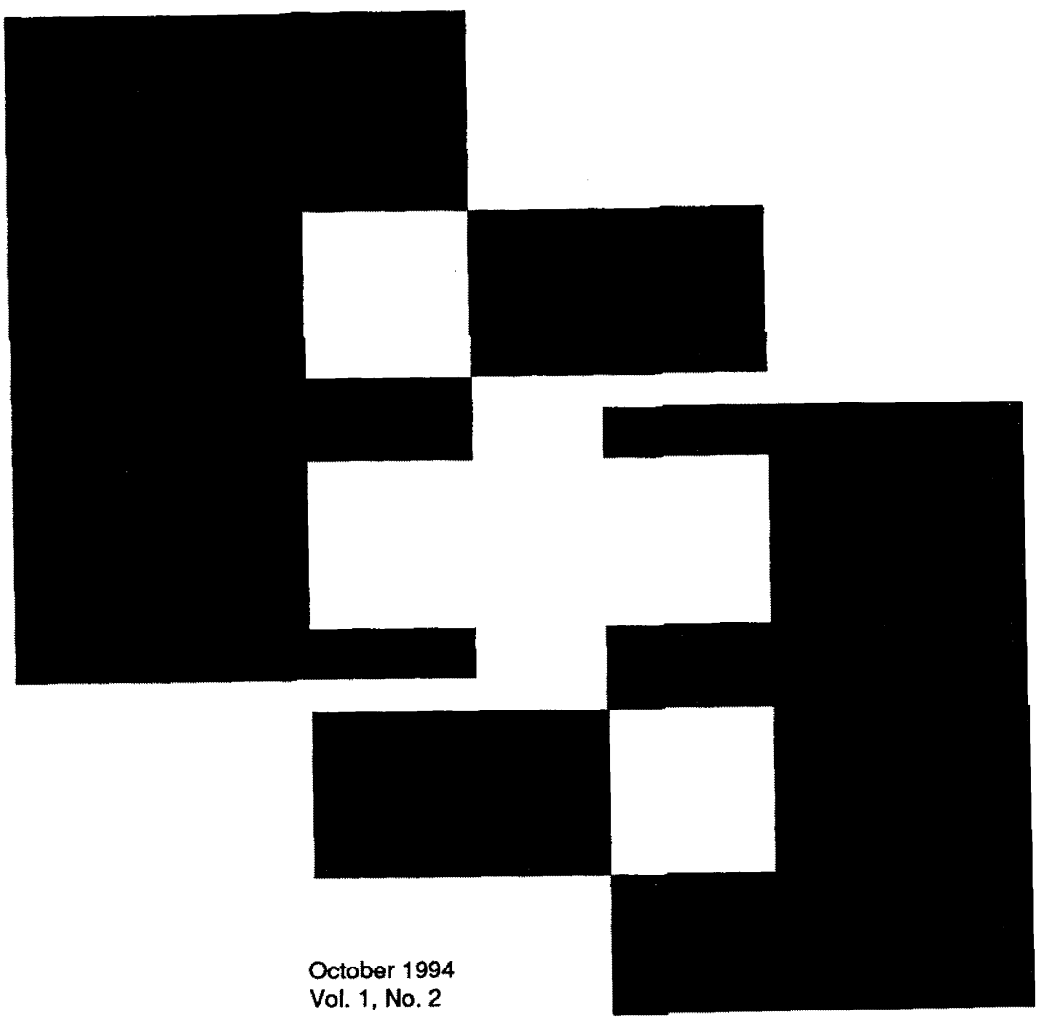
Language and Learning Across the Disciplines

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



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Language and Learning Across the Disciplines

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Language and Learning Across the Disciplines is a forum for issues concerning interdisciplinarity, situated discourse communities, and writing across the curriculum programs. The journal will publish articles dealing with issues in learning theory, discourse analysis, participation in disciplinary discourse, and the social, intellectual and political locations of WAC programs. We welcome articles seeking to make connections among several such areas of inquiry. All manuscripts will be carefully reviewed by members of the editorial board and appropriate outside readers. You may expect to hear from us in two months. When submitting a manuscript please follow the current MLA or APA style sheet; submit three copies (3,000 to 7,000 words); print your name, address, telephone number and affiliation on a cover sheet, not on the manuscripts; and enclose sufficient return postage clipped, not pasted, to a self-addressed envelope. Send manuscripts to Sharon Quiroz and Michael Pemberton, Editors, *Language and Learning Across the Disciplines*, 1025 Angell Hall, Ann Arbor, Michigan 48109-1003

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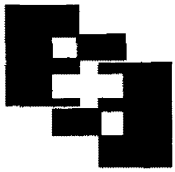

Language and Learning Across the Disciplines

A journal about interdisciplinarity, situated discourse communities and writing across the curriculum programs.

Volume 1 Number 2 **October 1994**

In This Issue...

Language and Learning Across the Disciplines is a joint publication of the University of Illinois, Urbana-Champaign, and the University of Michigan, Ann Arbor, and follows the NCTE guidelines for non-sexist language. Publication of this journal is supported by the University of Illinois Center for Writing Studies

Letter from the Editors

Sharon Quiroz
University of Michigan, Ann Arbor
Michael A. Pemberton
University of Illinois, Urbana-Champaign

The four articles that comprise this second issue of *Language and Learning Across the Disciplines* do not all directly address the conflict between "writing-to-learn" *and* "writing in the disciplines," but the journal's mission as a forum for such issues is served by juxtaposing them here. In "Resistance and Reform: The Role of Expertise in Writing Across the Curriculum Programs." Daniel Mahala and Jody Swilky take the "writing-to-learn" point of view. They directly attack tie "second wave" notion that the engine driving WAC programs should be the mastery of disciplinary languages, asserting that such a program subverts the agenda for social change which has been the core of WAC since its beginnings in England. The authors express doubt that research into the languages of the discipline will produce any critique of those proprietary languages and will therefore merely replicate existing disciplinary constructs — for better or worse. In contrast, however, "Students and ProfessianalsWriting Biology: Disciplinary Work and Apprentice Storytellers," written with unusual wit and grace by Sharon Stockton, who actually does research the language of biology in journals and classroom practice, explicates the gap between professional practice and curricular representation. And she dues so, in part, by critiquing disciplinary practice.

The second set of two articles in this issue tries to find a middle ground between these oppositional stances, making the implicit case that it is indeed possible to valorize the discourse conventions of individual disciplines while simultaneously offering students the opportunity to transcend them. The first reports research by a team of investigators, Ann M, Blakeslee, Jo-Ann M. Sipple, John R. Hayes, and Richard E. Young. "Evaluating Training Workshops in a Writing Across the Curriculum Program: Method and Analysis," appears to assume that it is a good thing to transmit the values of the disciplines,

while at the same time the authors' method of evaluation very clearly sets forth criteria for teaching excellence which assume the student-centered, writing-to-learn pedagogy of traditional WAC programs-in the tradition of Fulwiler and Young, that is. In the second article, "Introducing Students to Disciplinary Genres: The Role of the General . composition Course," another research team argues that first-year programs in English departments can and should introduce students to the more readily visible aspects of writing in the various disciplines, and suggests a plan for doing so. Patricia Linton is joined by two psychologists, John Madigen and Susan Johnson, in making this interdisciplinary argument.

The members of our editorial board take different positions on this issue, embodying as many different shades of positions as the authors of this issue's articles do, and the contributors whose work we have considered but not yet published here adopt, perhaps, an even greater range of positions, However, the majority of the manuscripts we have received seem to assume that WAC exists to teach students the language of the disciplines. We don't often see articles that build from a theoretical or political position like Mahaha/Swilky's, and go on to offer the kind of help with everyday practice in "content" classrooms that the remaining three articles in this issue do.

But surely such theoretical and political assumptions are put into practice every day. We know there are instructors trained in other disciplines who share Mahala/Swilky's agenda for disciplinary and social critique and practice it in their classrooms. However as editors of *Language and Learning Across the Disciplines,* we have seen no manuscript that examines practice in, for example, a feminist classroom other than the author's own, and that will invariably be a writing class. To study "the language of a discipline" and critique it should mean to study the emerging as well as the dominant and residual languages that serve other disciplines-to use the language of Mahala/Swilky. We would like to see more investigations of this type, and we'd like to ask: How does knowledge production and its accompanying rhetorics change over time in disciplinary discourse? Where are the sites of these emerging reconstructions.? And what forms of critique are likely to appear with what effects on inquiry, disciplinary conventions, and writing?

The Second National Writing Across the Curriculum Conference will be held February 2-3, 1995, in Charleston, South Carolina. The conference will provide a unique opportunity for administrators and theorists to meet with practitioners in all disciplines to discuss a wide range of practical and theoretical issues relating to WAC. The conference will focus on such issues as program administration and assessment, interdisciplinary collaboration, research opportunities, school/college collaboration, classroom practices, and writing in the disciplines. Registration will be limited to 300 participants. To receive information about the conference and registration materials, please write Sylvia Gamboa, Department of English, College of Charleston, Charleston, SC 29424,

ESSAY COMPETITION

Graduate students in rhetoric and composition are invited to submit papers on the topic of entering the discipline for the Fifth Annual Symposium on the Teaching of Composition at Texas Christian University. This year's symposium, "What Comes After Composition and Rhetoric?: Issues Facing the Discipline" features keynote speaker Janice Lauer. The winner will be a featured speaker at the symposium and will receive a registration waiver, a commemorative plaque, and a $50 crash award. Students should submit two copies of the manuscript, not to exceed 10 pages double-spaced, and an abstract, not to exceed 125 words. The contestant's name, address, affiliation, and phone number should appear on the cover sheet only; the manuscript should include no internal reference to the author. Papers cannot have been submitted to other conferences or have been previously published. Submit papers by December 1, 1994, to Rachelle M. Smith, Symposium Coordinator, Department of English, Box 32872, Texas Christian University, Fort Worth, TX 76129.

Evaluating Training Workshops in a Writing Across the Curriculum Program: Method and Analysis

Ann Blakeslee
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John R. Hayes
Carnegie Mellon University
Richard Young
Carnegie Mellon University

Introduction

Robert Morris College in Pittsburgh, Pennsylvania, is a small private college (approx. 5,000 students, 110 full-time faculty) that emphasizes undergraduate and graduate instruction in business. Its degree programs include a strong foundation in the liberal arts. Robert Morris College prides itself on its commitment to teaching. The faculty of the college tend to be student-oriented and receptive to faculty development programs and interdisciplinary interaction. In 1984, it began a comprehensive writing program based on writing-across-the-curriculum principles (Carson, 1991, Sipple, 1989). Twenty-one faculty members selected from the eleven departments of the college participated in a 45-hour series of workshops conducted during the first year by Richard E. Young of Carnegie Mellon University. During the subsequent years, Jo-Ann M. Sipple of Robert Morris College, who was then head of the Department of Communications, conducted similar workshops. In the workshops, each faculty member targeted one of his or her courses, redesigning it with the purpose of integrating writing-to-learn tasks as a means of helping students enter the discourse community of the discipline they were studying.

As the basic strategy of increasing the amount and kinds of writing students did, the program planners sought to educate faculty from every discipline in the College in WAC principles and practices. The faculty, the program planners argued, are the custodians of the educational process, It is their responsibility to transmit their disciplines, design the courses and curriculums, certify that students have learned, and so on.

Involve them directly in the educational enterprise, the planners reasoned, and substantive changes in student abilities are more likely than if the burden of change is borne solely by the curriculum, in the form of more required courses, or by the students, in the form of exit tests in writing that must be passed before graduating.

The plan was to reach all or nearly all the faculty in all the disciplines in the College by means of training workshops. The workshops had three broad educational objectives: to help the faculty understand (1) WAC principles and methods; (2) ways to incorporate the principles and methods into their teaching; and (3) the contribution of writing, not only to effective participation by students in their disciplines but to acquiring the disciplines as well ("writing to learn"). The writing-to-learn objective requires a bit more comment. Workshop participants were taught to distinguish writing to learn from writing to communicate, And they were taught how to use writing as a tool for thinking in the disciplines – in particular, how to engage students in problem-solving activities in which writing was not only a means of communicating results but an aid in engaging in what John Dewey called "reflective thinking" (1910).

One of the distinctive features of the workshops was the recognition of the close relationship between WAC pedagogy and course design. The approach to writing across the curriculum at Robert Morris was described by a team of external evaluators from Writing Program Administrators in 1985 as "structural" (Sipple and Stenberg, 1990, p. 183): rather than asking the workshop participants to simply incorporate writing tasks into existing courses, they were asked to combine their disciplinary expertise with their newly acquired knowledge of writing research in rethinking and restructuring an existing course. This conception for the workshops was prompted by early reports of disruptive effects of WAC pedagogy on the teaching of existing courses (e.g., Graham, 1983-84). If WAC methods are simply grafted on to well-established courses, the result can be increased work loads for both students and teachers. Such practices can also result in basic disharmonies among the educational activities and even the objectives of the course, as when a write-to-learn pedagogy is incorporated in a course designed essentially to convey an ordered body of information, In cases such as this, the teacher may feel that the work load has become more burdensome or that the course has lost its coherence and, as a consequence, may become disenchanted with WAC. Those who persist in the face of such difficulties, may, as Joan Graham reports (pp. 2 X-22), begin

redesigning the course. The linkage of WAC principles with course design in the workshops was an effort to by-pass this often frustrating and costly evolutionary process. It made the primary activity of the workshops the redesign of courses that the participants were already teaching in order to incorporate WAC assumptions and methods.

The strong emphasis in the workshops on the analysis of educational means and ends in the redesigning of courses was based on methods of course design developed by Ralph Tyler (1950) and Algo Henderson (1965). The methods entail the analysis of course objectives, analysis of methods and materials that could be used in achieving the objectives, and preparation of a syllabus of instruction based on the outcomes of these analyses. The intensive efforts in the workshops resulted in exemplary course plans that exploited writing-to-learn activities to achieve course objectives, In a similar way each faculty member also prepared a plan for evaluating the course to ensure that writing-to-learn activities were both integrated and effective. In the subsequent semester the participants implemented the plans in their classrooms.

Activities in the workshops, then, focused on helping faculty

- reformulate their course objectives to include writing-to-learn concerns;
- use writing as a means to attain course goals, rather than as an end in itself; and
- develop course plans, assignments, and plans for evaluation that took into account the importance of writing in helping students to learn (Sipple, 1989).

The ultimate goal of the program was the creation of a campus-wide environment that nurtured student literacy in the majority of classrooms and over the four years of the baccalaureate. (For a description of the fully developed program, see Sipple and Stenberg, 1990.) The program had a number of other attractions, among them its relatively low cost, ease of management, increased sophistication in faculty teaching, diffusion of responsibility for literacy beyond the English Department, and increased sense of collegiality among the faculty.

The proposal for the program at Robert Morris (called "Writing Across the Business Disciplines," or "WABD") specified that the entire program be evaluated three times, beginning in 1986.[1] The discussion that follows reports on one part of the evaluation project – the effort to evaluate the effectiveness of the faculty workshops in encouraging and

helping participants to integrate writing-to-learn activities into their courses. (For a summary of the entire evaluation project, see Sipple, 1989.) Because of the program's reliance on a faculty-oriented strategy, determining whether the workshops for the faculty actually fulfilled their function was crucial. If the workshops were effective, the program had a good chance of succeeding; if they were ineffective, it was quite likely to fail. Below we discuss in detail both the outcomes of the evaluations and the method we used to conduct them. The protocol/interview method used in the project is, we believe, at least as significant a contribution to research on writing across the curriculum as the specific results of the project.

The Approach to Evaluation

The general question asked in evaluating whether the workshops both persuaded and helped participants to integrate writing-to-learn activities into their courses was this: Did the workshops influence the participants' approaches to constructing writing assignments in ways that reflect the principles advanced in the workshops? We selected faculty writing assignments as the focus of this part of the evaluation project since they are suggestive of instructors' concerns and approaches to teaching writing. Further, the assignments created by workshop participants could be compared with those created by nonparticipants, with both sets of assignments being analyzed for evidence, or lack of evidence of the principles espoused in the workshops. The specific questions we asked about the assignments included: Did the participants in the workshops try to create writing assignments that promoted student learning, that helped students solve problems related to the course, that were integrated into the course structure, and that were manageable by the students?

To answer these questions, we developed what we call the "protocol/interview" assessment method. With this method, several workshop participants were asked to provide think-aloud protocols while they created a writing assignment for one of their classes. Immediately after completing this task, they were asked a series of questions about their goals in creating the assignment. Other faculty who taught comparable courses and who did not participate in the workshops were given the same tasks. Raters then examined the protocols and the answers to the interview questions to identify evidence bearing on each subject's approach to creating writing assignments. Because the subjects in the evaluation went observed while they were creating writing

assignments and were interviewed soon after, we believe that the protocol/interview method provided sensitive indices of the subjects' approaches to this educationally important task. In contrast, we believe that interviews alone, because they are not so closely tied to performance of the task, are less likely to provide useful information than protocols and interviews together.

Method

Data collection for the Robert Morris evaluation was carried out in three phases by three teams of researchers. Phase 1 was carried out in the Spring of 1986; Phase 2 in the Spring of 1987; and Phase 3 in the spring of 1989.

Subjects

The subjects in Phase 1 were nine faculty members, five who attended the workshops and four who did not. The subjects in Phase 2 were 15 faculty members, eight who attended the workshops and seven who did not. The subjects in Phase 3 were 16 faculty members, eight who attended the workshops and eight who did not. The workshop participants were chosen to provide as broad a sampling as possible of the disciplinary areas on the Robert Morris campus. Each of the non-participants was chosenbecause he or she was in the same discipline and taught the same course as a participant.

Procedure

The subjects were asked to think aloud, describing as fully as possible their main teaching/learning concerns while planning and composing a writing assignment for their classes. The instructions for the protocol read:

> Devise one writing assignment for your course, _____. While you are devising the assignment, describe as fully as you can your main teaching/learning concerns. Talk aloud about what is going on in your mind while you are doing the task. Write the words for the assignment which you would have typed to hand to the student.

Following the think-aloud sessions, each subject was asked six questions (Appendix A) designed to supplement the information obtained through the protocol. These questions concerned the objectives of the assignment, its use in the course, its relation to course goals, specific learning problems addressed by the assignment, and the intellectual demands it placed on the students. The protocols and the post-

protocol interviews were tape recorded and transcribed for later analysis. These transcripts together with any written text or notes produced during the protocol session and the assignments that the faculty members created constituted the data set for each subject.

Analysis

For analysis of the protocol and interview data, the raters were given the list of 19 features shown in Table 1. These features were developed and used to evaluate each complete data set, including protocol and interview transcripts, written texts and notes, and the assignments created. Some of the features focus on the nature of the assignment created, and the concerns suggested by it, while others address, more explicitly, the thinking and attitudes of faculty members while creating the assignments. Raters were asked to examine the data set for each subject to determine whether each of the 19 features was present or not.[2] Each data set was analyzed as a single unit; that is, all three sources of data (protocols, interviews, and writing assignments) were examined for evidence of each of the features under investigation. The raters did not know which data sets belonged to participants and which to non-participants.

1. The writing assignment is designed to do more than test student knowledge. The writing assignment is designed to promote student learning/discovery.
2. The writing assignment leads the student to solving a particular problem in achieving course objectives.
3. The writing assignment is responsive to a learning problem that the teacher has identified.
4. The teacher is aware that the writing assignment is cultivating a level of cognitive ability.
5. The writing assignment is integrated into the on-going learning process in the course.
6. The teacher has an awareness of different, varied ways of responding to student writing with a mind toward giving feedback to the student.
7. The teacher's response to student writing is integrated into the on-going process of the course.
8. The writing assignment is manageable for the student given the allotted time, constraints, and description of the writing assignment.
9. The teacher realizes that creating an assignment is a rhetorical task.
10. The teacher is concerned that students see the purpose of the writing assignment.
11. The teacher realizes that the assignment will provide him/her

with valuable information about student learning/progress in the course.

12. The teacher has thought about the task in concrete operational terms; recognizes sub-tasks involved.
13. The teacher is sensitive to his/her students' abilities, e.g., thinks about how students might respond to the task.
14. The teacher is sensitive to students' abilities and plans to act on that information, e.g., by modifying assignments, providing extra guidance, etc.
15. The teacher is sensitive to student needs, e.g., the types of writing and other skills students will need in later courses or in their careers.
16. The teacher is sensitive to student needs and plans to act on that information, e.g., by modifying assignments, providing extra guidance, etc.
17. The teacher is sensitive to students' attitudes towards writing.
18. The teacher gives students a specific audience to write for.
19. The teacher hopes that the writing assignment will help improve students' writing skills (intentionally or as a side effect).

Table 1. Features of the Protocols, Interviews and Assignments Assessed by the Raters.

In addition to these 19 features, two additional features of the writing assignments as well as the length of the protocols were assessed by the raters. These additional measures are shown in Table 2.

20. Quality of the writing assignment rated on a scale of 1 (low) to 4 (high):
    1 = Low quality: confusing, purposeless, not integrated into course goals, etc.
    4 = High quality: well thought out and articulated, fits into course, helpful, etc.

21. Breadth of teacher's view of writing rated on a scale of 1 to 4:
    1 = Restricted view: writing equals grammar, correctness; writing takes place after thinking; writing is thought of in terms of number of pages; etc.
    2 = Larger view: writing is a medium for thinking and learning; writing is an occasion for exploration; etc.

22. Protocol length (number of transcript lines).

Table 2. Additional Measures Assessed by the Raters.

Results and Discussion

The results of each of the three phases of the evaluation suggest that the protocol-interview method was a reliable and sensitive measure for determining the effects of the WABD workshops on participants' attitudes and on their approaches to constructing writing assignments. More specifically, the method, in this case, revealed that participants constructed assignments in ways that reflected the principles advanced in the workshops. Participants were more likely than non-participants to create writing assignments that promote learning or discovery (Feature 1), that solve a problem in achieving course objectives (Feature 2), that respond to students' learning difficulties (Feature 3), that take students' abilities and plans into account (Feature 14), and that are integrated into the on-going learning process in the course (Feature 5). Further, participants were more likely than non-participants to view writing assignments as cultivating cognitive abilities (Feature 4) and less likely to view them as a means for improving students' writing skills (Feature 19).

Table 3 shows the numbers of participants and non-participants in each phase of the study who exhibited each of the 19 traits listed in Table 1.[3] To analyze the results of these features, we used Fisher Exact tests (Siegal and Castellan, 1988, p, 103) to assess the significance of the observed differences between participants and non-participants for each feature and each phase. These significance levels for features 1 through 5, 14 and 19 for each phase of the evaluation are shown in Table 4, Then, using the inverse chi-square method (Hedges and Olkin, 1985, p. 37), we combined the significance levels for the three phases to obtain an overall significance level for each feature. Significant differences at or beyond the .05 level were found for the seven features presented in Table 4; these significance levels are shown in the right-hand column of the table.

To analyze the results for the features addressing assignment quality, instructors' views of writing, and protocol length (Table 2), we conducted three 3X2 analyses of variance in which the independent variables were phase and participation. The analysis of variance of assignment quality revealed significant differences among phases ($F=5.139$, $df=2$ $p=.012$) but no significant difference due to participation and no interaction between phases and participation. Analysis of variance of instructors' views of writing revealed a significant difference due to participation ($F=6.358$, $df=1$, $p=.017$) but no differences among phases and no interaction between phase and participation.

Finally, analysis of variance of protocol length revealed a marginally significant difference due to participation ($F=3.271$, $df= 1$, $p=.08$) but no differences due to phase or to the interaction of phase and participation.

The Effects of the Workshops on Participants

Those who participated in the workshops were volunteers: they were not randomly selected. Thus, there is a possibility that when they entered the workshops they already possessed the attitudes, abilities, and educational values that the workshops were designed to cultivate. This would, of course, provide an alternative explanation for our results and call into question the explanation we have offered in this study.

It seems to us unreasonable to prefer this explanation to the one we have offered, First of all, there is no evidence that any of the participants entered the workshops with the knowledge, attitudes and abilities that the workshops were designed to develop-that is, there is no evidence that they were already knowledgeable about WAC and skillful in the application of its principles. There is, though, clear evidence that the participants brought with them a strong commitment to teaching and to improving their own performance as teachers, along with a great deal of classroom experience; those who directed the workshops testify to that. But a strong interest in good teaching is obviously not equivalent to a knowledge of WAC principles and an ability to use them in teaching; in fact, it is not necessarily even consistent with them. Consider, for example, that the specific form one participant's commitment to good teaching took appeared to be inconsistent with the writing-to-learn principles and methods being presented in the workshops. His rather authoritarian, teacher-centered approach clashed with an approach that seeks to involve students more fully in the learning process. Such conflicts are not uncommon in WAC workshops, as Deborah Swanson-Owens has shown in "Identifying Natural Sources of Resistance: A Case Study of Implementing Writing Across the Curriculum" (1986).

But suppose the participants brought with them something more than a strong interest in good teaching. Suppose they brought a predisposition toward the attitudes and abilities the workshops were designed to develop. Such a predisposition would still not be sufficient to explain their behavior in the subsequent evaluation studies. Like a strong commitment to teaching, a predisposition is in no way equivalent to the specific principles being presented in the workshops or the ability to make use of them in the classroom; it is at most merely consistent with them. Even individuals who were predisposed to this sort of thinking and behaving could conceivably come away from the workshops with

	Phase 1		Phase 2		Phase 3	
	(total participants =5	(total non-participants =4	(total participants =8	(total non-participants =7	(total participants =8	(total non-participants =8
	No. of workshop participants exhibiting feature	**No. of non-participants exhibiting feature**	**No. of workshop participants exhibiting feature**	**No. of non-participants exhibiting feature**	**No. of workshop participants exhibiting feature**	**No. of non-participants exhibiting feature**
1. Assgn. promotes student learning	5	1	7	4	7	4
2. Assgn. leads student to solve problem in achieving course objectives	4	1	8	3	4	4
3. Assign. is responsive to a learning problem	4	2	6	3	5	1
4. Teacher is aware that the assgn. is cultivating cognitive ability	4	3	4	3	5	1
5. Assgn. is integrated into the ongoing learning process in the course	5	2	6	2	7	4
6. Teacher is aware of different ways of responding to student writing	0	0	1	1	1	0
7. Teacher response is integrated into the on-going process of the course	0	0	0	0	0	0
8. Assgn. is manageable	0	1	7	5	1	0
9. Teacher realizes that creating assgn. is a rhetorical task	2	0	3	2	0	0

10. Teacher is concerned that students see purpose of assgn.	2	0		2	1	1
11. Teacher realizes assgn. will provide info about student learning and progress	2	1		4	0	0
12. Teacher has thought about task in operational terms	5	3		2	7	6
13. Teacher is sensitive to students' abilities	5	3		3	2	1
14. Teacher is sensitive to students' abilities and plans to act on that info	5	1		2	0	1
15. Teacher is sensitive to student needs	4	2		3	4	4
16. Teacher is sensitive to student needs and plans to act on that info	4	2		1	5	2
17. Teacher is sensitive to students' attitudes toward writing	2	0	1	1	6	2
18. Teacher gives students specific audience to write for	2	2		0	6	1
19. Teacher hopes assign. will improve students' writing skills	0	3		4	4	2
20. Quality of writing assgn.	2.95	2.81	1	1.9	3.0	2.6
21. Breadth of teacher's view of writng	3.1	1.9	6	2.4	3.0	2.1
22. Protocol length (transcript lines)	90.7	59.0	85	86.5	122.4	69.6

Table 3. Results for All Three Phases of theEvaluation.

Feature Number	Phase 1	Phase 2	Phase 3	All Phases
1. Assgn. promotes student learning	.0476	.2051	.0962	.01
2. Assgn. leads student to solve problem in achieving course objectives	.1587	.0256	.4079	.01
3. Assign. is responsive to a learning problem	.3571	.1958	.0490	.02
4. Teacher is aware that the assgn. is cultivating cognitive ability	.5556	.3807	.0490	.05
5. Assgn. is integrated into the ongoing learning process in the course	.1667	.0914	.0962	.01
14.Teacher is sensitive to students' abilities and plans to act on that info	.0476	.2000	.5000	.02
19.Teacher hopes assign. will improve students' writing skills	.0476	.1958	.4406	.02

Table 4. Significance Levels for Each Phase and for All Three Phases Combined for Features 1 through 5, 14 and 19.

little deep understanding of the principles and little ability to use them effectively in their teaching, The correspondence between the particular principles that were taught, which are not part of the general lore of teaching, and the participants' subsequent actions in the evaluation study, where they were using WAC principles with considerable skill and thoughtfulness, is simply too strong to explain by an exceptional commitment to teaching or a general predisposition toward WAC principles. It seems to us that the most reasonable explanation for the results of the study is that the participants learned what they had been taught.

More specifically, the results from the WABD evaluation suggest that the workshop participants generally viewed writing as a means of promoting learning and were more likely than non-participants to integrate writing assignments and learning objectives with their overall course objectives. Also, the results suggest that workshop participants conceive of and implement writing-to-learn in ways which tend to be more elaborate and sophisticated than those of non-participants. For example, participants frequently used writing in their courses to help students to understand course concepts, to apply theoretical principles, and to analyze information. These uses of writing correspond to levels two, three, and four in Bloom's Taxonomy of Educational Objectives (1977). In contrast, non-participants tended to use writing in their courses to test student recall or understanding of course concepts (Bloom's levels one and two). Figure 1 presents excerpts from the data sets of participants which exhibit their concerns with student learning along with the features from the coding scheme which they demonstrate.

Feature 1: *The writing assignment is designed to do more than test student knowledge. The writing assignment is designed to promote student learning/discovery.*

- "I use [the writing assignment] as the basis of discussion."
- "So, I will stress that their journal can be their source book."
- "Now what I would want students to do is to recognize where their personality profile is in terms of the DIS&C [a personality measure] and be able to see how that impacts their preferred style of dealing with conflict. . . . If students can recognize it, they can then begin to work through some strategies of how they might change and practice some of the other styles."

Feature 2: *The writing assignment leads the student to solving a particular problem in achieving course objective(s).*

- "[written class observations] will be very important because in order for them to evaluate their own project or the presentations of other groups, they will have to have exact observations of what. . . went on in each group presentation."

- 'The function of this writing assignment is to get them to think about how they would apply a model of a particular sampling design to actual reality. . . ."

Feature 3: *The writing assignment is responsive to the learning problem that the teacher has identified.*

- "'For some students, for example, who don't catch on, it seems as if the software package is just beyond them. Each command seems separate and unto itself. And no connections or relationships are made among them. . . . And I have asked them to draw a chart that shows their logical interpretation of the software package."

- "I am not sure that students really understand the impact of their personality on their ability to deal with conflict, and as a way of getting them to understand this, I would like to come up with a writing assignment."

Feature 4: *The teacher is aware that the writing assignment is cultivating a level of cognitive ability.*

- "Instead I'm getting to what I perceive as the higher level of learning which would have to do with analysis and evaluation of the situation as well as application."

Feature 5: *The writing assignment is integrated into the on-going learning process in the course.*

- "This is to tie their ... writing directly with the material that we're going over in class, which would be relating management objectives and philosophy with actual problems or situations that may be occurring within their work situation."

- "So the concept of the journal with their written comments and evaluations will be important at the beginning for them to see the connection between the writing that they do in their journal and the speaking activities that we're going to have."

> "Well. I would use this probably early in the course as kind of an addition to and diierent approach to the overall course. . . . But by bringing it in early, I'm not just focusing on the mundane facts which are usually covered early in most courses. Instead I'm getting to what I perceive as the higher level of learning which would have to do with analysis and evaluation of the situation as well as application."

Figure 1. Excerpts from Participant Data Sets Exhibiting Concerns with Student Learning.

The writing assignments created by the subjects, and the goals underlying them, offer further support that workshop participants differed from non-participants in their approaches to and conceptions of the functions of writing in their courses. Participants generally created writing tasks requiring uses of knowledge different from those asked for in the assignments created by non-participants. For example, participants' assignments often asked students to communicate information to other individuals, with the goal of helping the students acquire a better understanding of the information. In Figure 2 we present summaries of assignments created by both participants and non-participants. (Ah names are pseudonyms.) In the selections presented, three of the non-participants (Ina, Eric, and Bob) created exam questions or questions designed to test students' knowledge of course concepts. In contrast, all of the assignments created by the participants ask students to show their understanding (Cas), to respond to various audiences and situations (Norm and Mark), to apply their knowledge (Ann and Renee), or to use and become familiar with the language and sources of their disciplines (Gabe and Jane).

Writing Assignments Created by Participants:

Cas ***Lotus Function Chart*** – students are asked to draw a picture representing their understanding of the logic structure of Lotus.

Norm ***Flex-time*** Case ***Study*** – a timed assignment in which students develop strategies in response to conflict and different personalities.

Gabe ***Demographic Profile of a City*** – students are asked to find and to familiarize themselves with sources of demographic information.

Renee ***Application of Accounting Calculations*** – students are asked to determine the role of an accountant in creating a bottom line, maximizing profit, etc.

Jane ***Chapter Summaries*** – students are asked to read chapters and to write summaries of the chapters to assist them in learning the language of their discipline.

Ann ***Statistics Questions*** – students are asked to write questions that can be solved using distributions that pose problems for them.

Mark ***AIDS Case Study*** – students act as human resource managers and must discuss how they would handle the situation of an AIDS rumor in front of the president and board of directors of the company.

Writing Assignments Created by Non-Participants:

Deb ***Data Base Description*** – students are asked to write a description of how they would set up a spread sheet or data base.

Kate ***Observation and Response*** – students are asked to observe and write a paper on their verbal communication process.

Les ***Marketing Plan*** – students act as marketing consultants and design a marketing program for a product.

Ina ***Exam Question*** – students are asked to write a journal entry for given transactions and to state and discuss the general accounting principle that governs the recording of the transaction.

Eric *Exam Question* – students are asked to write an essay explaining how to set up a good system of control for cash.

Bob ***Hypothesis Testing Problem*** – students are given parameters and asked to explain what they mean.

Tim ***Interview and Summary*** – students are asked to interview people involved in personnel and to summarize the interview responses.

Figure 2. Summaries of Writing Assignments Created by Participants and Non-Participants.

The protocols and interview responses reveal the concerns and assumptions underlying these assignments. Specifically, these data indicate the different ideas participants and non-participants have about how to use these writing assignments and about the role of writing in their courses. In particular, many of the participants mentioned their concerns with using their assignments to encourage student learning (Feature 1 in the protocol coding scheme) (see Figure 3). For example, Cas, the instructor who created the Lotus function chart assignment, was concerned that students develop a chart that would be meaningful to them and that would help them understand the program. Jane, the instructor who asked students to write chapter summaries, said that she wanted students to begin understanding the language of their disciplines. Also, Mark, the instructor who constructed the case study asking students to handle an AIDS rumor, wanted students to think about the complexity of the problem.

Cas: Lotus Function Chart Assignment

"I was not looking for neatness particularly or having a wonderfully drawn, visually captivating chart. What I wanted them to have was a chart that was understandable and meaningful mostly to them. . . . It was for them, to help them in their understanding."

Jane: Chapter Summaries

". . . they start learning to understand their discipline's language because there's a certain communication that goes on in accounting and the more they read it, the more they sit down and think what are they telling me, and then they get a little bit better at that in understanding their own discipline."

Mark: AIDS Case Study

"I also want students to understand that there is often not a right or wrong answer, that the world is gray and not black and white, that they have to manage a lot of different values and ambiguities.. . . I'm looking for the beginnings of thinking. . . . So I'm not looking for a very polished or finished end project. What I'm looking for is really just the beginnings of thinking about the problem."

Figure 3. Concerns Expressed with Using Assignments to Encourage Student Learning.

The protocol segments in Figure 3 suggest that workshop participants created assignments to help students understand and master difficult course content, to apply classroom theory, to learn the language of their disciplines, and to explore problems. Participants also tended to distinguish themselves from non-participants by showing a greater concern with using assignments to address learning problems (see Figure 4). For example, Cas, the instructor who created the Lotus function chart assignment, indicated that she was trying to address the problems students have using the software. Similarly, Norm, who created the flex-time case study, was concerned with problems that students have understanding key concepts in his course.

> **Cas:** *Lotus Function Chart*
> "For some students, for example, who don't catch on, it seems as if the software package is just beyond them. Each command seems separate and unto itself. And no connections or relationships are made among them. . . , And I have asked them to draw a chart that shows their logical interpretation of the software package."
>
> ***Norm:*** ***Flex-time Case Study***
> "I am not sure that students really understand the impact of their personality on their ability to deal with conflict, and as a way of getting them to understand this I would like to come up with a writing assignment."

Figure 4. Concerns with Using Assignments to Address Learning Problems.

While some instructors created assignments to address specific learning problems, others tied their assignments to course objectives, another strategy emphasized in the training workshops (see Figure 5). For example, Jane, the instructor who asked students to write summaries, addressed the stages of learning covered by the assignment and related the assignment to a more basic objective of her course: building a framework to help students when they solve applications problems.

> ***Jane: Chapter Summaries***
> "And the summaries aren't really taking them all that far in the learning process, but it's to get them through maybe one of my first several stages which would be getting to understand their discipline, the rules, and the terminology, and so on. The next step, of course, would be to get them familiar with all of that and

> . . . and also emphasize what the authors are saying about the cases and the problems and so on and applying that all together – start solving problems. . . . That's what the summaries are for – to build the basic framework to get them through or at least introduce them to applications problems."

Figure 5. Concerns with Tying Assignments to Course Objectives.

In contrast to the learning concerns participants had in creating writing tasks, non-participants' assignments tended to focus on expanding or testing student knowledge (see Figure 6). Many of the non-participants also articulated concerns with developing student writing ability, conceived of as principally a matter of grammatical correctness and nearness. For example, the writing assignment of one non-participant (Tim), who asked students to write summaries of interviews with personnel managers, provided students with an opportunity to see how the theory that they were learning in class translates into practice in the world of work. However, Tim's comments suggest that his emphasis on neatness and mechanical correctness superseded his concern with having students explore ideas. Similar conceptions of writing were expressed by other non-participants who created writing assignments to test students' knowledge. For these instructors (i.e., Ina) classroom writing functions primarily to test students' comprehension of course content.

> ***Tim: Interview and Summary***
> "In essence, my grade is based upon the number of spelling errors, the number of punctuation errors, neatness, and questions that were skipped, the quality and the depth of the student questions, and the depth of response to all questions, the detail on the summary sheet, and any additional comments that I find as I read through this.... It's to expand their knowledge, yes, but it's also to give them a little work on their writing. . . . I mean they have to be careful when I tell them I'm going to check their spelling and their punctuation. . . . And typing errors and spelling errors just jump right out and hit me right in the face. . . . And I tell them. . . . that I am emphasizing both the content and the spelling and the punctuation. So it's not just content It's the things that surround content. We're looking for correct punctuation. We're looking for not having crossovers and strikeovers on words. We're looking for them to prepare a sound report is what it amounts to."

Ina: *Exam Question*

"I'd like to test whether the student knows when and how to write a general journal entry or entries for various business transactions. So they would have to know what it accounts to debit and credit, what amounts to use and also, very importantly, should they have a transction for various dates. . . . So, step one, I am seeing if they know how to write the entries, which is basic accounting, and step two is more testing of theory. Can they relate to me in writing what concept or theory they are using and why? And that would be a major section of the examination."

In the post-protocol interview, Ina expressed an interest in using this task to categorize students for purposes of grading: **"I** wanted some way of testing to see who, as I said, to weed out who really understands the concepts behind what we are doing and that is why I decided to. . . . Let's say that it separates the A's from the B's. I believe that to get an A you have **to** be exceptional, and I would have to find out who those exceptional people are. And I think this is one way of doing it,"

Figure 6: Focus on Expanding or Testing Student Knowledge.

Several of the non-participant data sets contained statements similar to those quoted in Figure 6. However, a few of the non-participants also exhibited an interest in goals similar to those espoused in the WABD workshops. The data sets of these individuals contained statements expressing an understanding of how writing might contribute to achieving these goals (see Figure 7). Statements such as Deb's (below) suggest something important for WAC directors: that is, one use of an evaluation might well be the identification of instructors who have a predisposition toward WAC principles and who might well be potential leaders in the program.

Deb: Database Description

"The most important thing is for the students to understand the decision-making process and in order to understand the decision-making process they have to be able to formulate a problem. They have to take that problem that they formulate and put it into either Lotus or DBase in such a way that the computer comes up with the right answer that will help them to make adecision. . . . I would like to use it so that the students would understand the process that we are going to go through

and maybe by writing it down they'd be better able to do the process itself."

Figure 7. Non-participant Statement Exhibiting an Interest in WABD Goals.

The Value of the Protocol/Interview Method

The results attained from our use of the protocol/interview method to evaluate the WABD program suggest that think-aloud protocols can be a reliable and sensitive measure for assessing other programmatic goals for WAC where changes in attitude and applications of principles are at issue. Besides the comparisons between groups, the protocol/interview method, as has already been suggested, can reveal important characteristics of individual teachers. The results of the WABD study suggest that certain workshop participants disagreed with workshop objectives and that certain courses taught by participants may have had goals for which WAC principles are less relevant For example, one workshop participant demonstrated evidence of only two of 19 features, while three non-participants demonstrated many of the desired features.

The protocol/interview method may also shed light on the instructional objectives and practices of particular disciplines and on how writing-to-learn activities can be integrated with them. For example, in the WABD evaluation, teachers in psychology and sports management tended to make greater use of workshop instruction than teachers in business applications. In this study at least, the assignments in business applications typically were information- or skill-oriented, perhaps making it more difficult to construct writing assignments designed to promote learning or reflective thought. Such differences, of course, may be the result of the smallness of the population king studied; but they may also be the result of distinctive differences in the nature and practices of the disciplinary communities. (For discussions of such differences, see, e.g., Bazerman, 1988; McCloskey, 1985; Myers, 1985, 1990; Nelson, Megill, and McCluskey, 1987; White, 1985). If so, the protocol/interview method may be of use in studying the discourse of disciplinary communities and how their conventions are acquired and used.

Finally, the protocol/interview method can help program directors identify existing or potential problems in implementing a WAC program subsequent to the faculty workshops. Although most of the data from the Robert Morris evaluation indicated positive outcomes for the WABD workshops, the interview responses also helped program direc-

tors identify some weaknesses (see Figure 8, below). In particular, several participants expressed concerns in the interviews about the amount of time required to incorporate writing-to-learn activities into their classes. For example, Cas, the instructor who created the Lotus function chart assignment, said that she was troubled by the amount of class time write-to-learn activities require. Some participants also raised questions about the overall effectiveness of such activities, and they talked about the difficulty of determining how much students learn from these activities. The expectations of students, at times incompatible with educational innovation, may compromise the effectiveness of instruction and remind teachers that success and failure in the classroom are not wholly under their control (see Renee's second statement in Figure 8). Finally, one instructor, Gabe, suggested interviewing students directly to overcome some of these problems and to solicit their version of the story. Teachers' reports of what they are doing in their classrooms, he argued, are not always consistent with student perceptions of what is being done. Therefore, students, he contends, should be asked directly about the effectiveness of writing-to-learn activities. It should be noted that the Robert Morris evaluation project did in fact incorporate student responses by means of surveys and interviews. However, a study of the data from that part of the project is outside the scope of this paper.

Cas:
"If a professor is going to incorporate write-to-learn activities in a course, time definitely has to be allotted to those activities. And in a way content has to be sacrificed. What I mean by that is, perhaps, as much content can't be covered in a course if one is going to incorporate write-to-learn activity because you have a given amount of time and you have to prioritize how to use that time in your courses. . . . I would liked to have been able to spend more time looking at and discussing the write-to-learn activities with the students. . . ."

Renee:
One problem that I've had is really concluding whether or not it had a pedagogical benefit. I don't know. . . . I would say my experience with it this semester has been mixed. It helped me. . . it helped me address some of these issues. On the other hand, whether it's effective or not is going to be dependent on the student, and as far as I can tell, without being able to pinpoint what creates learning, I am not sure these students perform any better than any other student that I have ever had in Accounting 101 over the past twelve years."

"The outcome is not really clear cut. . . . I don't know, and that bothers me that I don't know. . . . The only thing I can say for sure is that it's helped me as an instructor to be perhaps a bit more interesting or motivated or energetic. . . . But I must say that I've been a bit disappointed. Students try to get a recipe. They try to get at what they think I want rather than how they really should respond . . . and my feeling is it hasn't really been completely successful, although I must say I am still in the learning processes."

Gab:

"I worry about whether or not what we are saying is actually being clone. . . . It's equally important to find out, maybe interview a couple of students who may have a class that has these projects involved and see what they say. What is their perception?"

Figure 8. Concerns Raised About Implementing Write-to-Learn Activities.

All of the responses in Figure 8 suggest potential areas of concern with regard to application of workshop principles. However, they also demonstrate another benefit of using the protocol/interview method for evaluation: directors can obtain not only evidence of a workshop's overall effectiveness but also valuable information concerning the experiences of individual participants after they have begun trying out the principles of the program. Similarly, the protocol/interview method could also be used to monitor workshop participants' development and change over time. More specifically, it could be used to assess how participants change in their approaches to constructing and administering writing assignments. Program directors could use data from protocols and interviews to identify what Swanson-Owens calls "natural sources of resistance" (1986), and what Fulwiler refers to as "translation and follow-up problems" (1984). Workshops can successfully introduce participants to writing-to-learn principles and strategies, but they can not guarantee that participants will use them in their classrooms successfully. The inevitability of such problems also suggests the importance of follow-up mechanisms that encourage feedback and advice (Fulwiler, 1984). Such mechanisms may include anything from monthly lunches and newsletters to substantial research and evaluation projects, like the one at Robert Morris (Weiss and Peich, 1980).

Refining the Method

Although the protocol/interview method yielded positive results and useful outcomes in the WABD evaluation project, we learned through the process of employing it that it could have been more effective had the design been somewhat different. In particular, we believe that the raters would have found it easier to make the judgments required of them if we had asked them to judge just four or five features rather than 19. We also believe that the coding schemes we used could have been better designed. In response to coding difficulties, one of the authors conducted a pilot study using just four of the 19 features in Table 1 (features 1, 2, 3 and 5, which consistently yielded meaningful results through each phase of the evaluation), and features 20, 21 and 22 from Table 2. (Her revised coding scheme appears in Appendix B.) Inter-rater reliability in the pilot study was found to be 96% – much higher than the reliabilities observed above. This higher reliability may well have been the result of the greater simplicity of the revised coding scheme, since it seems reasonable to assume that the raters could understand the seven features more easily than the original 22. Further, the results of this simpler instrument are consistent with those of the WABD evaluation, The three phases of the evaluation allowed for the progressive refinement in the design of the instrument. Directors of WAC programs should be alert to occasions for refining methods or for inventing new ones.

Figure 9 presents a comparison of the mean raw scores of participants and non-participants on the four features of the revised coding scheme. Differences in the mean raw scores of number of T-units exhibiting evidence of Features 1 (learning versus testing) and 3 (response to a learning problem) approached statistical significance ($p = .102$; $p = .088$). Differences in the raw scores for Features 2 (tied to course objectives) and 5 (integrated into the on-going learning process of the course) were not statistically significant ($p = .296$; $p = .357$); however, the small sample size may have influenced these results. Finally, although these features taken separately are not statistically significant, taken together they constitute a pattern of difference which is significant ($p = .040$).

Significant differences were also obtained in this second analysis for the mean ratings of instructors' views of writing: participants were rated higher on average than non-participants (3 versus 2.1; $p = .055$). Differences in the ratings on quality and in the mean lengths of protocols and numbers of T-units were not statistically significant; however,

participants generally did rate higher than non-participants on quality of assignments created (3 versus 2.6), and they tended to talk more in response to questions than non-participants (122.4 average lines versus 69.6; 75.9 average T-units versus 48.1).

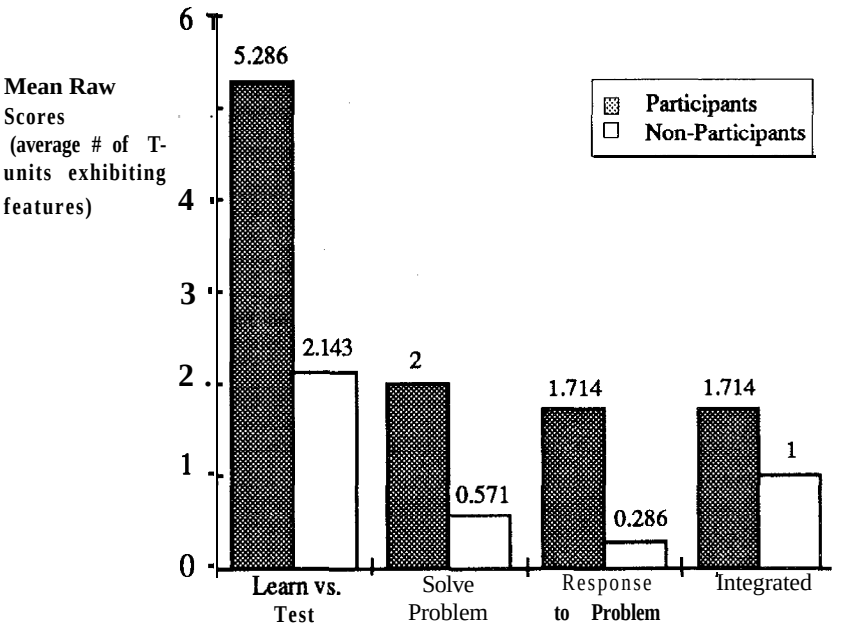

Figure 9. Comparison of Mean Raw Scores of Participants an Non-Participants

Summary and Conclusions

The protocol/interview method proved to be a useful tool for evaluating the faculty workshops offered as part of the Writing Across the Business Disciplines program at Robert Morris College. Combining protocols with post-protocol interviews for evaluation purposes allowed program directors to determine in some detail how the workshops affected the teaching and attitudes of the participants. The method revealed that faculty who had participated in the WABD training workshops differed significantly from non-participants on measures of attitude and teaching behavior. Participants typically viewed writing assignments as a powerful means for encouraging student learning, rather than as only a means for testing content knowledge or improving writing skills. And they were more likely than non-participants to

develop assignments that furthered the learning objectives of their courses and that were integrated into the course structure.

The protocols and interviews conducted in this evaluation provided the program directors with valuable information about the views of faculty on student writing, attitudes and needs and about their approaches to the design of writing assignments. Such information would not have been so readily available through other, more conventional assessment methods used in isolation, such as surveys, classroom observations, student evaluations, or close analyses of assignments and student papers – methods which were used to evaluate other components of the WABD program. The protocol/interview method complemented and clarified data obtained from these other sources. Those who Planned the WABD evaluation project, as a general principle of design, devised multiple, complementary methods keyed to the distinctive features and educational objectives of the various components of the program.

The evaluation described here was tailored to Robert Morris College and to the distinctive features of the WABD program. Because of this, it may not be applicable without modification to other WAC programs. However, we believe that the general principles we relied on and some of the particular features developed for this project have broad applicability. The general principles include the use of multiple measures, the use of complementary measures, the use of the most appropriate and sensitive measures, even if they are unconventional, and, finally, the customizing of measures for the situation at hand. Two other features of the project are also notable. The protocol/interview method has, we believe, considerable utility in evaluation projects, especially where changes in attitudes and applications of principles are at issue. In addition, our engagement in this project over a number of years reflects our belief that if we are to understand how well WAC programs are working, we must spend much more time on the development and application of effective assessment tools than has been the case in the past.

Notes

1. The three evaluations were conducted by John Ackerman, now of the University of Utah, Nancy Penrose, now of North Carolina State University, and Ann Blakelee, now of the University of Illinois at Urbana-Champaign.

2. In Phase 2, the raters were asked to rate an additional five features. Here, we confine ourselves to reporting results for just the 19 features, which were used for all three phases.

3. The reliability with which these and the other traits were rated was assessed in Phase 2 by having a second rater independently rate four of the data sets. (Reliability wa not assessed in Phase 1.) Average agreement between the raters over all 19 traits in Phase 2 was 67%. Reliability was assessed in Phase 3 by having a second rater independently rate two data sets . Average agreement betwe enthe raters over all 19 traits in this phase was 69%. For the traits listed in Table 2, Pearson product-moment correlations were calculated to determine reliability. In phase 2, the correlation between the independent ratings for quality of assignment was .816 and for breadth of instructor's view of writing, .548. The corresponding correlations for Phase 3 were .665 and .547.

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Appendix A
Post-Protocol Interview Questions

1. What do you think I asked you to do?

2. Why did you do what you did in devising this particular writing assignment?

3. Do you see this writing assignment related to your course goals? What are some of your course goals? How is the assignment related to your course goals?

4. What is the function of this writing assignment? How would you use it in the course?

5. Do you see this assignment as a response to a learning problem which you have either already identified or anticipate?

6. How complex are the intellectual demands of this assignment? Would you say that this is a simple task or a complex task? Is there a cognitive or behavioral level that you are looking for in this assignment?

7. [Ad hoc questions to expand on problematic responses and to check the reliability of responses.]

Appendix B
Revised Coding Scheme

1. The writing assignment is designed to do more than test student knowledge. The writing assignment is designed to promote student learning/discovery.

2. The writing assignment leads the student to solving a particular problem in achieving course objectives.

3. The writing assignment is responsive to a learning problem that the teacher has identified,

4. The writing assignment is integrated into the on-going learning process in the course,

5. Quality of the writing assignment rated on a scale of 1 (low) to 4 (high):

   1 = Low quality: confusing, purposeless, not integrated into course goals, etc.

   4 = High quality: well thought out and articulated, fits into course, helpful, etc.

6, Breadth of teacher's view of writing rated on a scale of 1 to 4:

   1 = Restricted view: writing equals grammar, correctness; writing takes place after thinking; writing is thought of in terms of number of pages; etc.

   4 = Larger view: writing is a medium for thinking and learning; writing is an occasion for exploration; etc.

7. Protocol length (number of transcript lines).

8. Number of T-units (number of main clauses plus their modifiers).

Resistance and Reform: The Functions of Expertise in Writing Across the Curriculum

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I. Change at the Margins and Center: WAC Reform in its "Second Stage"

In the 1990s, as the writing across the curriculum (WAC) movement enters what some reformers call a "second stage,"[1] there is conspicuous concern for what David Russell defines as the fundamental problem of WAC — "how to place it firmly in the complex organizational structure of the university" ("Some Lessons" 191). During the 1970s and much of the 1980s, WAC reform was fueled mostly by compositionists' fervor rooted in humanist concepts of process pedagogy, administrative support for improving students' ability to read and write, and the desire of some faculty to reconsider their teaching practices. Reform occurred primarily at the margins, so to speak, of disciplinary practice, and largely in spite of institutional incentives and structures. To reformers of the 1990s, however, this dynamic of reform no longer seems adequate. Even *Programs That Work: Models and Methods for Writing Across the Curriculum,* a recent collection of essays edited by Toby Fulwiler and Art Young that represents the movement's growth and impact, concludes with anominous "Afterword" concerned with resistance to reform. "Institutions must develop," Fulwiler and Young write, "a more or less permanent structure whereby writing-across-the-curriculum advocacy is ever renewed and expanded. Otherwise the best that can be hoped for is to keep the enemies at bay" (294).

One of the most intractable obstacles to reform is the resistance that stems from expertise — resistance that informs not only the thinking of faculty but the very organization of the university. While WAC advocates often speak about the shared purposes of postsecondary schooling,[2] which is conspicuous, indeed, at some colleges, academic

life is characterized more by division and difference than by common cause. Faculty are separated by specialization, and this compartmentalization of academicians and knowledge discourages conversations across disciplinary divisions. These conditions are at odds with the goal of having everyone share the responsibility for teaching students to write or using writing as a means of learning. In other words, expertise often produces resistance to incorporating cross-curricular writing instruction as an integral part of higher education.

Today's WAC reformers, and those of the past two decades, are not the first to contend with the obstacles that expertise poses for institutionalizing cross-curricular writing programs, James Fleming Hosic addressed this issue as early as 1913, when he identified "over-specialization" as a "chief stumbling block" in attaining "co-operation" among faculty in cross-curricular writing instruction (481).[3] Although WAC reformers still face this problem, Hosic spoke in another era and about another context (the secondary school). Current impediments to reform are shaped by our historical era and the conditions of the postsecondary institution. How, then, do dominant conceptions of expertise in American colleges present problems for WAC reform? How has the WAC movement, during what some reformers call the "second-stage," addressed the resistance that stems from expertise? What other ways might we respond to and use expertise in the interest of effecting change?

In addressing these questions, we want to consider both the programmatic structure and research initiatives of WAC reform. We will consider how competing forms of expertise are currently affecting the practices of undergraduate education, at both the center and the margins of the curriculum, and how these competing forms enable and constrain WAC reform. Thus, we will discuss not only how WAC has been conceived in relation to dominant programs and structures, but how alliances among programs informed by emergent and residual forms of expertise present possibilities for WAC reform that have yet to be adequately explored. In the next section, we present a strategy of reform based on an analysis of how various concepts and uses of expertise in American universities produce resistance or receptiveness to the goals of reform, In the third section, we examine how some "second-stage" reformers have conceived of expertise in establishing WAC's research agenda, illuminating how this agendaignores the ways WAC research might harness forces of change already powerfully at

work within the institution. We also briefly outline an alternative to the research agenda of these reformers.

We wish especially to query the notion that WAC reformers should, in the belief WAC is now in its "second stage," redirect their energies primarily towards placing programs permanently within existing institutional structures. The recent surge of research on discipline-specific writing has been advocated as the means to achieve long-term institutional legitimacy (Bazerman, "Second Stage" 209; see also Jones and Comprone 62-63). Certainly, WAC programs need strong administrative support, and reformers will have to make compromises to build the consensus necessary to attain and preserve such support. But what principles will determine the extent to which WAC reformers might be willing to compromise in order to achieve mainstream legitimacy? By pursuing WAC reform as a "second stage," what kinds of accommodations with dominant conceptions of expertise will reformers be pressured to make? What possibilities might we explore of collaborating with emergent groups and programs outside the mainstream who are already working against the grain of the postsecondary institution?

We contend that WAC reform should be guided by a vision of change that goes beyond considerations of strategic possibility in this or that locale, at this or that moment in time. Indeed, such a vision can and should be linked with other challenges to dominant conceptions of expertise that are emerging alongside WAC programs in postsecondary institutions. In this next section, we examine a few such challenges, and how they advance what we believe are the most crucial goals of WAC reform.

II. Dominant, Residual, and Emergent Cultures: Expertise as an Obstacle to and Impetus for Reform

In his historical analysis of writing in the disciplines, David Russell argues that academia is an aggregate of distinct disciplines which expanded through accretion, by dint of external pressures more than institutional logic, and therefore comprises independent groups of scholars "characterized more by their differences than by their similarities" ("Writing Across" 54; also see Bledstein 327-28; Veysey 337-41; Graff, *Professing* 6-9; *Beyond* 135-141; Ohmann 290-95). Academicians often perceive closer linguistic and ideological ties to professional communities outside academia than to their colleagues in other institutional departments (Russell, "Writing Across" 54; see also Bledstein

303-04). Distinctions in identity are evident not only in the institutional order, which arranges faculty into colleges, divisions, departments, and specialized fields within departments, but in the partitioning of knowledge on a specific subject, which can result in courses concerned with language study, for instance, offered by philosophy, speech communication and English departments.

In such an institutional order, power is dispersed, flowing, if you will, at different rates and from different sources. The dominant structure of expertise in such an order may seem immovable, producing division among practitioners even on a common subject. But as Raymond Williams explains, culture, institutions and practices are always evolving, shaped by dynamic relations between competing determinants — what Williams defines as the dominant, the residual and the emergent (l21-26). Understanding the complexity of the institutional culture, then, entails identifying the dominant domains of power and corresponding conceptions of expertise, as well as alternative domains and conceptions that are having an impact on curriculum.

The dominant features of expertise in the university are familiar. Acquired through educational training, expertise is predominantly understood by faculty as a specialized body of information and specific methods of investigation. When involved in research, scholars apply expertise as a means of investigating a question, problem or issue, addressing a professionai community (or several communities) through arguments that add to the community's lore and knowledge. By contrast, when academicians teach they often assume the role of "representative of expertise," transmitting information and "facts," and translating principles in reductive ways (Larson 54-55). A storehouse of specialized knowledge is presented to students, covering "facts," principles, methodologies, and sometimes theory. Such practice often simplifies or withholds the controversial or unsettled aspects of such knowledge, reinforcing the faculty member's status as expert yet distinguishing this function of expertise from its use during research (Larson; see also Graff, *Professing 7-8; Beyond* 106-114).

For several reasons, these dominant practices create obstacles to implementing cross-curricular writing programs. First, there is the fundamental conflict between the dominant conception of expertise and the notion, promoted by WAC reformers, of an institution-wide commitment to writing instruction. Since many instructors hold the view that teaching is the act of "representing" one's expertise, they often consider writing instruction either the domain of the expert "writing

specialist," or the province of the non-specialist, and therefore not the responsibility of disciplinary instructors who should focus on covering their specialized knowledge (course content). Second, since this view of expertise locates writing and language outside the essential operations of knowledge-making, the writing specialist (or, worse, the writing non-specialist) tends to be cast primarily as a service provider in her collaboration with disciplinary practitioners.[4] Rather than raising questions about the nature of knowledge, academic "objectivity," and tactics of disciplinary socialization, the writing specialist is cast as a facilitator who helps faculty develop their teaching in an exclusively technical sense. However, WAC reform should, as many advocates acknowledge, encourage teachers and students to question disciplinary conventions, and to reconsider the priorities of disciplinary practice. The obstacle this poses for WAC is that asking faculty to change their understanding and use of expertise, which for many instructors requires philosophical and pedagogical transformation, also increases the likelihood of significant resistance to reform. Finally, reformers and many disciplinary instructors are likely to disagree about the specialized knowledge in composition that often informs WAC programs. When reformers first introduce colleagues to WAC theory and practice, they often present them with ideas about language and learning derived from education and composition theory (Fulwiler, "Writing Workshops" 8; Fulwiler and Young 2). Some reformers boldly claim that this theory often "challenge[s] traditionalclassroom writing pedagogy ... [and] the nature of teaching and learning" (Fulwiler, "Writing Workshops" 8; see also McLeod, "Defining" 23-24). At the same time, reformers claim that many disciplinary instructors have little respect for education theory (Fulwiler, "How Well" 122; see also "Evaluating" 66). Thus, significant resistance to reform could emerge when a writing specialist presents ideas that challenge what many faculty members believe and practice, especially if such ideas go beyond narrowly technical advice.

What programs represent possible alternatives to educational practices informed by this dominant conception of expertise that we have been describing? A general answer would be those programs that: challenge traditional views and uses of expertise in the following ways: by underscoring interdisciplinary study that disrupts the conventional division of knowledge; by encouraging active participation by students in the classroom; by legitimizing teaching and classroom discourse as sites where knowledge is produced and not merely distributed and assimilated; by emphasizing reading and writing as investigation of the

nature of disciplinary knowledge and the ethical and political implications of such knowledge; and by breaking down the walls between the academy and the "real world" through critical examination of relationships between disciplinary cultures and popular cultures. In other words, residual and emergent programs (Williams) that share some of the assumptions about language use, literacy and learning that inform the deepest goals of WAC reform.

Some interdisciplinary programs that have emerged at American postsecondary institutions during the last two decades--and thus might be called emergent (Williams 123) — share some of these philosophical and educational goals associated with WAC reform, By classifying these programs as emergent, we mean that they are in some way alternative or oppositional to, rather than merely a new form of, dominant practices (123). However, by identifying emergent programs, we do not mean to imply that traditional disciplines are univocal sites where the dominant culture of expertise holds absolute sway. In Williams' words, "no dominant social order and therefore no dominant culture ever in reality includes or exhausts all human practice, human energy, and human intention" (125). Therefore, when we cite women's studies and cultural studies as examples of the emergent, which we will soon proceed to do, we do not wish to represent them as strongholds of public, non-disciplinary practices opposed to the univocal hegemony of traditional disciplines. Rather, challenges to the dominant culture of expertise which are consolidated in these programs also exist as dispersed, local practices in most, if not all, disciplines. In the context of our analysis of expertise, then, we wish to identify our examples of alternative and oppositional programs as consolidations of counter-hegemonic practices that exist within and between many disciplines. We cannot emphasize enough that by classifying particular programs as emergent and opposed to the dominant culture of expertise, we are distinguishing between competing forms of expertise, not identifying programs and practices somehow miraculously "pure" or "outside" of expertise and disciplinarity.

As we have suggested, in cultural studies and women's studies there is much work that challenges traditional notions of expertise. Discourse in these fields is dispersed within and across many traditional disciplines and is often characterized by its engagement with issues of wide public concern and its use of materials derived from mass culture. Teachers with whom we have worked often encourage students to break down barriers between academic and non-academic worlds, to question

the ideological dimensions of disciplinary discourse, and to use journals as means of exploring the different worlds in which they live.

Recent literature on pedagogy in women's studies discusses similar activities and goals. Donna Perry, for instance, explains how she has begun "Making Journal Writing Matter" in an introductory-level course. In this course, journal writing is not "merely practice in writing," but rather a way to subvert "the structured, hierarchical relationship" between teacher and students as well as a means for providing "students with a 'safe place' in which to critically examine their worlds" (151). Through journal writing, students "explore the implications for their own lives of ideas raised in the course," as well as "write about what for them were taboo subjects (homosexuality, abortion, etc.)" (152-53).[5] Rebecca Blevins Faery expands Perry's concern to all classrooms, contending that "the new approach to using writing to learn " is important for "revising the educational circumstances of women students" (202). The way to change the circumstances of women (and men) students, Faery argues, is through curriculum that encourages students to talk and write frequently, in every discipline (212); through education that emphasizes active student participation, the transformation of knowledge, and writing as a way to learn how language practices shape student identities (204,212).

More recently, Bonnie Spanier, a molecular biologist, has explored the implications of this feminist vision of WAC for science and science education. Her revision of dominant conceptions of expertise in science is worth quoting at length:

> As a scientist and feminist, I see writing across the curriculum as providing a fruitful partnership of the humanities and the sciences, one that encourages science educators to confront neglected humanistic aspects of their disciplines: values, dominant beliefs, and societal influences that shape the content of science and science education. More precisely, writing-across-the-curriculum projects *that address ideology in the discourse and practice of science* are potentially transformative and may help alleviate the exclusion of women and people of color from the scientific professions, the crisis in scientific literacy in the United States, and the vast gulf between scientific experts and the public in issues of science and society. (193, emphasis Spanier's)

In Spanier's view, by focusing attention on issues of language and representation, WAC can help increase "scientists' awareness of the

norms of their profession a necessary change if we are to attain equity . . . and eliminate distortions in our understanding of nature" (207).

Even in such a seemingly "neutral" field as molecular biology, Spanier shows how teachers can help students recognize how scientific knowledge is socially positioned both in relation to scientists and students. For instance, Spanier analyzes the discourse of molecular biology, showing numerous examples of how this discourse reflects "culturally generated distortions" (199) by superimposing stereotypical gender attributes onto the natural world. In one example, Spanier shows how biologists often describe bacteria as "male" or "female" "based on the presence (male) or absence (female) of a 'fertility' (or F) plasmid," thus projecting a cultural sense of sex in a way that falsifies the scientific description since these bacteria do not make eggs or sperm (200). By giving her students writing assignments that encourage this kind of analysis, Spanier helps them "find a voice" and situate themselves in relation to subject matter (204). Thus students learn to develop "an active analytical stance, not that of passive recipients of knowledge" (206), and to recognize how the social profile of scientific communities shapes hypothesis generation and scientific description.

Spanier's vision of WAC's potential importance is remarkable in the degree to which it foregrounds the depth of possible change when reform aligns itself with ideas and practices currently at the margins of disciplinary ideology. Of course, Spanier's expansive view of disciplinary expertise — as including the study of the political, cultural and linguistic aspects of knowledge-making — is not, as she admits, widespread in scientific communities. But for Spanier the likely resistance to attempts at WAC reform in such contexts is also a measure of WAC's deepest possibilities for transformation (207). Significantly, Spanier, Perry and Faery all suggest that the role of WAC reformers goes well beyond technical facilitation to broad questioning of disciplinary rhetoric, the power-effects of knowledge and the goals of undergraduate education.

Other programs that might be aligned with WAC reform may not be as obvious in their potential challenges to institutional culture. Such programs may have been in existence for a long time, and might be called residual, to borrow Williams' term, because the practices they sponsor have been incorporated, to a limited degree, into postsecondary education, yet have often remained at some distance from dominant practices. While the residual is formed in the past, it is active in the present (Williams 122-23). Also, as Williams explains, while residual

cultural forms may operate in the service of the dominant culture, they also may, in other contexts, have an oppositional or alternative relationship to it.

Honors programs, for example, have been part of the postsecondary school since the 1920s. While such programs have historically been implicated in the practice of tracking as a means of reproducing social class in schools, such programs frequently distinguish themselves from mainstream schooling by the quality of learning they sponsor, the validation of student experience as a source of evidence in argumentation, and the degree to which they expose students to the unsettled aspects of knowledge. According to Anne Ponder, a recent president of the National Collegiate Honors Council, "the discussion class...the collaborative seminar, is the locus, the prevailing language, the central practice, of honors [today]" (1).[6] Such programs, if made democratically accessible, can present a legitimate challenge to dominant educational practices.

At Drake University, for instance, the honors program was instrumental in the formation of an interdisciplinary Cultural Studies Program that emphasizes many of the goals that WAC reformers advocate. The honors program attracted teachers from the humanities and social sciences who were interested in teaching interdisciplinary courses that encouraged high levels of student participation, critical investigation of issues and subjects, and different uses of writing. According to the university's "Course Guidelines for Honors," an honors course encourages "active participation by students in the class," to the degree that "discussion should be a primary part of the learning experience"; "invites connections among several disciplines of study" and "involves frequent writing assignments, offering multiple opportunities for feedback and evaluation." The honors program was unable by itself to institutionalize a cultural studies curriculum. But it did link together faculty concerned with cultural studies who eventually developed a new program, rooted in methods and principles of cultural materialism, affording students the opportunity to develop a concentration of courses in which they could examine in writing connections between cultural theory, their experiences of daily life, and the production and reception of music, film and printed texts, In this particular case, then, honors offered an area of the curriculum that linked faculty who were dissatisfied with dominant practices and were quite receptive to the deep goals of WAC reform.[7]

Programs such as women's studies, cultural studies and honors represent potential networks of faculty who can institutionalize writing reform in local, and perhaps eventually more expansive, areas of the curriculum. Of course, the list of such programs might easily be extended to include interdisciplinary programs of many sorts, for Instance, programs that focus on ethnicity or race, political and cultural change in the third-world, environmental studies, medical anthropology, ethics, etc. Many teachers are drawn to these programs because of conviction and commitment, and therefore they are likely to be open to considering new ideas such as how writing can be employed as a means of extending disciplinary insights to daily life. In some cases, such teachers are already experimenting with emergent practices arising locally in their own disciplines. These programs also offer reformers a greater possibility of moving beyond the technical service role in which the dominant culture of expertise often casts them. Thus, this sort of collaboration can be as liberating to WAC reformers as to faculty in the disciplines.

In arguing that the best way to pursue WAC reform is to look for allies in programs where the dominant ideology of expertise is already being questioned, we are acutely aware that many of the programs we mention are also among the least powerful or secure in the university. Women's studies, cultural studies, and other interdisciplinary programs are often, like WAC programs, run on soft money, without adequate staffing (usually borrowing faculty from other disciplines), and with little support. However, we must point out that our strategy of establishing alliances between residual and emergent programs does not preclude WAC reformers from working within traditional programs. Working with traditional faculty whose view of expertise reflects the dominant institutional culture is essential, indeed, if writing-intensive courses are to be offered regularly to large numbers of students. However, we believe it is equally essential for WAC reformers to find ways of connecting such work at the center of the curriculum with work at the margins where the deep goals of reform are easier to realize. For instance, WAC reformers might work with others in establishing linked courses on the same subject that are informed by contrasting ideologies, and use writing in contrasting ways. What we are suggesting is somewhat like the curricular agenda Gerald Graff has offered in *Beyond the Culture Wars,* which foregrounds the ways in which differences within and between disciplines can be dramatized in teaching and curriculum. Rather than focusing on conventions which highlight a

lowest common denominator of agreement within disciplines, Graff's proposal highlights differences between disciplinary conventions and ways of understanding, thus constituting a significant revision of the dominant uses of expertise in teaching wherein differences are reduced for student consumption. Just as important, programs that highlight differences in institutional culture oblige faculty to debate alternative conceptions of expertise and the alternative uses of writing those conceptions sanction.

Graff shows how early attempts at curricular reform in higher education have often failed because they did not accommodate faculty research obligations, were too rigid in their restriction of faculty and student choices, and confused reform with the goal of achieving consensus on the fundamentals of knowledge (177). Hence, under the rubric of "turning conflict into community," Graff cites a number of reform programs that dramatize differences between faculty understandings of themes like "Power and the Person: Looking at the Renaissance" (Seattle Community College) which focuses on "three periods of re-awakening" in 15th century Europe, in Harlem during the 1920 and 30s, and the American upheavals of the 60s (181). These programs are interdisciplinary and, most importantly, explicitly situate competing perspectives within and between disciplines in relation to one another. For instance, the Queens College World Studies Program, a lower-division general education program, encourages that instead of "treating works from and about different societies and cultures in isolation or simply as examples of variety, works shall be studied in relation to each other, each offering a commentary on the others" (qtd. in Graff 188). In this program, then, learning is a process of becoming engaged with competing disciplinary perspectives that constitute current debates, rather than being informed of a single argument that is part of a debate.

These integrative programs can bring emergent practices and programs into contact with dominant practices and programs. They present possibilities for representing programs such as women's studies and cultural studies as components of core curricula or general education programs that dramatize disciplinary and methodological differences. They can rebuild an academic community by clustering the established and the emergent, in a fashion similar to interdisciplinary programs such as the Federated Learning Communities at State University of New York, Stony Brook, or the integrated studies program at the University of Missouri-Kansas City, which cluster courses from differ-

ent departments, providing classes that focus on how these disciplines complement and contrast with each other (Klein 168-69; see also Graff, *Beyond* 181-85).

Only some of the interdisciplinary programs Graff cites are allied with or part of WAC programs (181). However, these sorts of programs, if WAC reformers are successful integrating writing into them, constitute an opportunity for faculty to see and argue about differences between pedagogies that enact WAC's deep vision of change and those that use writing in more superficial ways. As writing is used in some classes as a means of internalizing dominant discursive practices, it can be used in other courses as a means of learning and interrogating dominant modes of discourse, and thereby serve as a form of inquiry into the political implications of discursive practice. Programs that offer students such opportunities allow them access to the conventions of dominant practices while encouraging them to develop their critical understanding of how dominant ways of knowing are relative, culturally positioned ways of knowing. This sort of clustering of courses correlates differences between changes WAC is achieving at the margins and the center, rather than keeping various faculty appropriations of WAC isolated in separate institutional spaces.

III. Disciplinary Rhetoric, Power, and Permanence in WAC Research and Reform

Of course, our strategy of underscoring differences between appropriations of WAC may seem dangerously retrograde, given the emphasis in recent WAC discourse on accommodating each discipline's conventions and practices in the interest of promoting and preserving WAC reform (McLeod "Translating" 7; Jones and Comprone 61-64; Russell, *Writing in the Academic* 301-07; Bazerman, "Second Stage" 212). Indeed, prominent recent thinking in WAC discourse suggests that WAC programs must establish a research component, and a central administrative structure to link discipline-specific WAC research to teaching, ensuring that new teaching practices are, in Jones and Comprone's words, "substantiated by knowledge of actual disciplinary knowledge and conventions and by theory firmly based in that knowledge" (64). Jones and Comprone warn that "if we do not do this, WAC will continue to be primarily a general education program with little or no direct effect on graduate programs, and no guaranteed long-term effect on undergraduate curricula" (63-64). David Russell goes so far as to argue that "[i]f writing is to become a central focus of pedagogy,

then it must be structurally linked to the values, goals, and activities of disciplines; faculty must see a connection between encouraging better writing among their students and advancing the value and status of their disciplines — and of their own individual careers" (302). But what if, as we have been arguing, the deepest goals of WAC reform are mostly opposed to the interests of the dominant culture of expertise and those disciplinary practitioners that most profit from it?

By noting the incongruity of the deep goals of WAC and the dominant culture of expertise, we are by no means suggesting that discipline-specific rhetorical research should not play a crucial role in institutionalizing WAC reform. We are suggesting, however, that discipline-specific research can never play a neutral role in this process. Such research is always a social act positioned in relation to "internal" disciplinary conflicts (which are, of course, never simply internal but always positioned themselves in relation to "external" social formations).

It is our contention that the role of discipline-specific rhetorical research in WAC reform should be twofold. First, such research should clarify the dominant culture of expertise while illuminating and linking emergent challenges to it; and secondly, it should facilitate, as Bruce Robbins has suggested in his recent critique of the rhetoric of interdisciplinary discourse, the formation of a critical "public sphere" between and within disciplines. Since the dominant culture-of expertise does not encourage publicizing "internal" disagreements among experts to outsiders, a key goal of WAC research should be to open such a sphere of informed debate where relationships between competing discursive practices can become visible to non-specialists, and where the validity and social effects of such practices on the public can be debated. As Robbins puts it,

> the interdisciplinary role of rhetoric. . . would approximate role some have ascribed to "theory"; an opening of what appears private [that is, the exclusive province of experts] in disciplines to public scrutiny and accountability. This task could be described as "public-making": making public or visible, opening to a variety of perspectives and judgments, but also the interdisciplinary *fashioning* of new publics, new instances of judgment, new collective viewpoints. (116, emphasis Robbins')

Since the "public" and "the public interest" are never simply given or agreed upon, the role of discipline-specific WAC research should not be

to autocratically pronounce on how "the public interest" is or is not served by disciplinary rhetorics, but to clarify and delineate dominant, residual and emergent discursive practices so that informed argument about the public import of these practices can be undertaken. Such research should seek to open a discursive space within the institution where disciplinary rhetorics become visibly situated both in relation to one another and the contested needs of society at large.

However, as we will show in this section, the problem with most second-stage calls to base WAC in discipline-specific research is that they usually emphasize, as in Jones and Comprone's article, the strategic expediency of muting criticism of disciplinary rhetoric and accommodating disciplinary conventions and dominant ways of knowing in order to achieve "permanence" for WAC. Moreover, much of this new research does not emphasize conflicts between competing disciplinary rhetorics nor their relationships with the "public." On the contrary, the rhetoric of this new research often encourages WAC reformers to mute criticisms of dominant uses of expertise on the grounds that each discipline is a culturally relative world that must be respected for its intrinsic differences and neither judged in relation to "public needs" nor the values of deep reform.

For instance, Christine Farris' recent "Giving Religion, Taking Gold: Disciplinary Cultures and the Claims of Writing Across the Curriculum" echoes our belief that "in isolating a reason to use writing, WAC advocates must work from some vision of schooling" (121). However, in her article, Farris reports on ethnographic observations of two classrooms in which, as she recognizes, the writing assignments discouraged students from developing their powers of independent critical thinking. Farris states that the teacher's instructions either stressed "form and stylistic matters, outlining. ..and footnoting" or emphasized that students use "class notes and textbook to write formally and intelligently" (117, 119). It is not surprising, then, that in an art appreciation classroom many students wrote art interpretations in which they "cut-and-pasted their lecture or quiz notes into a received pseudo-interpretation" (119). Farris explains that the research team believed that this approach to the assignment "may have reflected the more accurate assessment of [the professor's] real objectives" than the assessment of students who did not take this approach (119). "[W]riting for [this professor] was still the act that takes place after learning has happened. Papers, even informal ones, were not exploratory. . . but fait accompli interpretations sanctioned by the critics" (129).

Farris recognizes that WAC reformers "are charged with transforming that culture" which they observe and not only describing it. However, despite her team's observations, Farris refrains from criticizing reductive uses of writing because she believes that, if she does, "I am as guilty as Columbus in conquering the Indians" (120). The belief that each discipline, and each instructor's classroom, is a culturally relative world where outsiders apply their values only at the risk of "colonization" (113, 114, 120, 121) leads Farris to relativize (and mute) criticisms of the pedagogy she is observing. Indeed, we would argue that this metaphor of WAC as a "colonization" of the disciplines misrepresents the real power relations surrounding writing instruction, which has long been viewed as a "service function" and has long been carried out, disproportionally, by women and low-ranking faculty.

Despite our criticisms, we applaud Farris for raising some key questions for the future of discipline-specific rhetorical research. Should WAC reformers base their judgments of pedagogical priorities on composition theory or discipline-specific rhetorics in cases where the two conflict? If, say, rhetorical research in some discipline shows that most faculty don't revise substantively in this discipline, don't see their writing as a medium of critical reflection, but only as a mechanical tool for communicating results, should majors in this discipline be taught to see writing this way? If, to suggest another example, most molecular biologists, as Bonnie Spanier argues, do not consider the "humanistic aspects" of their disciplines as a part of science education, should teachers such as Spanier be warned against introducing such concerns into writing courses on the grounds they don't reflect, in Jones and Comprone's words, "the considered results of interdisciplinary research"(64)? We doubt that rhetorical research that invokes disciplinary relativism will be able to sustain emergent challenges to dominant uses of expertise that reduce students to consumers of knowledge. To sustain such challenges, rhetorical research will need to clarify dominant discursive practices by showing how disciplinary discourses always specify relationships between observer and observed, how classificatory schemata focus attention in ways that include as well as exclude possible objects and methods of study. Obviously, by situating dominant practices among alternatives, such research will not be able to escape subjecting dominant (as well as emergent and residual) practices to public assessments of their value. On the other hand, research founded on the premise of disciplinary relativity is more likely to shift dialogue about WAC towards how writing can serve isolated interests

of disciplinary socialization, thereby moving discussions away from the goal of establishing a critical public sphere between and within disciplines.

The focus of many second-stage arguments about how discipline-specific research and writing instruction can reinforce disciplinary norms is, in our view, evidence of such a shift. First-stage reformers in the 70s and early 80s often defined WAC in opposition to dominant educational practices -- to the '"banking model of education," or other models which envisioned teaching as primarily a transmission of knowledge (Jones and Comprone 62; Fulwiler, "Writing is Everybody's" 2 l-24; "Quiet" 182). However, second-stage reformers like Jones and Comprone say that such criticism must be "'leavened with the considered results of interdisciplinary research into writing conventions and processes" (64). From this perspective, as Jones and Comprone put it:

> permanent success in the WAC movement will be established only when writing faculty and those from other disciplines meet halfway, creating a curricular and pedagogical dialogue that is based on and reinforced by research. This dialogue must work toward balancing humanistic methods of encouraging more active and collaborative learning in WAC courses with reinforcing the ways of knowing and the writing conventions of different discourse communities. (61)

Jones and Comprone are no doubt right that a negotiation of expertise must occur to advance dialogue between reformers and disciplinary practitioners. Fulwiler and other early reformers have long noted that such negotiation of expertise would be necessary in reform ("Showing" 55-56; "Writing Workshops" 9-10). But given the service ethos in which writing instruction has long been embedded, given the dominant tendency in universities to see writing and teaching as outside the real processes of knowledge-making, what shape are such negotiations likely to take, if conducted in the terms Jones and Comprone recommend?

We welcome the dialogue Jones and Comprone foresee, if it really is collegial activity through which writing teachers and disciplinary practitioners "meet halfway," However, Jones and Comprone's overtly egalitarian language belies a subtle division of labor between humanist writing teachers and disciplinary practitioners. Indeed, Jones and Comprone imply acceptance of the dominant culture of expertise by dichotomizing and then seeking to "balance" the pedagogical and research functions of expertise: classroom "methods" on the one hand

and disciplinary "conventions" and "ways of knowing" on the other. In reflecting on how a "balance" between these opposed functions of expertise might be achieved, Jones and Comprone significantly associate the expertise of humanist first-stage reformers only with classroom "methods," not with possible insight into disciplinary "ways of knowing" or "writing conventions" which are presumably relative to each (disciplinary) discourse community. The suggestion is made that such conventions and ways of knowing, as revealed by authoritative discipline-specific research, should be "reinforced" by writing teachers. This division of labor between humanist writing teachers and disciplinary specialists implies not reversal, but reinforcement of the service ethos long surrounding writing instruction.

By conceiving the division of expertise between reformers and disciplinary practitioners in these terms, Jones and Comprone leave reformers and teachers with little room for criticism of disciplinary cultures, effectively relativizing the ways of knowing articulated in WAC pedagogies. Indeed, we suspect that, egalitarian rhetoric aside, the terms of dialogue that Jones and Comprone recommend will effect a power play, making writing serve not as an opening where the heteroglossia of disciplines (and of WAC pedagogies) can come under public scrutiny, but as a technology for reproducing dominant disciplinary values and discursive practices. Although Jones and Compronee claim that rooting WAC teaching in research on disciplinary conventions "does not mean that those conventions need to be slavishly imitated" (65) in classrooms, we believe that dominant discursive practices are unlikely to be interrogated in classrooms if teachers are charged with reinforcing conventions revealed by the "considered results" of research. Such language situates writing teachers as technical implementors of research conclusions about disciplinary conventions. We would argue, on the contrary, that writing teachers should feel empowered to draw on personal knowledge and research that situates dominant practices among oppositional alternatives. Without such recognition of alternatives, discipline-specific research may make it more difficult than it already is for teachers to represent academic writing as an activity receptive to student perspectives and intentions.

Recently, a number of compositionists and prominent WAC reformers have raised similar concerns about the direction of the American WAC movement. For instance, Gary Tate considers the possibility that "the recent interest in academic discourse and the various communities of writers that exist within the college and univer-

sity is a small part of . . . the increasing professionalization of undergraduate education in this corntry" (320). Along similar lines, both Nancy Martin and James Britton, two prominent founders of the language-across-the-curriculum movement in Britain, have recently questioned attempts to align WAC interests with those of the dominant culture of expertise. Nancy Martin suggests that the American WAC movement's concern for "'adequate standards of written language" distinguishes it from the British movement whose goal "represented a big shift in the concept of subject English" and was not primarily "to improve language butts improve learning" (4-5). Martin warns that the interests of LAC in postsecondary institutions

> . . . is not seen to serve the interests of the specialist or the specialism. However, . . . there is a direction in teaching, as distinct from research, that is by nature a shared one. . . . This, and not the vanishing commonality of the different subjects, is the promise of language across the curriculum (21; see also Britton 47, 59-60).

The danger of WAC research that implies that rhetorical pedagogies should be relative to each disciplinary culture is that it suppresses the ways in which relationships with other cultures and other ways of knowing, often hierarchical and contestory relationships, are now and have always been aspects of disciplinarity. The historical subordination of rhetoric and writing instruction both within English departments and within the scientistic ethos of the late nineteenth century university, is a case in point (see note 4). When research focuses on dominant conventions without tracing their relationships with emergent and residual conventions, the outcome is likely to be reinforcement of the "patterned isolation" of different forms of knowledge (Graff, *Professing* 60; Veysey 337-38) which we believe WAC should work against, Moreover, the more such research focuses on how writing instruction can "reinforce" disciplinary norms, the more likely emergent challenges to institutional culture (such as the ones we linked in the previous section) will become fragmented and be pushed into the background.

Norms and conventions are, after all, representations of majority practices in a community. But where does discipline by discipline investigation of norms and conventions locate Spanier's feminist critique of the language of molecular biology (which we cited in the previous section)? Spanier readily admits that her desire to "address ideology in the discourse and practice of science" is shared only by a relatively small minority of scientists, and is likely to be resisted by

larger disciplinary communities. Indeed, feminist critique is located both everywhere (as a marginal set of alternative perspectives within all the disciplines) and nowhere in the disciplines. (For accounts of how the legitimacy of feminism as a field of specialization is undermined by disciplinary cultures, see Scott, "Campaign" 37-38; *Gender* 17-18, 29-30; and Bauer 386.) We believe that since feminist critique challenges dominant discursive norms across the disciplines, there are powerful reasons why WAC research in discipline-specific rhetorics might not adequately represent it, especially if researchers regard their efforts as serving dominant disciplinary values in a bid to make WAC permanent.

Before we conclude by expanding on our view of what WAC's research agenda should look like, we want to acknowledge that some researchers of disciplinary rhetoric have given serious thought to the likely social effects of this research. Charles Bazerman's recent writing in particular gives significant attention to the dangers that a narrow focus on disciplinary socialization presents for students. Bazerman criticizes rhetorical critics of the disciplines (among whom we number ourselves) who may, by relying on textbook accounts of the disciplines, "make disciplines seem more like purveyors of hegemonic univocality rather than the locales of heteroglossic contention they are" ("From Cultural" 63). Bazerman shows how his own inquiries into disciplinary rhetoric "have not at all fostered the enclosed dominance of this discourse" (66), since they demonstrate a heteroglossia that can always be redirected. In Bazerman's words,

> "[t]eaching students the rhetoric of the disciplines . . . does not necessarily indoctrinate them unreflectively into forms that will oppress them and others. . . Explicit teaching of discourse holds what is taught up for inspection. It provides the students with the means to rethink the ends of the discourse and offers a wide array of means to carry the discourse in new directions" (64-65).

Bazerman illustrates this possibility of redirecting discourse by showing how the discourse of ethnography transformed itself from its nineteenth century beginnings in the service of imperialism to its currently vital self-consciousness about power relations between self and other (65).

We applaud Bazerman's professed goat as a researcher of disciplinary rhetorics to reveal disciplines as "locales of heteroglossic contention" and as never fully "enclosed." However, by criticizing the use of textbooks as indicators of disciplinary practice, Bazerman

neglects to explore how disciplines actually limit heteroglossic contention in practice, especially in relation to students and alternative sources of cultural authority. The textbooks, lectures, and short-answer tests, etc. on which rhetorical critics of the disciplines often base their critiques are the dominant vehicle through which "research" is represented to students in universities. The point is that textbooks are so stereotypically reductive (and difficult to change) *across the curriculum* because they express a dominant institutional culture which sharply dichotomizes the pedagogical and research functions of expertise, If WAC researchers neglect to explore how disciplines limit heteroglossia in practice, especially in pedagogical practice, they may, perhaps unwittingly, reinforce this dichotomy. Indeed, many WAC texts produced during the 1980s have perpetuated this reductive mode of representing scholarly behavior and practice. (See Mahala 779-781; also for an excellent account of how textbooks on research writing continue to suppress heteroglossia and reproduce dominant forms of knowing, see McCormick). Bazerman ignores the fact that textbooks, far from being naive distortions of the heteroglossia of disciplinary practice, reflect the results of extensive discipline-specific rhetorical research that textbook publishers have long conducted to guide their decision-making. (How many of us have filled out cards explaining exactly what we like and don't like about a particular textbook, often in exchange for a desk-copy of a text of our choice?) Textbooks are actually a fairly good reflection of the dominant pedagogical uses of expertise in schools and colleges.

We differ from Bazerman in believing that if students are to experience the messy and embroiled interchanges that produced a transformation in ethnographic discourse, the dominant pedagogical uses of expertise must be significantly transformed. Classrooms must be recognized as sites where knowledge is resisted, queried and produced (and not merely distributed), and where students read and write to appropriate and interrogate dominant discursive practices. Writing instruction should help students gain awareness of the power effects of dominant practices, the relations of these practices to alternative or oppositional discourses, and the multiple possibilities for students to inscribe themselves in discourse. Lastly, research must come to be valued less for its abstract "contributions" to knowledge and more for how teachable it is, and how it can contribute to informed social practice.

Fortunately, alternative and oppositional practices will continue to emerge in most disciplines. Therefore, the work of WAC reformers is not the work of converting disciplinary practitioners to their own "politically correct" points of view, but of intervening creatively in disciplinary conflicts and ambivalences that are already developing locally. If WAC reformers begin to develop rhetorical research that foregrounds fault-lines between various research communities, and between these and the public, perhaps they will succeed both in making education more spacious for students and in giving a legitimate place to different kinds of faculty expertise in reform, Such research can make criticisms of institutional culture more informed, specific, and locally applicable. However, to perform these functions, we believe WAC research must focus not on disciplines conceived as cultural monads, but on how dominant, residual and emergent ways of knowing and doing have evolved in historical, often hierarchical, relationships to one another and to cultural authorities outside the university. WAC research must also make visible how disciplines have historically tried to limit, contain, and even deny such heteroglossic contention. Such inquiry is more likely than research agendas informed by disciplinary relativism to put emergent cultures between and within the disciplines on the curricular map.

The programs, sites, and emergent uses of expertise described in the second section of this essay might be especially valuable to study. There is often a strong public character to such interdisciplinary programs, especially when they focus on bringing knowledge from a variety of disciplines to bear on urgent communal problems, as for example, in the Program in Social Ecology at the University of California, Irvine, which emphasizes, in Julie Thompson Klein's words, "direct interaction between the intellectual life of the university and recurring problems of social and physical environments" (174). Similarly, Klein describes a program at the University Center of Roskilde in Denmark which has sponsored interdisciplinary projects on community interests such as working conditions in Danish breweries, educational problems, and Danish volunteers who fought in Germany on the Eastern front during World War II. In such programs, Klein reports, interdisciplinarity is highly valued because "it is conceived as politically and socially engaged work on problems that arise in contemporary society. Thus interdisciplinarity is not considered an asset in and of itself, but rather a consequence of the kind of problems in which faculty and students are engaged" (158-61).

Klein also describes many courses and programs that go beyond traditional aims of liberal education towards the establishment of a rhetoric of inquiry that questions the values and epistemologies of traditional disciplines (166-67, 172-75, 195-96). Some of the programs are general education programs, but others are interdisciplinary undergraduate concentrations, and some are graduate programs. Unfortunately, as Klein notes, "interdisciplinary graduate programs tend to be more 'multidisciplinary' than 'interdisciplinary,'" partly because graduate education focuses so heavily on training specialists (169). However, even such "multidisciplinary" graduate programs offer WAC researchers an important opportunity to correlate epistemic differences between disciplines by examining how advanced learners struggle to achieve a professional voice among competing disciplinary discourses.

We contend that the study of discursive practices in such emergent public spheres represents the most desirable course for WAC rhetorical research the course that offers the best chance of opening more such public spheres and including students in them. But WAC research can also play a valuable role in traditional disciplinary settings if it attempts to illuminate how writing often poses itself for students as a struggle to negotiate between competing discourses and ways of knowing — not only those of the university, but those of the home, of religion, of ethnicity, of mass culture, etc. Mike Rose's *Lives on the Boundary* is an excellent example of this kind of research. Learning the discursive practices of many disciplines at once (as undergraduate students are called upon to do) is never a simple linear process of socialization, and WAC research can reveal the cultural detours and conflicts along the way. In some ways, then, classroom-based research in traditional disciplines, if it makes visible how some students struggle to negotiate between competing cultural affiliations in their writing, can be as interdisciplinary and "multicultural" as research focusing on learning in interdisciplinary programs. Both kinds of research can help make faculty more ethically and politically aware as they learn how the practice of their expertise in teaching interacts, and often conflicts, with ways of knowing students have already internalized.

Of course, this strategy does pose dangers. If second-stage WAC research follows this path — becoming in effect a forum where differences between ways of knowing can become visible and debated — it could revitalize the challenge WAC poses to the institutional culture of the university. Such research, if WAC reformers can gain institutional sanction and support for it, might even provide, in Fulwiler

and Young's words, "a more or less permanent structure whereby writing-across-the-curriculum advocacy is ever renewed and expanded" (294). But new research structures, and the teaching practices they sanction, will not be as stable as long-established disciplines. Plainly, such structures are likely to make entrenched practices and perspectives more open to public questioning, even if reformers make it clear that they are not enemies of disciplines. However, in noting the danger of resistance from entrenched positions, we must also point out that permanence can never be an unqualified value in reform. Reform means change, and change will always have its enemies.

Notes

1. References to a transition in the WAC movement can be found as early as 1985, when C.W. Griffin asks, in "Programs for Writing Across the Curriculum: A Report," "the *first act* is now over; what do we do for the *second*?" (403, our emphasis). In the late 1980s, however, there is more pervasive talk about a transition, centered on how to strengthen and preserve the reform effected by WAC during the 1970s and 1980s. See, for instance, Anne Walker's "Writing Across the Curriculum: The Second Decade" (1988); Susan H. McLeod's "Translating Enthusiasm into Curricular Change" (1988) and "Writing Across the Curriculum: The Second Stage, and Beyond" (1989); and Charles Bazerman's "The Second Stage in Writing Across the Curriculum" (1991).

2. Claims about WAC effecting common educational goals and promoting a community of scholars are conspicuous in literature published in the 1980s. This is not to say that reformers ignore the obstacles to achieving these objectives. Rather, it is commonplace for reformers to claim that WAC should and does effect these ends. See, for instance, Toby Fulwiler's "How Well Does Writing Across the Curriculum Work," (121); James L. Kinneavy's "Writing Across the Curriculum," (13-20); Elaine Maimon's "Cinderella to Hercules: Demythologizing Writing Across the Curriculum," (3, 1 I); and Susan McLeod's "Defining Writing Across the Curriculum," (24). Also see David Russell's comments on WAC reformers and the idea of a "return to a homogeneous academic community and a common learning," articulated in "Writing Across the Curriculum in Historical Perspective: Toward a Social Interpretation," (66).

3. Hosic 'argued that "co-operation in the teaching of English" necessitated overcoming certain "difficulties," particularly the fact that among faculty "each goes his own way, quite unfamiliar with the attitude of the other," a state of affairs partly caused by "the overspecialization of students in the universities and of teachers in the high schools" (478-79).

4. In a recent article, Robert Connors examines the historical roots of the service ethos that has long surrounded writing instruction. Connors documents the transformation of rhetoric and writing instruction from "one of the most respected fields of higher education" in the early nineteenth century to "a grim apprenticeship, to be escaped as soon as practicable" (55) in the late nineteenth century. Connors connects this fall with the rise of the belletristic study of literature and the philological study of language as the dominant fields of "English" (63), as well as with the rise of the modem departmental structure of the university (58-63). Connors explains how this structure was imported from German universities in the nineteenth century to form the basis of undergraduate education in the U.S., even though the German system had "no undergraduate component" and "was devoted to higher study and research rather than to any pedagogical end" (58). Connors follows Veysey in arguing that the German system privileged empirical scientific research and reflected an ideal of "pure science" (61) in which expertise in rhetoric and writing had no place, since study of rhetorical practices was not perceived as "scientific," was not amenable to laboratory methods, and evinced an ethically suspect worldliness that corrupted the expert's objectivity (6 l-63).

5. It should be noted that Perry acknowledges Fulwiler's work on journal writing (155), particularly 'The Personal Connection: Journal Writing Across the Curriculum."

6. The importance of these activities, formats and approaches to learning are evident in much discourse on honors, For a discussion on the idea and practice of the seminar, which emerges in the early 1920s, see Swarthmore College Faculty's *An Adventure in Education: Swarthmore College under Frank Aydelotte,* particularly chapters 3 and 4. *The Superior Student in American Higher Education,* a volume edited by Joseph W. Cohen and published by the Inter-University Committee on the Superior Student (ICSS) in 1966, speaks about the importance of the seminar, colloquia, and discussion-oriented classroom in honors (46-47, passim). For an overview of early honors programs that identifies important issues pertinent to the quality of

honors education, see Arnold B. Danzig's "Honors at the University of Maryland: A Status Report on Programs for Talented Students," (4- 10).

7. Faculty involved in the honors program collaborated with other faculty to institutionalize the Cultural Studies Program at Drake University. Some faculty who were involved in DUFA (Drake University Faculty Association), a group concerned with institutional reform, joined with honors faculty to form a Cultural Studies reading group. Starting with this reading group, this alliance of faculty developed courses, then a curriculum that offered a university-sanctioned concentration, as well as eventually secured a budget line for the program.

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Introducing Students to Disciplinary Genres: The Role of the General Composition Course

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Recent discussions of disciplinary writing have addressed the possibility that disciplinary genres cannot be taught. In particular, they have considered the proposition that if we understand disciplinary writing as a product of situated cognition, then it cannot be taught effectively by English faculty as part of a composition curriculum. David Russell, drawing on Vygotsky and Dewey, has argued this point forcefully:

> [Because writing is] a matter of learning to participate in some historically situated human activity that requires some kind(s) of writing, it cannot be leamed apart from the problems, the habits, the activities-the subject matter---of some group that found the need to write in that way to solve a problem or carry on its activities. (194)

Russell recognizes that one logical consequence of this way of understanding writing might be "to drop the abstraction (and perhaps the institution) of general composition courses in higher education" (195).

Furthermore, it may be the case that even within the disciplines, skill in writing can be learned (as one component of apprenticeship) but not taught. Carol Berkenkotter and Thomas N. Huckin have observed that "generally the enculturation into the practices of disciplinary communities is 'picked up' in the local milieu of the culture rather than being explicitly taught" (485-M). They focus attention on the question of when this initiation into disciplinary practices actually occurs, suggesting that what undergraduate students acquire are pedagogical genres rather than disciplinary discourse models. In other words, most undergraduate students acquire transitional genres which share some of

the features of disciplinary writing but are situated in classroom contexts. For this reason, Berkenkotter and Huckin argue that it may not be reasonable to expect undergraduates to acquire true disciplinary style and that modified teaching objectives may be more valid at the baccalaureate level. In support of this view, they suggest that writing-across-the-curriculum activities might reinforce the idea that classroom genres should not be assessed according to the standards for disciplinary genres (488).

Aviva Freedman raises the possibility that explicit teaching of disciplinary genres may be not only ineffective but even harmful. She argues that at best it may have little effect on students' development of the tacit knowledge needed to practice disciplinary writing. On the other hand, explicit teaching may lead students to overgeneralize rules which only partially encode the rhetorical practices of a discipline, and particularly when presented by writing specialists rather than faculty in the disciplines, may cause students to attend to the wrong things and thereby actually impede the process of enculturation (234-s).

We believe, with Joseph Williams and Gregory Colomb, that explicit teaching is beneficial, and we argue that it is particularly so for undergraduates, who are just at the thresholds of their disciplines. Most undergraduate writers lack contextualized knowledge of the disciplines to which they are being introduced. For them, the generative potential of disciplinary forms is especially important: When students try to practice the linguistic features of disciplinary genres, they must seek at the same time the kinds of substantive information those genres convey. As Williams and Colomb propose, even students who are not fully socialized are "compelled to focus on, perhaps even to generate, the knowledge for those generic moves" (262).

We suggest that in the process of introducing students to disciplinary genres, the roles of faculty in composition and faculty in the disciplines are distinct but complementary. English faculty can prepare the ground for acquisition of disciplinary style-which typically takes place gradually throughout the period of undergraduate and graduate study. Explicit teaching of writing by faculty within the disciplines can further ease the task undergraduates face as they move toward mastery. Our position rests on two fundamental propositions. First, even if "all" that general composition courses can accomplish is to introduce students to formal differences in the writing characteristic of different disciplines, that introduction is nevertheless a crucial stage in their acquisition of disciplinary style. Noticing the surface features of a

disciplinary genre is not a trivial matter, but a subtle and extremely important one. Second, a focus on the acquisition of disciplinary style is desirable at the undergraduate level because of its pedagogical role in fostering students' enculturation into their chosen fields. Truly mastering a disciplinary style means mastering the reasoning, the conventions, and the epistemological assumptions of the relevant discourse community; because completion of the undergraduate major is typically the first stage in mastery of the discipline, it makes sense to incorporate explicit attention to writing at that level.

The Role of English Faculty

English faculty are in the best position to introduce students to the concepts of discourse communities and disciplinary style. Samples of writing across different disciplines can be used to illustrate to beginning college students how writing varies with the setting. This fact is an important discovery for students and becomes itself a conceptual tool to assist them in dealing with the varied writing assignments encountered during their lives. Unless they become academics, students are unlikely to practice in their careers the kind of writing they produce in college courses. But they will have to adapt to patterns in the form and style of writing in their professional settings. Job promotions, career changes, and avocational pursuits can all move individuals into new discourse communities and present them with writing challenges that cannot be anticipated by formal instruction. A successful introduction to disciplinary styles prepares students to attend to the writing demands of new situations and thus speeds their enculturation into new communities.

The undergraduate curriculum itself presents many writing challenges. Variations in academic writing are more numerous and more fundamental than we once perceived. Charles Bazerman has shown that what counts as knowledge differs across disciplines and that disciplinary writing styles have grown out of varying conceptions of what and how we know. Susan Peck MacDonald's work has extended that insight; she has identified systematic differences at the sentence level, demonstrating not only that disciplines privilege different kinds of information but also that those interests are reflected and reinforced in the syntax of the sentence. Disciplinary styles are not just frames or shells into which content can be cast, but habits of thought and communication grounded in the objectives, values, and "world view" of each discipline. To ignore these realities in a general composition course seems irresponsible. A decade ago, Elaine Maimon proposed

that with help from faculty in the disciplines English faculty could "'make explicit the tacit conventions of a variety of genres" (1 13). Similarly, Leslie E. Moore and Linda H. Peterson have suggested, "[I]f English faculty cannot bring a knowledge of the content and methodologies of various disciplines to the composition classroom, they can bring something else that is essential: an understanding of how conventions operate in a piece of written discourse" (466-67).

The General Composition Course

Composition courses can introduce students to ways in which writing produced in different disciplines can be expected to vary. Like most introductory courses, general composition courses should aim to survey material which will be developed more fully as students progress. One of the goals of Writing Across the Curriculum has been to counter the notion, in the minds of students and faculty alike, that a single composition course---or, more likely, a sequence of required courses-completes a program of instruction, that it prepares students to "go forth and write" without further formal instruction. The general composition sequence should inform students about the task that lies before them and prepare them to assimilate new genres (ideally with the help of explicit instruction from faculty in the disciplines).

Although academic writing is not monolithic, there are at least three categories of conventions which occur in all academic genres. Conventions of structure control the flow of the argument and, more importantly, determine the kinds of cues available to readers. Conventions of reference establish standard ways of addressing the work of other scholars; they encode the formal or public relationships among members of the discourse community. Finally, conventions of language guide phrasing at the sentence level: they reflect characteristic choices of syntax and diction. Undergraduates in the early stages of their academic careers-toward the end of their first semester and particularly during the second semester of a two-semester sequence-can understand the ways in which writing conventions reflect the values and serve the needs of specialized communities of writers, and they can begin to recognize patterns and variations in selected samples of academic texts.

Conventions of Structure

Students can learn to observe disciplinary patterns in the ways academic writing is structured. Although there is, as Freedman notes, danger in overgeneralization, it is valuable for students to know that

there are certain rhetorical moves which are familiar and accepted within particular discourse communities. In empirical reports, it is conventional for detailed presentation of data to precede discussion of the conclusion to be drawn from them. In a literary essay, on the other hand, presentation of the author's central insight (the conclusion or endpoint of reasoning) typically comes much earlier and is followed by detailed discussion of supporting data. Handbooks for freshman composition courses generally offer students a menu of devices for the opening sentence or opening paragraph of an essay. It is important for students to know that particular options are more appropriate to one discipline than another. For example, opening a literary essay with an anecdote or a play on words or a quotation may be a sign of sophistication, but opening an empirical report in the same way would be extremely unconventional and would mark the writer as an outsider.

All academic writing exhibits patterns that Peter Elbow has called "conventions of explicitness"- that is, every mode of academic writing has ways of announcing its own structure and directing attention to its main points. "Even though there is a wide range of custom as to the degree of signposting in different academic discourses, signposting is probably the most general or common textual convention of academic discourse" (Elbow 144). For example, academic writing typically provides some sort of preview of its own objectives at or near the beginning of an article. In the humanities, as Elbow points out, it is particularly conventional to articulate the thesis near the start of an essay; the stress in many composition texts on announcing the thesis explicitly and early reflects the practice of their authors. The statement of thesis may be accompanied by even more detailed previewing: a listing of the principal stages in the development of the argument. In addition, academic writing in the humanities tends to be particularly attentive to signposting in the form of explicit sentence-level transitions, as well as mini-introductions and conclusions as the argument proceeds: here's where we've been and here's where we're going; thus . . . next. The use of headings and subheadings to announce subsections of the essay is optional but less common, certainly not required by convention.

The early introduction of an explicit thesis is by far the most common way of announcing in advance the point an essay will make. But in the humanities, another familiar strategy to cue readers to the writer's interests and strategies is the use of an epigraph. From the perspective of enculturated readers, epigraphs offer an especially el-

egant way of previewing because they accomplish more than one task: a well-chosen quotation both reveals and conceals, guides readers and challenges them; at the same time it often serves to establish the writer's scholarly credentials.

Writing in the natural and social sciences offers a preview of significant content, but not always by means of an explicit thesis statement early in the article. By convention, scholarly articles in these disciplines are preceded by an abstract or initial summary; before they begin the text of an article, readers have considerable insight concerning where it is going and how it expects to get there. Sometimes there is a true thesis statement near the end of the introduction, but more often what is stated in the introduction is a hypothesis, which focuses the issue yet preserves the possibility that the outcome may be unexpected.

Another convention of explicitness in the natural and social sciences is the nearly universal use of headings and subheadings to divide the text and announce its content. In empirical reports, the labeling and sequence of the major subsections are prescribed: introduction, methods, results, discussion. The specificity and universality of the convention are not trivial matters. These headings, in the order specified, signal not only the content or objective of each section, but the writer's commitment to one of the fundamental values underlying the empirical disciplines: the importance of shared, replicated methodology. Practitioners have long recognized that the genre of the empirical report is not so much a record of the actual process of thinking and doing as it is a rhetorical strategy for imposing a particular kind of order on experience (Gross, "Does" 437-39). By presenting their work in the conventional structure, with the customary signposting, researchers make the messiness of ordinary experience-which is more recursive, less linear, less neat than the model-conform to the ideal of the empirical method. Noticing and imitating this kind of rhetorical restructuring contributes to students' development of the values of the discipline.

Conventions of Reference

All academic discourse requires attention to the work of other scholars; the way references to other writers and texts are managed is governed by disciplinary conventions. These patterns encode differences in the ways disciplines conceive the nature and purpose of intertextual dialogue.

Strategic Use of Citations. The incorporation of citations in a scholarly text accomplishes a variety of different purposes, as John M.

Swales has observed (6-7). First, writers need to establish their credentials as masters of the literature in the field. Second, they display strategic judgment in their choices from among a range of possible citations. It may be prudent or even necessary for publication to establish professional alignments by including certain citations. For academic writers, the choice of citations becomes a subtle argument for the centrality or prominence of particular sources; texts and writers that are cited frequently acquire status, while citation of new or less familiar work can bring it wider notice. Finally, writers use citation and discussion of particular sources as a means to establish the focus and stance of the present text. The relative importance of these rhetorical objectives varies by discipline.

In empirical reports, for example, selecting references effectively and incorporating them in the right places is more important than discussing them. Listing citations without detailed discussion of the work referenced is accepted practice. Merely naming the source serves as a subtle and highly condensed form of communication with other members of the discourse community. Indeed, it may be difficult for an uninitiated reader to tell from the context exactly what the publication cited is about or how it relates to the work under discussion. The function of the reference is not to say anything substantive about the work cited, but to encode other kinds of communicationbetween writer and readers. At first, it may seem to students that being allowed to drop names is easier than extended discussion; they do not appreciate the importance of citing the right sources. It is true that English faculty won't know the relevant sources for other disciplines, but they can alert students to some possible missteps-for example, the risks in citing a source outside the particular target discourse community.

In other disciplines (for example, philosophy or literary criticism) a long string of unexamined citations is less common and likely to seem superficial, the strategy of a novice rather than an initiate. In the humanities, analysis (rather than identification) of previous work is often used strategically to anchor adiscussion. One of the most common ways for writers to put an issue on the table is to select a particular precursor for extended discussion, focusing on points of convergence as well as points where the present text will diverge. While it is still true that the subtleties of the argument are inaccessible to an outsider or a neophyte, the conventional treatment of sources is obviously less telegraphic and more discursive.

Quotation. In many freshman composition courses, considerable attention is paid to the mechanics of incorporating references to source material within a new text. Typically, students are expected to learn the phrasing and punctuation of direct and indirect quotation, the uses of block quotations as well as shorter quotations incorporated within paragraphs or sentences. In addition, students are taught to avoid dropping quotations or citations of sources into the text without analysis or discussion.

In fact, however, the use of frequent or extended quotation is a discipline-specific feature, more characteristic of the humanities than the sciences. A glance at the pages of a journal publishing literary criticism is likely to reveal quotations on every page; in journals publishing articles on cognitive psychology or archeology, quotations are quite rare. In such disciplines, students are expected to do extensive research and to master literature relevant to the problem they are addressing, but they are likely to lose points if they include the exact language of the original. Even a crucial insight, distinctively phrased, is more often paraphrased than quoted; block quotations are almost unknown.

A reliance on direct quotation is natural and essential in a discipline like literary criticism where the objects of study are texts. However, the habit of direct quotation is so common in the humanities and so uncommon in the empirical sciences that it seems to coincide, in practice if not in origin, with other differences in the relationships among members of a discourse community and the uses writers make of each other's work. In the humanities, the writer often defines a position by distinguishing it from that of others. New learning is as likely to result from revisiting old territory as from actually breaking "new" ground. Advances in understanding an issue or a text can be conceived as "thickening," elaborating, making more complex. Although literary scholars would be likely to agree that the "truth" toward which the discipline proceeds is multi-layered and encompasses a variety of different, often conflicting, contributions, the way an individual scholar presents a contribution is often by disputing or displacing work that has gone before. There is nothing particularly disturbing about standing apart or presenting work that represents a radical departure from the prevailing norms-perhaps a startlingly new reading of a literary text, Enterprises like literary criticism, philosophy, and history need revisionist thinking. The enabling fiction which justifies

new contributions may be that previous work has been "wrong," "blind," or inadequate in a significant way.

Progress in the empirical disciplines, on the other hand, depends upon the cumulative, collaborative nature of the scientific enterprise. As Kuhn implies, the most common and perhaps overall the **most** satisfying kind of contribution is to add a brick to the wall without displacing parts of the wall that are already in place. Obviously, identification of a fundamental flaw or instability requires radical rebuilding, but tearing down the wall and starting over sets everybody back. Researchers who produce completely anomalous findings are likely, initially at least, to be distressed and to be concerned about the validity of their own work. While relationships among members of scientific communities are no less hierarchical and no less competitive than those of other intellectual communities, the governing myth is one of disinterested cooperation.

The habit of avoiding direct quotation is useful to this community in two ways. First the practice of rephrasing minimizes explicit attention to the language in which ideas are expressed and contributes to what George Dillon has called "the rhetoric of objectivity." In theory, it is the core of the insight or observation which is available for restatement. Second, the convention of condensing and paraphrasing rather than quoting directly diminishes the need for public dispute or for the kind of clarification that sometimes seems quibbling. The narrow but inevitable distance between a statement and its paraphrase creates a useful space for redirecting language in ways that support new work. Although writers are expected to guard against actual distortion of another's point, a certain amount of accommodation is the norm.

Thus a relatively superficial difference in the texts produced in different disciplines, observable on the page, pointed out to students and imitated by them, suggests a crucial distinction in the assumptions of different disciplines about knowledge and knowledge-making. Dispensing with direct quotation assumes that ideas are separable from the language in which they are expressed. Conversely, heavy emphasis on direct quotation, particularly when quotation is accompanied by extensive explication, assumes that language and meaning are inextricable.

Conventions of Language

Preparing students to assimilate the conventions of language they will encounter in their disciplines is the most demanding and dangerous portion of a general composition course which addresses disciplinary

genres. Useful information associated with conventions of structure and reference can be communicated to students as concrete examples and suggestions for practice. Students at an introductory level can examine texts to determine whether a discourse community typically uses--or doesn't use--quotations. They can be guided in observing the different functions references perform in disciplinary texts They can compose texts which imitate the way typical written works in the discipline are organized. But with respect to the nuances of language, this approach is more difficult-for several fundamental reasons, not the least of which may be the inability of the typical English instructor t.0 recognize and articulate such features.

Although analysis of disciplinary genres has been conducted largely by specialists incomposition (forthemost part faculty in English Departments), the insight it has produced forces us to question whether English faculty are qualified to teach the language of academic writing in other disciplines. Composition instructors typically have little or no experience writing outside their own fields, In many colleges and universities, composition is taught by people steeped in the traditional English curriculum who have a sketchy understanding of and no admiration for the writing produced in other fields. Lester Faigley and Kristine Hansen observe that "the conventional four-part organization of a psychology report specified in the APA Style Sheet embodies a world view about how knowledge can be verified, a world view that few English teachers share or are willing to assimilate" (148). Many English faculty give students and colleagues the impression that they regard writing in other disciplines as pedestrian at best, because features they associate with fine writing (vivid metaphors, perhaps, or active verbs) are missing. On the other hand unfamiliar rhetorical moves may not be valued or even recognized. People who have never written lab reports or case studies cannot appreciate the way fully enculturated writers communicate with one another--the way they use and "manipulate" conventions, the way a particular choice of language may encode a subtext evident to readers in the discourse community--let alone coach students to attempt such writing.

Further, an English teacher venturing into these waters risks offending colleagues in the disciplines whose writing styles are addressed. Even scholars specializing in composition or rhetoric often fail to perceive how often their characterizations of intentions and practices in other fields strike a false note. It is hard for English faculty to appreciate how annoying it may be for writers in empirical disciplines

to be told that they "manipulate conventions" when "manipulation" suggests not an appropriate and admirable mastery of the form but deviousness, deceit, or a lapse in the forthrightness valued in the discipline.

To be successful in preparing students to assimilate conventions of language, an English instructor must develop sensitivity to these issues and adopt conservative instructional objectives that can be reasonably achieved. He or she should not be placed in the role of "expert" in the nuances of language in other disciplines but rather should use appropriate examples to instill in students the basic principle that conventions of language differ among academic writing genres. We nominate three topics for use in making that point.

Language as a Medium or a Product. In some disciplines such as literary criticism, texts not only communicate, they are unabashed celebrations of language. Vivid metaphors, dramatic sentences, and self-conscious phrasing distinguish these works from writing in other disciplines where words are chosen to make language appear to be a transparent medium for expressing ideas. Writing in the natural and social sciences is an example of the latter, where diction and syntax work together to keep the reader's attention on the phenomenon under study, not the language used to describe it. Metaphors are not at all uncommon in empirical reports (where, for instance, measurements may be discussed in terms of "floor" or "ceiling" values), but they are likely to be conventional metaphors so familiar to enculturated readers that they do not call attention to themselves. Undergraduate students can learn to appreciate fundamental assumptions about language which underlie differences in disciplinary styles. A collection of carefully selected samples can prepare students to attend to the ways language is used in their disciplines and thus aid them in assimilating the style of their chosen fields.

Expressing Disagreement. Writers must sometimes disagree with others in their fields, and the ways in which disagreement is expressed differ dramatically among disciplines. This is another area where distinctive language patterns can be identified that are interesting to students and also serve to reinforce the idea that there are differences in language conventions among disciplines. In some fields such as literary criticism, disagreement may be sharply expressed. Another view may be described as "willful revisionism" (Bethea 232), or a colleague may be said to be "truculently persist[ing] in crediting the discredited" (Battersby 51). In the discipline of history, such assertive rhetoric is

rare; disagreement is gently handled or ignored. An alternative position is described as "too simple" (White 874). A historian with a different interpretation may be said to "take a sunnier view of the material" (Rogin 1076). In empirical disciplines such as psychology, disagreement is focused on the details of the empirical process and away from other writers as individuals. The generality of another's proposal may be challenged as Tenpenny and Shoben do in asserting that ". . . this [theoretical distinction] is not able to deal with an increasing number of results . . ." (25), or methodology may be questioned as illustrated by Hirshman and Durante: "The primary criticism is that the threshold-setting procedures used in previous experiments are not adequate to ensure that. . ." (255).

These examples show different conceptions of etiquette in disagreeing with colleagues. Although the subtler nuances of such language conventions are beyond the scope of a general composition course, their basic forms and the issues they index can be presented by English faculty in a way that prepares undergraduates to be more thoughtful readers and writers in their disciplines,

The Language of Conviction. Handbooks used in composition courses often give students blanket advice to be direct and to avoid redundancy or "clutter" by eliminating qualifiers ("probably,"' 'maybe," "I think," "In my judgment,") and making assertions forthrightly. In particular, students are advised not to allow the use of such qualifiers to become a mannerism. Inliterary criticism, for example, it is understood that the writer is presenting his orherreading of the work and it is usually unnecessary to repeatedly emphasize the tentativeness of the enterprise. Within this disciplinary context, an appropriate degree of assertiveness conveys conviction.

In the conclusions of empirical reports, however, "hedged" wording-for example "tend," "suggest," "may," "it is probable that," "it is reasonable to conclude that"-serves an important function. Because empirical reports typically relate the data of the study to the discipline's current understanding of a recognized problem, the author is faced with a rhetorical task that requires a delicate balance. On the one hand the author must convince peers that the results have substantive implications, butontbeother, the conclusions must not appear to extend beyond the data. One indication of this rhetorical tightrope is the frequency with which hedged wording is used to discuss the conclusions of empirical studies. Hedged wording implicitly recognizes the uncertain flow of the ongoing stream of empirical studies investigating complex phenomena.

New findings can and do cause old conclusions to be abandoned. As Alan Gross has observed, the language is designed to convey the impression that theories are more tenuous and less permanent than the data that generate them, an idea that has characterized empirical disciplines since the time of Bacon (Rhetoric 69-74). By communicating proper respect for the empirical process, such wording has the rhetorical effect of making a hedged conclusion more convincing than a stronger claim.

The Role of Faculty in the Disciplines

We should begin by saying that the role of other faculty in improving the writing skills of their students is, and will remain, outside of the purview of the English department. We expect that these faculty will continue to employ a wide variety of strategies designed to improve the writing of their students. Nonetheless, the approach to discipline-specific writing proposed here would change the model of writing instruction current on most university campuses. Presently, most faculty view writing instruction as the responsibility and the expertise of faculty in the English department (even writing across the curriculum programs often involve "outreach" by members of the English department who participate directly in the instruction and assessment of writing in disciplines other than English). Many faculty would be surprised at the disciplinary differences identified by studies in composition; they share with some English faculty the assumption that good writing is readily identifiable and that good writing in one setting is good writing in another. As English courses move to explicitly prepare students to acquire disciplinary style, the operative model of writing in an academic setting is likely to evolve as well to one where faculty in the other disciplines feel responsibility to help their students master the relevant disciplinary style. We believe this will be the case, if for no other reason, because students primed in the ways we suggest here will be asking more focused questions that faculty in the disciplines will find interesting to address. Many of these faculty may come to accept the proposition that mastery of a discipline's writing style helps students acquire the discipline's style of thinking and problem solving. It is likely that disciplinary writing could become a more important pedagogical objective for these faculty than it is at present. We believe that such changes could revolutionize not only the composition course but also the general role of writing in college instruction. The effect may be an increase in experimentation with pedagogical approaches to disci-

plinary writing, carried out by individual faculty members in many disciplines. These innovations are likely to involve explicit teaching strategies in many varied forms. They will no doubt draw on existing guidebooks (such as Gelfand and Walker's *Mastering APA Style*) and also develop new directions. English faculty cannot expect to direct such efforts. But they can expect that studies in composition and rhetoric will be enriched by mutual. exchanges with colleagues in the disciplines.

Concluding Comments

Presently, students in composition classes are offered more models of writing in the humanities and more practice in producing that kind of writing than any other, The result is that much of what they learn in composition is not transferable to writing in their other classes, let alone to writing in their professions. We believe that this need not be the case. Students can learn the kinds of conventions that can be expected to change across discourse communities. They can practice the surface features of generic form--and can profit particularly from comparative exercises. For example, working from a set of readings, students can compose introductions for two different disciplinary genres, an assignment that requires them to attempt different rhetorical moves in their opening sentences, in references to source material, and in the establishment of focus, They can practice modifying an argument by using the language of conviction appropriate to different disciplinary genres. By careful selection of material and staging of assignments, the general composition course (particularly the second course in a two-course sequence) can prepare students to adapt to the discourse communities they will encounter later.

In examining the crucial issue of whether writing skills acquired in one context can be applied successfully in other situations, Michael Carter draws upon a fundamental distinction between general and local knowledge: general or abstract knowledge of writing should be applicable across different contexts, while local knowledge is context specific; he argues for the importance of both general and local knowledge in writing, with general knowledge particularly critical when writers approach unfamiliar writing tasks (269-71). Heretofore, composition specialists have typically assumed that examination of disciplinary writing relies upon local. knowledge and therefore is beyond the scope of the introductory composition course. The problem is that many of us have been offering local knowledge (the patterns of structure, reference,

and language characteristic of writing in the humanities) as general knowledge. In fact, however, the required composition course presents a unique opportunity to equip students with heuristically useful general knowledge about writing conventions in the disciplines.

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Students and Professionals Writing Biology: Disciplinary Work and Apprentice Storytellers

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I. Introduction

The character of formal scientific writing has been well defined by various rhetoricians and sociologists of science. In most cases, published professional work follows the general scientific format of abstract, introduction, methods and materials, results, and discussion, Much has been written about the ways in which this structure effaces the role of the experimenter/writer and instead presents the object studied (nature) as operating autonomously; results are made to appear to be merely the quantified revelations of this operation.[1] At the same time, much work has been done on student writing in the sciences, Composition and writing across the curriculum specialists have established that various "write-to-lead strategies can be incorporated into the science classroom and have studied pedagogical approaches to teaching scientific writing.[2] What has not been taken into consideration in nearly the same detail are the rhetorical differences which set student writing apart from professional work in the sciences. Such a comparison would offer rehtoricians a vision of the underlying framework generally concealed beneath the airtight smoothness of professional discourse.

For this project I have studied the differences and similarities between student and professional writing in the biological sciences. Ultimately, I found that the student writer is granted apprentice status in the discipline of biology when s/he comes to understand two central things: that the format of the scientific paper has at stake the separation of the "natural" from the human; that the "human" function of interpretation and argument is dependent for its legitimacy on the narrative presentation of a "natural" process, I use "natural" in quotation marks in order to emphasize that the subject matter of a narrative is no more removed from the human who writes than that of any other rhetorical form. The function of formal writing in the discipline of biology is to

establish the illusion of "natural" time through an abstract "story" which validates the scientific claim by (rhetorically if not actually) preceding it. If this process of emplotment is precisely the task of writing in the discipline, however, that fact is rarely explicitly articulated. Instead, students are given advice for writing "lab reports" that not only contradicts itself but that helps to mystify how legitimate knowledge is actually structured in the discipline. As Ball et al. say of academic work generally, the "constitutive knowledge of the discipline.. .is naturalized and kept hidden by institutional representations of disciplinary work" (356). I shall explore this premise by contrasting the stylistic norms of professional and student writing in biology; my goal is to foreground the gap between what the institution nukes explicit for students and what it keeps to itself.

II. Methodology

The research examined here is part of a larger study I am conducting on the gaps between the discipline-specific expectations of faculty and the explicit articulation of those expectations for student writers. I study one academic department per semeester, accumulate data (faculty interviews, syllabi, assignments, comments on student papers, publications; student interviews, papers), and shape that information into a report that I present to the appropriate department. What has been particularly useful for me in this has been access to faculty grades and comments on student writing; evaluation reveals a great deal-generally in implicit ways-about how certain shapes of writing and knowing are valued above others in the disciplines and how that prioritization is communicated (or not) to students.

Data for this particular study was gathered between the spring semester of 1992 and tie spring semester of 1994. I interviewed all biology faculty members at my institution (a small liberal arts college in Pennsylvania about the teaching of writing and the structure of scientific writing; I collected and studied graded student writing from several sections of General Biology as well as from assorted upper-level courses; I examined all the articles published in six central professional journals in 1993-4; I solicited other data such as syllabi, assignments, and style guides. This research has been admittedly unscientific, owing as it is to understandable faculty and student hesitancy; however, the repeating themes have been striking, particularly in terms of grading criteria, articulation of those criteria, and structures of writing. For example, students almost universally claim that writing in their biology

courses is about "facts"; conversely, their paper grades show that they are regularly penalized for not organizing and selecting what will count as "factual." In interviews, faculty articulate a desire for greater "clarity" and "brevity" in student writing; their comments on students' papers reveal a greater expectation for narrative emplotment.

III. Discussion of Findings:

A. The Style Guide

The "Style Guide" given to all students in General Biology provides a clear example of the contradictions and mystifications embedded in "institutional representations of disciplinary work." The guide takes students through the traditional sections of the research paper (abstract, introduction, materials and methods, results, discussion, tables, works cited) and then offers them the additional stylistic advice to "be brief' and to "be precise," to "use exactly the right term for what you mean, even if this means you must repeat the term several times in a paragraph." This expectation for representational "truth" in scientific writing is contrasted explicitly with what are described as the more aesthetic but less mimetic qualities of writing in the non-scientific disciplines: "You may have been taught to vary your expressions and use synonyms, but in scientific writing precision has a higher priority." In other words, "precision" is a function of fewer total words, fewer "synonyms"; writing "precisely" (and scientifically) is a process of perceiving the "thing" for what it is and naming it correctly. Significantly, exactly half of the fourteen lines of advice about style explain the format of the scientific name. The message is clear: nature can be reflected in the mirror of scientific writing if that "nature" is precisely encoded into its corresponding scientific names. Writing within the social sciences or arts and humanities, in contrast, is thus implicitly defined as an enterprise not primarily concerned with representation -- with correspondence between word and thing-but rather with an enclosed and perhaps reflexive multiplication of verbiage.[3] Unsurprisingly, then, the style of scientific writing is also defined for the student as involving a great deal of "cutting." Fewer words meangreater correspondence to the world; more words imply an imbalance. Brevity ("Be brief. Cut out needless phrases") is the soul, not of "wit," but of truth.

Alongside these directives to "be brief' and "precise" is the advice to "stick to the point." This is an interesting complication. If nature is to be mirrored through a precise one-to-one translation into scientific

names, then there is no particular "point" involved; that one should have a "point" implies a certain agenda or pattern of individual choices, a certain amount of literary shaping, a goal having to do with audience reception. The necessity of "sticking to a point" also implies a sidelong glance toward the multiplicity of semiotic - and natural? - possibilities that await the unsuspecting and unfocused writer. A "point" is necessary only in a world of dizzying abundance, a world opposed to being easily and permanently codified. This seeming contradiction between reporting and "making a point" is repeated elsewhere in the style guide. In the introduction, for example, students are told on one hand, that

> Contrary to what many people believe, scientific writing is not fundamentally different from other kinds of formal writing. A superbly-written scientific paper is logical, clear, and makes a cogent point. It is also readable, provocative, and even exciting.

In the next paragraph, on the other hand, students are told that "the major goal of a scientific paper...is to report descriptive or experimental observations." "Sticking to a point" and observing/reporting are thus presented as if they do not contradict each other as goals, and yet there is no clear explication of how they might interlock. Is scientific writing about mirroring the natural world, about making and defending a point, or about a subtle combination of both?

Ultimately, this contradiction (and its apparent invisibility to the writer of the style guide and the professors who assign it for classes) is lodged in the attempt to explain to students the formalities of scientific writing and the relationship of these formal constraints to the natural world. That there are formal constraints and that they derive not from nature but from human language/knowledge systems is self-evident and in some contexts easily admitted:

> . ..some conventions have evolved that most scientific writers follow. When you first try these you may feel confined and awkward, in somewhat the same way as in writing a first haiku or sonnet.

What is not so easily explained is how -- and how much -- these "conventions" change *from the beginning* the nature of the thing observed and reported. The writer of the style guide claims that it is *"because of* [the] priority" of description and experimental observation that "conventions have evolved" (my italics). The logic of this claim is odd: it is *because* the goal of scientific writing is pure representation that impure forms -- forms that replicate the imprecision of the arts and humanities -- have evolved, Somewhere in this explanation is a failure to

acknowledge the complicated nature of "reporting"; in between the linguistic form and the material world is the shaping mind perceiving through language, and this is what is excluded from discussion--just as it is excluded from the formal written genre of the discipline.

B. The Structure of the Genre

1. "Methods and Materials" in Professional and Student Writing

The largest portion (roughly 70%) of almost all professional articles and student papers examined for this study is composed of the sections on methods and materials-the section whose purpose is to provide the objective base for all and any interpretative moves. This section removes the disinterested "reporting" and "observation" of the experiment from the more explicitly interested introduction and results/ discussion: the introduction must take up the relationship of the study in question to previous work as well as the guiding hypotheses of the current researcher; the discussion must "interpret" the results, an action that necessarily and obviously involves some human intervention. The successful materials and methods section, on the other hand, must exclude all reference to the shaping experimenter-as well as to the shaping and constructive writer.

The materials and methods section functions to place the experiment within the rhetorical framework of an idealized and seamless narrative. The extent to which this legitimating section is necessarily separated fiom human hands is evident in the ongoing use of passive constructions. In the case of the professional articles examined for this study, all methods and materials sections were written entirely in the passive voice, The general effect is that the "doer" of the experiment is rhetorically subordinated to the object-which Bazerman claims is "taken as given, independent of perception and knowing"(31)-and its transformation through time. Here, for example, is a representative passage from an article on the "direct monitoring of intracellular calcium ions in sea anemone tentacles" from *The Biological Bulletin:*

> For experiments involving fluo, whole animals were incubated in a 20-pM fluo-3 AM solution for 40 min at 23°C and then washed twice for 10 min each. Tentacles were excised, placed on glass coverslips, and secured with glass micropipettes (tip diameters of <1 mm) by applying gentle suction with microinjectors. (Mire-Thibodeaux and Watson 336)

This style of writing not only removes the human actor from the scene, portraying nature as almost alone, but it also reinforces this sense of

impersonality by generalizing the events of the experiment, transforming them to an idealized narrative. No reference is made to the accidents, the unexplainable incidents, the awkward confusions that generally accompany scientific practice -- the events of "incoherence and uncertainty" that Pickering argues are "the hallmarks of experiment" (277).[4] Instead, experiences are generalized into one linear trajectory that is presented as if observable by any disinterested viewer capable enough to set events in motion.

What I refer to here as the generalized trajectory of the experimental narrative Gilbert and Mulkay articulate similarly as a series of abstract "rules"; the methods section of a scientific article, they argue, is constructed as if

> all the actions of researchers relevant to their results can be expressed as impersonal rules; as if the individual characteristics of researchers have no bearing on the production of results; as if the application of these rules to particular actions is unproblematic; and as if, therefore, the reproduction of equivalent observations can be easily obtained by any competent scientist through compliance with the rules.(52)

Gilbert and Mulkay go on to contrast this formal impersonality of scientific writing with scientists' informal and spoken admission of personal involvement in the formulation of results. The interviews that Gilbert and Mulkay have conducted reveal the extent to which these "rules" are dependent for their practical meaning on individual context, on "variable craft skills, intuitions, customary knowledge, social experience and technical equipment available to individual experimenters" (55). Similarly, Gooding works with what he calls the "technique" or "skill-ladenness" of observation.

If the methods section of professional writing obscures the personal and unique in order to produce the impersonal and general, however, student writing often blunders into revealing its own constructive hand; such blunders are instructive in providing a clear sense of what must be cut from a scientific paper in order to preserve the core section of disinterested observation which grounds all interpretation. The most common type of awkwardness is caused by students contorting their syntax in order to preserve the passive voice, as in these typical sentences from papers turned in to Introduction to Biology:

— When calculating the total number of species identified, fungi located in clumps were counted as a single entity.

— Using one empty mouse cage constructed a simplified version of an obstacle course.

In both cases, the students are attempting to remove themselves from the natural subject position and offer agency instead to the object studied (in the first case) or the experiment itself (in the second). Furthermore, although faculty interviewed for this study claimed that they encourage (some) students to avoid passive voice in order to circumvent such cases of convoluted syntax, the evidence shows that in fact it is only the students destined for lower than average grades whose editing comments push active voice; the best writers, the students judged to be doing "A" quality work, are never told to avoid the passive voice-which they almost always use.[5] The best work in the discipline is still presented passively, and those judged to be apprentice insiders are implicitly taught this fact. It is thus perhaps somewhat disingenuous to encourage students to resist a form that would ultimately help to legitimate them.[6]

More telling than these syntactical problems are slips in impersonality. A lapse in self confidence, for example, plunges the tone of a paper back toward personality, as in this case: "Algae types were identified to *the best of our abilities* and records kept on each tube" (emphasis added). The writers' expressed lack of faith in their own identification skills turns the paper toward self-reference and away from the object studied (algae). This type of self-reference, interestingly, is rarely commented upon by graders, and yet only the papers judged to be lower than average make these types of blunders. One paper turned in for a independent research project, for example, is filled with personal moments like these:

> Because of the lateness of the season, it was more difficult to collect fungi specimens with all of the leaves on the ground. We were lucky though and discovered a large amount of Polyporus sulfereus ("Chicken of the Woods," which we will refer to as 'chicken') growing in the front yard of Dickinson's president A. Lee Fritschler.

Clearly this paper does not replicate the tone of the *Biological Bulletin* because of its haunting sense of personal humor, its implicit reference to desperate and procrastinating college students picking leaves from the president's lawn. The personal anecdote intrudes on the generalized narrative. Significantly, the professor comments generally that "the paper...needs a little more work, to be gotten into proper journal article format." In addition to combining the introduction and abstract (which the professor comments on), this student has not managed to replicate

the precise nature of professional scientific narrative, the "evidence" portion of the scientific article that upholds the ultimate interpretation. It is essential for purposes of validity that methods and results sections maintain what Barry Barnes has usefully termed "a cosmology firmly denying man (sic) any special significance"; it is this "cosmology" that accounts for the characteristically scientific "aversion to anthropocentrism and anthropomorphism" (45). "Man" returns onIy to the writing of those who are not quite conscious of the scientific requirement for non-reflexive evidence.

Nowhere in all the papers and professor comments examined for this study, however, did I see an explicit articulation of the problem of self-reference, Problems with syntax are corrected, and general comments about "appropriate format" are made, yet the problem of explicit textual shaping is not explicitly addressed. The problem of self-reference is apparently so central to the discipline that even reference to self-reference is avoided. What is articulated instead as the central problem in student writing-both in paper evaluations and in interviews-is the perennial lack of "clarity." Contorted passive syntax and tonal inappropriateness are subsumed within this general category that implies that only "concision" is at stake in report writing. As in the "Guide to Scientific Writing," the final answer is always that in spite of the "artificial" form of the lab report, in spite of the "point" one must ultimately make, scientific writing comes down to being "clear" and being "brief," establishing a one-to-one correspondence between words and nature, between narrative and experiment-as if naming things precisely will necessarily entail emplotment. In the case of the "chicken weed" paper discussed above, for example, although the final comment is that the paper is not yet in "proper journal article format," the margin notes written throughout the methods section draw constant attention to the issue of "wordiness." When the student writes that "after the spores had fallen out and had been collected, we had to then begin to prepare the agar plates," the professor writes, "Pretty wordy. Try to condense." When the student writes that there "is [was--sic] a grand total of 27 plates (just for chicken spores)," the professor writes, "Clear but still wordy. Try to condense." When the student comments that "the light/darkcontrastplates were a little tougher though," the professor responds with "Nice setup! Keep practicing condensing, though."The articulated editorial desire for greater brevity in these sections helps to disguise a problem that is even more specific and more central: the narrative flow is disrupted not only by "wordiness" but by tense shifts (to the present

moment of writing) and other personal intrusions-suggestions of purpose, decision making, emotional responses, self reflection.

This issue of narrative flow is, I think, a central one. Myers has established that the form of the methods section in biological discourse is generally narrative and that the structure of this narrative is highly contingent on contextual variables such as audience, the relative power of the writer, the number of contending claims, the amount of unknown data, etc.[7] In terms of explicit function, the methods section purports to describe "what was done" and "what happened." Thus Gilbert and Mulkay's contention that methods sections are constructed "as if all the actions of researchers relevant to their results can be expressed as impersonal rules"' (52) is misleading to the extent that it does not take into account the implicit fact that a "rule," whether personal or not, is not necessarily a function of time but rather of space, or spatialization. In fact, genre theorists outside the field of the sociology of science have critiqued the discourses of the social sciences partly by contrasting them with the narrative structure of the natural sciences; writing in the social sciences is accused of "abstract objectivism," the relocation of the temporal and contextual onto the encyclopedic grid of space.[8] The task of the biological researcher when writing a methods section, conversely, is not so much to list abstract rules of operation as it is to tell the generalized story of what s/he did to certain materials to set a certain course of events in action. This story telling is clearly impersonalized and abstracted-s/he must tell the story of what s/he did without explicit reference to her own part in the drama--but it is not detemporalized.

Writing a clear and cogent methods section, then, is about "emplotment," a term commonly used to describe historical discourse and implying that coherence, meaning, and argument are constructed through the narration of selected "events."[9] Narrative emplotment is a form of discourse that easily masquerades as being "true" and without human intervention and purpose; as de Certeau puts it of historical writing, narrative "discourse takes on the color of the walls; it is 'neutral' ...instead of being the statement of 'causes' which might express a desire." *(The Writing of History* 68) This narrative "neutrality" is "established out of principle by a will to objectivity," a will that creates distance between the teller and the told, the voice of the present tense and the object that is safely and rhetorically in the past, by itself, inviolable. It is through this "will to objectivity" that "storytelling...renders believable what it says[;] inpretendingtorewunt the real, it manufactures it." (*Heterologies* 4, 207)

The function of the methods section of a scientific paper, in this reading, is precisely to "render believable" the conclusions of the researcher, to construct a believable story. Scientists generally claim that the purpose of this section is the demonstration of "replicability," an assertion that Mulkay, Barnes and Gross have found to be largely untrue. The function of methods and materials is not "replicability" but rather validation of argument through a form of emplotment that denies the generally non-linear "progress" of science. Actual lab notebooks are never published, as Cantor points out, reflecting as they do more of the actual messiness of scientific process; what does reach the public is the "retrospective narrative, an impersonal, passive reconstruction which draws attention to those theories, tests and data which are considered appropriate for consumption by the scientific community" (160). Similarly, Lynch argues that the "docile record" of scientific narrative is always produced from the vantage point of the already known results: "the 'what-was seen' at any given point in an experiment is an historicized construct based upon 'what it turned out to be' in the end" (220). In short, the function of the experiment is to produce results of a particular kind; if it does not, the variables need to be recrafted in order to ensure appropriate numerical results; furthermore, the telling of this story needs to select out inappropriate elements in order to retain "clarity": as Knorr-Cetina puts it, "scientific products are 'occasioned' by the circumstances of their production" (124). It is precisely this recursive construction of the experiment and its story that is unarticulated in published writing. [10]

The clarity and linearity of the narrative "flow" are thus understandably central areas for evaluative judgement of student writing. Above all else, a good story must be readable, must through illusion replicate the lived and rational experience of time and causality. The central problem in the "chicken" paper discussed above is its constant "wordy" interruption of the story line, a critique that implies that "words" and stories are opposed-that stories and "truth" are united. Additionally, in spite of such recurrent criticism of the "wordiness" that breaks down coherence, the top rated papers from Introduction to Biology employ far longer sentences (on average 33% longer) than those of papers at the bottom of the ranking system. Furthermore, the successful papers utilize complex sentence forms on a much more regular basis. More specifically, the top ranked papers depend upon introductory clauses and phrases-particularly adverb clauses that reinforce the sense of linear time. In one top ranked paper, for example,

(see figure 1 in the appendix) of the twelve sentences total in the methods section, exactly half begin with introductory clauses or phrases that contribute to narrative flow; four of those are actually temporal markers, as in these examples:

— Once this was accomplished, this mixture was drawn up...
— After ten days of incubation.., the tubes were removed..,
— After two hours had passed, the amount of sexual reproduction was determined, etc.

On the other hand, in a paper ranked closer to the bottom of the same set, out of the 26 (highly periodic) sentences total in the methods section (this methods section is only one line longer than in the previously discussed paper), four begin with introductory clauses or phrases, only one of which is a direct temporal marker (see figure 2); one other sentence begins with an implicit reference to previous time, but not in a manner that relates to the experiment itself.

Like the student papers judged to be at the upper end of the grading scale, professional writing within the various branches of biological research evidences a strong tendency toward lengthy sentences dependent on introductory temporal markers, For example, in the methods sections of articles published in the January *1994* issue of *The Journal of Experimental Zoology,* one quarter to one half of the sentences describing the actual experiments began with explicit references to time. Here are sample sentence openings of the methods section of the first article of the issue:

— On each of days 16, 30, and 39 ,...
— Then each group of eggs was exposed....
— On the same days....
— After measurements, eggs were transferred.,..
— They were later thawed.. . .
— Immediately after the O2 concentration...was measured,... etc. (Kam and Lillywhite 2)

This emphasis on linear emplotment is typical of all the methods sections of the journals I studied. Teacherly criticism of student "wordiness," then, is misleading, implying as it does that word numbers need to be pared down in order for the report to approximate the objective "truth"; in fact, the legitimate discourse of the field places a high premium not on fewer words but on words that enhance the sense of uninterrupted and non-reflexive narrative.

2. *"Results and Discussion"*

The idealized narrative of the methods and materials section makes believable and convincing the conclusions presented in the results and--more importantly--discussion sections. Results sections generally represent the quantified findings of the experiment reported in methods and materials, As it is put in the style guide to writing a scientific paper, the results section is "an objective report of what happened." Going further, the writer of the guide cautions the student reader that "it does not include your interpretation of what the data imply (save that for the Discussion)." Professional writing reflects this desire to appear to exclude explicit interpretation from results sections; these sections generally combine passive narrative (e.g. "Fluorescence intensity was measured for the 10 brightest epidermal cells per microscopic field at each timepoint"); quantified tables and graphs; and generalized findings (past tense) and "rules" (present tense), with the object studied usually taking the subject position of sentences (e.g. "sea anemone tentacles are composed of two tissue layers separated by a mostly acellular matrix called the mesoglea," and "Fluo-labeled tentacles exhibited fluorescence both in the epidermis and in the gastrodermis" [Mire-Thibodeaux and Watson 338, 339]). The results section thus realizes, in a sense, the narrative direction of the methods; it reflects the "natural" culmination of an (almost) agentless series of events, It is precisely because the results section follows and is thus legitimated by the narrative "methods" that it has become, as Thompson argues of the results sections of published work in biochemistry, "the bastion of 'cold' factual reporting" (107).

The highest ranked student papers for Introduction to Biology clearly employ this tone of natural closure in their results sections. Among the most often repeated words are "evident" and "obvious," used as in this particular paper to construct findings as believable:

> — From Figure 1, it is evident that similar rates of sexual reproduction occurred.
>
> — It was obvious both through visual observations and statistical analysis, that C. moewusii was affected by both the depleted nitrogen and phosphorus conditions (emphasis added).

The professor has marked the first sentence "good" and the second "excellent," praising, one must assume, not only the findings but their representation as being only too obvious to any observer. This sense that the events have resolved themselves without human intervention and

interpretation is further enhanced through a recurrent placement of the study itself or its attendant charts and tables into the subject positions of sentences (even if awkwardly): "the results suggest that there was much less sexual reproduction occurring in the -P condition than in the others"; "When comparing these two conditions together the statistical analysis suggests that there is no difference in growth between the -P and -N conditions." Gilbert and Mulkay have commented on this type of sentence construction in the context of professional writing; they argue, as do I, that it is in order to minimize explicit mention of the human nature of science that scientists employ verbs usually associated with human agency in the company of non-human 'agents'; [thus] authors construct texts in which the physical world seems regularly to speak, and sometimes to act, for itself' (42, 56). By the results section of a scientific paper, nature stops moving and begins talking; the events flow into their articulation.

Since nature speaks the truth of its own story, the interpretation of the scientist is rhetorically irrelevant; the discussion section is separated off from the actual body of the paper in a kind of endnote. Here the voice of the scientist might come through directly; first person may be used. Yet the voice here is of the person who has seen and heard and then interpreted, in that linear order. This is not the voice of the researcher engaged in a recursively constructed experiment functioning to produce coherent results; it is the voice at the end of the idealized narrative of generalized events. Thus it is not unusual at this point in the professional paper to read sentences that begin "we conclude that. .." or "this may be due to..." or even "we cannot account for this particular data..." (from *Journal of the Pennsylvania: Academy of Science);* these constructions signal human interpretation as separate from the autonomous body of rhetorical time encapsulated in the methods and results. Similarly, top ranked student writing accomplishes the same sense of separation for discussion sections: it moves abruptly from the presentation of the events as rhetorically autonomous to the use of first person and the foregrounding of interpretation, as in this report on the "Recessiveness or Dominance of Mutant Traits of *Drosophila melanogaster":*

> From the Fl offsprings we were able to conclude whether the traits that we saw were dominant or recessive, X-linked or autosomal. The first cross we had mated were round-shaped/ white eyed males with bar-shaped/red eyed females. Since all of the offsprings exhibited round-shaped/red eyed phenotypes, we can conclude that these traits are both dominant and the

> other two traits are recessive. Unfortunately, we had one round-shaped/white eyed son due to chromosomal non-disjunction. The mother did not pass on an X chromosome. Etc.

The student constructs this section to represent the present moment of writing as removed from the narrative of the experiment, a gesture that further naturalizes the already established results. The instructor comment is "Great discussion!" and the paper is judged to be "excellent overall!" The same professor marked as troubling any discussion section from the same set that allowed other sections of the paper to "bleed" into it, or vica versa, The highest evaluative criteria for discussion sections appeared to be the extent to which the writer(s) managed to disengage them from the rest of the paper.

The discussion section, then, which in terms of professional contribution is the most important section of the paper, is enabled by the teleological logic of scientific format;[11] the ultimate pronouncement of human understanding is validated to the extent that it claims to have grown necessarily from the "natural" linearity of the narrative. Alan Gross argues similarly that the linearity of the experimental paper functions to "necessitate" scientific interpretation:

> The sequence of the sections of the experimental paper...has Baconian roots: a steady march from Introduction to Discussion, from the contingency of laboratory events to the necessity of natural processes. This order is, as Woolgar aptly states, "a picture of the discovery process as a path-like sequence of logical steps toward the revelation of a hitherto unknown phenomenon" (89).

This path of scientific knowledge discounts the extent to which results are produced, shaped, and known before they are ever reported and their seamless story told. In the context of discussing Crick's "modest" claim that the discovery of the structure of the DNA molecule was dependent on "nature, not human beings," Gross goes so far as to argue that this Baconian conception of knowledge growing chronologically from mute observation is in fact a myth:

> [Crick's] line of argument fails: . ..the brute facts [did not] point unequivocally in a particular theoretical direction, In fact, in no scientific case do uninterpreted brute facts-stellar positions, test tube residues-confirm or disconfirm theories. The brute facts of science are stellar positions or test-tube residues under *a certain description;* and it is these descriptions that constitute meaning in the sciences.[...] No inductions can be justified with

> rigor: all commit the fallacy of affirming the consequent; as a result, all experimental generalizations illustrate reasoning by example. (11)[12]

"Reasoning by example," however, is rhetorically constructed through narrative forms as "truth and understanding out of the lesson of time." Similarly, Gilbert and Mulkay argue that the ideology of the scientific enterprise in general is dominated by the "truth will out device" of empiricism which posits that the inevitable problems of human intervention will ultimately be swept aside in the Linear and autonomous progress of science (Chapter 5). This "truth will out device," like the format that validates individual interpretation, depends upon a conception of history as progress and a vision of the natural world in the process of realizing itself and articulating that "selfness" to humanity.

IV. Complications of the Scientific Genre:

A. Parodies of Science

The extent to which narrative-particularly teleological narrative-underpins not only the rhetoric but the logic of biology is particularly evident in the clear enjoyment that both students and instructor took in an exercise assigned for a junior- and senior-level course examined for this study. For this exercise, students were asked to parody *Science News* by rewriting an article published in any *legitimate* journal of the discipline. Students responded-&most universally-by stripping the "legitimate" article of its narrative methods section and thus effectively "spatializing" the results (by "results" I mean the substance of both "results" and "discussion" sections, with little to no distinction drawn). The rewritten articles also foreground the author/researcher him or herself and highlight the significance of the study.[13] One of the top-ranked student papers, for example, is titled "Gardeners beware! Fertilizing soil may not be beneficial to your plants" and opens this way:

> Fertilizing soil tends to have negative effects on plant life, says Nancy Collins Johnson from the department of Ecology, and Behavior at the University of Minnesota. Results from her study suggest that adding phosphorus and nitrogen (two important elements in fertilizers) tends to select for fungi, specifically vesicular-arbuscular mycorrhizae (VAM), in the soil that are too aggressive for the host plant which results in a negative effect on the plant's growth.

The instructor comment on this paper reads "Excellent!! Style and

Content are great." Another top-ranked paper "outlines" the findings of the researcher, but apparently includes too much detail, as is noted by the professor: "'This is pretty hilarious, because it's way too obscure and technical for Science News, as I'm sure you realize. But it's just what I'm looking for, in terms of length and style. Great job!"

B. The Biology Major in a Literature Course

The extent to which most junior and senior biology majors have internalized and naturalized the legitimizing features of narrative was made very clear to me in the course of this study when I began looking at student work outside the field of the major. More specifically, I examined the work of senior biology majors taking introductory literature courses to fulfill (that last credit of) general education requirements. Fahnestock and Secor argue that literary criticism as a genre is dominated by an "appearance/reality topos" which relies for its rhetorical force and structure upon "spatial metaphors" such as surface and depth:

> The very notion of appearance versus reality translates immediately into images of a surface with something underneath, of solids that can be proved, of layers that can be peeled away to reveal deeper layers. (85-6)

The biology students generally avoided any such "spatial" constructions and opted instead for a constantly redrawn narrative of the enterprise of writing. This is not to say that the students turn just to plot summary, a form which also relies upon emplotment. On the contrary, the "time" constructed by the student writers is not so much that of the novel, play, or poem but rather that of the argument itself. In other words, the narrative form of the hybrid genre of lab report/literary analysis is self-reflexive, referring constantly back to what the student must do in order to be logically true to the text, what s/he must do next, and what s/he is compelled to do then. This linear progress does not trace the order of her thinking and/or discovery process; it maps the linear **process** by which a text reveals itself and its meaning to the observant reader.

For example, the openings of the introductory sentences from a typical essay draw constant attention to the emplotment of the following pages:

- In "Night Sea Journey" of Lost in the Funhouse, Barth develops a theme... [quotation]
- I would like to examine several aspects of this theme...
- I will illustrate the way...
- Let us first..., etc.

The student deflects commitment to a "point" in favor of inviting "us" on a journey. He has not constructed this journey, however, so much as studied it, become a trail guide of sorts. Barth-and logic itself-demand the linear order of ideas, and the student is only a detached but perceptive observer. Transitional sentences lead the reader from idea to idea in similar ways, and temporal markers dominate roughly every third sentence of the paper, constantly structuring analysis as chronology, projecting the reader ahead to some (future) point when full meaning and/or understanding will reveal itself. When the time of the paper is not explicitly mentioned, the book itself is generally presented as speaking for itself; our temporal journey is apparently one that takes us to the moments when the text reveals itself. Quotations are "analyzed" in such a way that they do not appear not to be undergoing analysis: thus "it is important to remember" points about the book which should come "as no surprise" because they are so "clearly" "obvious." Only in the final two sentences of the paper does the student articulate his own "point."

V. Conclusion

I have only begun in this essay to show how the appropriation of biological discourse works and what changes the evolution entails. Certainly the process is extremely complicated, influenced as it must be by almost innumerable issues of context (e.g. type of institution; ethnicity, class, gender of students; pedagogy, etc). This brief and naturalistic study can only gesture toward the immense complexity of academic language and discourseacquisition-who is "in" and who is "out," what the unspoken rules of membership are. What the study does show, however, is that the discipline of biology does in fact have such rules, a whole system of criteria for disciplinary membership that goes beyond (that *even* contradicts) the explicit and published expectations for writing in the field, Furthermore, these "rules" for writing speak to the construction of knowledge in the discipline as a whole; their articulation implies an unveiling of the naturalized scaffold that upholds legitimated knowledge. The students who "make it through" the system do so through absorbing without comment-probably without conscious thought-the tone, style, and silent epistemology of this scaffold. What this suggests is that if it is a goal for students to be admitted into the inner circles of tie academy with more democratic intent, then it is essential that faculty across the curriculum become self-conscious themselves about the shape of their own knowledge and articulate that structure for those who wish to learn.

Appendix

Figure 1: Methods

Complementary cultures of *Chlamydomonas moewusii* (+ and - strains), purchased from *Carolina Biological Supply,* were taken from their habitat, which was an agar plate consisting of Alga Gro and water, and put into glass tubes containing different medias. This was done by mixing distilled water on tope of the algal plate with the edge of a microscope cover slip to remove the *C. moewusii* cells from the agar. Once this was accomplished, this mixture was drawn up with a Pasteur pipette, and the tubes with were then inoculated with this mixture of distilled water and *C. moewusii.*

Some of these tubes were used solely for the culturing of the (+) strain and some solely for the culturing of the (-) strain. In these two sets tubes for each strain, several consisted of Bold's Basic Media (B), which was prepared according to the protocol reported by James (1978). Several tubes also contained this media without nitrogen (-N), and the other tubes consisted of Bold's Basic Media without phosphorus (-P).

After 10 days of incubation in an environmental chamber (68 F and 16 hours of light; 8 hours of darkness), the tubes were removed and a cell count in each tube was determined by placing a drop of the media with the *C. moewusii* onto a hemacytometer. Once these cell counts were determined (# of cells/ hemacytometer grid), equal amounts of the + and - cells were combined in a sterile Erlenmeyer flasks. These flasks were then put into the environmental chamber for approximately 2 hours which provided an ample amount of time for sexual reproduction to occur. We used two flasks for each type of medium, with each sample taken from two different randomly selected test tubes of each strain.

After the two hours had passed, the amount of sexual reproduction was determined by using a hemacytometer and counting the number of paired and unpaired cells per grid square (0.05 x 0.05 x lmm3) on a hemacytometer. Of these two randomly selected samples, twenty five counts were taken from each for a total of a hundred counts in each type of medium.

Figure 2: Methods

Both sites were chosen from an area in Micheaux State Forest, on South Mountain in Cumberland County, Pennsylvania. The undisturbed site was named Chimney Rocks. The disturbed site was about a half mile southwest of Chimney Rocks. We chose these two sites because of their obvious differences in landscape and proximity to each other. These two characteristics insured that our results were due only to the disturbance and not extraneous factors. Our disturbed site study was conducted on November 2, 1993, a clear and cool day. The previous weekend, a significant amount of rain had fallen.

Our undisturbed site study was conducted on November 5, '1993, a clear and cold day. The previous two days had been dry and cold.

We roped off three 10 x 10 meter areas in each site, with a rope measured and marked every meter. In each of the two sites, both undisturbed and disturbed, three random areas were chosen for fungal identification. Three random areas were chosen throughout each site to ensure relatively equal representation of the entire site. Disturbed area #1, included short new growth, dead decaying branches and logs, and rocky soil. Area #2, included less new growth, grassy patches of soil, and more decomposing material than in site #1. Area #3, included dead standing trees, rocky soil, and little new growth, Undisturbed area #l, on the top of Chimney Rocks, included large rocks, and various trees. Area #2, included low ground shrubbery, various trees, and rich soil. Area #3, included various trees, grassy soil and lots of sticks and twigs. All three areas within the undisturbed site included a significant amount of leaves covering the ground.

In each of the three areas within the two sites, we searched for any type of fungi. We carefully removed any fungi we found. If the fungus was growing from the ground, we were careful to remove the entire organism. When we collected bracket fungi only a portion of the organism was removed for identification. All fungi were wrapped in separate pieces of wax paper, and differentiated between undisturbed and disturbed site. We used Roger Phillips' *Mushrooms of North America* guide to identify all species.

Notes

1 See, for example, Barnes and Edge, eds., Science in Context; Bazerman, *Shaping Written Knowledge;* Gilbert and Mulkay, *Opening Pandora's Box:;* Knurr-Cetina and Mulkay, eds., *Science Observed;* Latour and Woolgar, *Laboratory Life.*

2 See Belanoff and Dickson, eds. *Portfolios;* Fulwiler, ed. *The Journal Book;* Gere, ed. *Roots in the Sawdust;* Parker and Coodkin, *The Consequences of Writing:;* Walvoord and McCarthy, *Thinking and Writing in College;* Young and Fulwiler, eds. *Writing across the Disciplines.*

3. This oppositional definition of writing styles in the natural sciences and in the arts and humanities is typical. Ernest Nagel, writing in defense of scientific discourse, claims that

> It is not always desirable or useful to diminish the vagueness of language. In poetical discourse, vagueness is often an advantage, rather than a defect. [...] On the other hand, it: is obvious that vague language can be a serious hindrance to the execution of social policy as well as to theoretical research. (51-52)

4. See also Collins, *Chaging Order;* Knorr-Cetina *The Manufacture of Knowledge;* Latour and Woolgar, *Laboratory Life;* Lynch, *Art and Artifact in Laboratory Science.*

5. During the spring semester of 1993, I conducted half hour interviews with all seven faculty members of Dickinson's biology department. Faculty were asked to describe 1. the types of writing they assigned indifferent courses; 2. the approach(es) they took to improving student writing; 3. their expectations for student writing at different levels; 4. the most common problems in student writing. Results were written up, returned to the department, and discussed in a faculty workshop.

6. I worry, then, about teachers like Spanier, a biologist who reports that she encourages students to write expressively in the face of rigid discourse conventions:

> A telling illustration of this initial difficulty surfaced when many of the science majors who took my course...had to ask me several times if I *really* wanted them to use "I" in the papers by telling us why they had chosen their topic. . . . With encouragement and reassurance those students wrote excellent papers, in which each one's voice was clear and distinctive, each "I" placed well in the context of the analysis. But to do so, the students had to overcome their training in science-and related disciplines. (204)

7. See also Beer, *Darwin's Plots;* Landau, "Human Evolution as Narrative"; Ree, *Philosophical Tales;* Latour and Strum, "Human Social Origins"; Steve Woolgar, "Discovery"; Lynch, *Art and Artifact in Laboratory Science.*

8. See, for example, Bazerman, *Shaping Written Knowledge;* Bourdieu, *In Other Words;* Voloshinov, *Marxism and the Philosophy of Language.*

9. See de Certeau, *The Writing of History;* Dominick LaCapra, *History and Criticism;* Ricoeur, *Time and Narrative;* White, *The Content in the Form.*

10. Latour argues that this shaping hand will always be ahead of the outsider who challenges the results and interpretations of a scientific study. Interpretation precedes not only the reporting process, in other words, but also experimentation and even the cognitive ability to observe. The "facts" of the "natural world" are always already "spoken for." See *Science in Action.*

11. Aronowitz notes briefly that "Francisco Ayala distinguishes

biology from physics and chemistry by invoking its reliance on teleological explanations, 'which apply to organisms and only to them in the material world.' [...] Ayala argues that organismic explanations 'cannot be reformulated in non-teleological form without loss of explanatory content., ..teleological explanations cannot be dispensed with in biology"' (307).

12 See also Ernest Nagel: "...it is of central importance to reognize that there is no logical route leading from data of observation to the explanations eventually adopted for them." (15)

13 Myers contrasts what he claims are two different types of narrative in professional and popular biology: *narratives of science* and *narratives of nature,* The former, he argues, "follow the argument of the scientist, arrange time into a parallel series of simultaneous events all supporting their claim, and emphasize in their syntax and vocabulary the conceptual structure of the discipline"; the latter present a sequential narrative "in which the plant or animal, not the scientific activity, is the subject, the narrative is chronological, and the syntax and vocabulary emphasize the externality of nature to scientific practices" (142).

For more on popular science, see also Shinn and Whitley, eds. *Expository Science;* Tourney, "Modem Creationism and Scientific Authority."

A genre shift similar to that from professional to popular biology is embodied in the revisions that must go on between professional biology and the biology text book. See Gaster, "Assimilation Of Scientific Change."

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