for this monograph is fall 2002.

Refer to the attached guidelines for authors for further information related to manuscript submission. This information is also available online at (http://www.gen.umn.edu/research/crdeul/).

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Cover Sheet

Exploring Urban Literacy and Developmental Education

Center for Research on Developmental Education and Urban Literacy
General College, University of Minnesota

POSTMARK DEADLINE: February 16, 2002

Lead Author:_____

(All further correspondence will be directed to lead author.) _____

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We, the undersigned, agree to have this manuscript published in the CRDEUL monograph, *Exploring Urban Literacy and Developmental Education.* This manuscript does not duplicate previously published works or articles under consideration for publication elsewhere. We agree to abide by revision decisions made by the co-editors and editorial board. Signatures of all authors must appear below.

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Submit this cover sheet, 5 copies of the manuscript, and 3 labels with lead author's return address to Jeanne Higbee, CRDEUL, General College, University of Minnesota, 333A Appleby Hall, 128 Pleasant Street SE, Minneapolis, MN 55455 by February 16, 2002 (postmark deadline).

Guidelines for Authors

Center for Research on Developmental Education and Urban Literacy (CRDEUL)
General College
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To be considered for publication, manuscripts must comply with the following guidelines:

1. Manuscripts must be typewritten, double-spaced, minimum one-inch margins, regular type face/font, preferably 12 point, no right justification. Do not use italics, bold, or special fonts.

2. The subject must be relevant to the monograph theme.

3. Manuscripts must not duplicate previously published works or articles under consideration for publication elsewhere. All authors will be required to sign a non-duplication agreement.

4. Manuscripts and reference style must be in accordance with the *Publication Manual of the American Psychological Association* (4th ed.). Submissions that do not comply with APA style will be returned to the author(s).

5. The title page must include the title of the chapter (not to exceed 12 words); the name(s) and institutional affiliation(s) of all authors; and the address, telephone numbers (work and home), and fax and e-mail information, if available for the lead author. All correspondence will be with the lead author, who is responsible for all communication with any additional author(s).

6. The second page should be an abstract of the manuscript, maximum 100 words.

7. The body of the chapter should begin on the third page, and may range in length from 10 to 30 pages, including all references, tables, and figures. Each page should include the running head and page number in the upper right corner, as described in the APA manual.

8. Names and institutional affiliations must be omitted from the body of the manuscript. Where appropriate, identifying information will be inserted following the blind review process.

9. Figures and tables must be camera ready, according to APA style, on $8^1/2$" x 11" paper, one per page, with figure captions appearing on a separate page. Any figures, drawings, diagrams, or tables must be the original work of the author(s). Only figures and tables that are necessary support to the text will be published.

10. Only references cited in the text may be included in the reference list. Care must be taken to attribute all quotations to their published sources. Direct citations for quoted work must be provided except in those rare situations when the original source is not available. Direct quotes must be accompanied by citations, including page numbers. The authors are responsible for the accuracy of all citations and references.

11. The only acknowledgments that will be published will be those required by external funding sources.

12. Manuscript authors must agree to abide by revision decisions made by the editors.

13. Upon acceptance the author(s) will be responsible for making required revisions and resubmitting the manuscript on disk.

14. Accepted manuscripts become the property of the Center for Research on Developmental Education and Urban Literacy and may not be reprinted without the permission of CRDEUL.