"Emphasizing Similarity" but Not "Eliding Difference": Exploring Sub-Disciplinary Differences as a Way to Teach Genre Flexibly

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Rebecca Nowacek, in her 2009 paper, "Why Is Being Interdisciplinary so Very Hard to Do? Thoughts on the Perils and Promise of Interdisciplinary Pedagogy," suggests that instructors can highlight disciplinary differences in genre expectations as a way to help students understand writing more deeply. In this paper, Nowacek describes her observations of a writing-intensive, team-taught general education course composed of three overlapping course units, each drawing on one of three disciplines: literature, history, or religion. She noted that the three disciplinary instructors thought that they were assigning the same genre, an essay, but had very different views on what an essay should do, or indeed, what it meant to have a thesis. Furthermore, she observed that students noticed this issue, and that instructors, when called upon to respond, tended to focus on "emphasizing similarity, [and] eliding difference" (p. 505). Drawing on cultural-historical-activity theory (Engeström, 1987; Roth & Lee, 2007; Russell, 1995), she analyzes the reasons for the disagreement, and the "double binds" that the students found themselves in when they could not resolve the conflicts. She further explores how the instructors might have responded. In the end, she says:

> Both students and instructors, I argue, must negotiate double binds placed upon them when various disciplines conflict. These double binds can limit and constrain the work of individuals, but if made an object of reflection, the double bind can also facilitate higher-order thinking about disciplines and the role of writing within them. (p. 494)

When I discovered this paper, I responded strongly to the idea of eliding differences. I—once an assistant professor specializing in cellular immunology and now an immunologist working as a "writing in the disciplines" (WID) specialist within a writing program—have, for four years running, co-taught a biology laboratory course with Cheeptip Benyajati, a faculty member in the biology department. We initially planned to co-teach every writing instruction session but emphasized to ourselves and to the students that she would maintain responsibility for biology content questions, while I would focus on attention to writing principles. However, this plan was

complicated by my years as a practicing biologist; I frequently found myself speaking with biology insider knowledge in response to student questions, and Tip encouraged this tendency, arguing that it helped model scientific discussion. Furthermore, when I did speak as a biologist, she sometimes disagreed and asked questions—and I found myself almost reflexively trying to claim that we were in agreement. In short, I was "emphasizing similarity" and "eliding differences."

Furthermore, I noticed that we didn't disagree about writing principles or, as Tip said, about "what it means to do good science"; we had similar epistemological orientations. Nor did we disagree about the essentials of the genre we asked them to use: the Introduction-Methods-Result-Discussion (IMRD) research article, or the rhetorical moves (Swales, 1990, 2004) within this structure. Instead, I thought our choices might be traced to subtle differences in rhetorical exigencies and conventions typical of particular sub-disciplinary communities (Thaiss & Zawacki, 2006); although we are both biologists, molecular biologists and cellular immunologists are somewhat different. While there could of course be other reasons than disciplinary specialization for our disagreement, this line of reasoning got me thinking: could our experience, combined with Nowacek's suggestions about creating opportunities for reflections on differences, point at a way of emphasizing genre flexibility and the ways that different disciplinary sub-communities use the genre *within* a scientific discipline?

Put more broadly, might Nowacek's suggestion be applicable even when the instructors are from the same discipline? In the rest of this essay, I will attempt to answer this question, drawing on both published literature and our own experience, and argue that widely disparate disciplines are not necessary to set up conflicts that can be made the object of reflection. Professors *within* a discipline may well have areas of disagreement within a single genre that can be exploited. If made the focus of reflection and discussion, these differences can help faculty members to make explicit their implicit knowledge of communication within their specialty areas (Becher & Trowler, 2001; Berkenkotter & Huckin, 1995b; Duff, 2010; Prior, 1995, 1998; Russell, 1995) and relate communicative choices to disciplinary rhetorical exigencies. In addition, they can help students to understand what it means to be a part of a wide-ranging discipline containing several areas of specialization and subtly different types of writing tasks, as well as to see how disciplines, and the rhetorical situations and choices associated with them, change over time (Bazerman, 1984, 1988; Berkenkotter & Huckin, 1995a; Vande Kopple, 2000). This approach should help students see genres not as static recipes, but as tools that both shape researchers and are shaped by researchers in response to evolving needs (Bazerman, 1988; Berkenkotter & Huckin, 1993; Prior, 1998).

Disciplines, Sub-Disciplines, and Overlapping Activity Systems

While there are many possible definitions of disciplines and sub-disciplines (Thaiss & Zawacki, 2006), I will use Becher & Trowler's (2001) approach, which captures three epistemological attributes. A first involves the fundamental disciplinary questions (MacDonald, 1987). The second is one of disciplinary stance, or whether the members of the discipline want to know how a phenomenon works or envision applying the knowledge to solve a problem (Biglan, 1973). Finally, it is important to consider whether the practitioners espouse a normalized viewpoint, attempting to accumulate knowledge that has been "proven," using agreed-upon theoretical frameworks, or tend toward a more reflexive approach that consistently questions these frameworks (Kuhn, 1977). While this is a reductionist approach that risks reifying fluid situations (Hyland, 2004a), it does provide a useful framework. As such, research disciplines are often classified according to where they fall on the Biglan classification scale (Biglan, 1973), which consists of three axes that roughly correspond, respectively, to these epistemological dimensions: *life/non-life, pure/applied,* and *hard/soft.*

Disciplinary communities can be further divided into sub-disciplines. In the simplest formulation, a sub-discipline is simply an area of specialization originally found within a parent discipline (Thaiss & Zawacki, 2006). However, as a result of specialization, the sub-discipline has adopted a recognizable focus on a particular type of question and/or epistemologies and methodologies and exhibits its own culture (Becher & Trowler, 2001). For the purposes of this paper, I describe (sub-)disciplines largely in terms of their Biglan characteristics. However, I do not mean this definition to be limiting, and suspect that the teaching applications and research questions that my work suggests could be applied within a wide variety of definitions.

Disciplines and sub-disciplines can also roughly map onto the activity systems described by cultural-historical-activity theory, making the connection to Nowacek's (2009) work clearer. In its simplest formulation (Nowacek, 2009; Russell, 1995), an activity system consists of a *subject* (person(s); here, the investigators), the *object* (what they are studying), the *motives* for their activity (their reasons for study), and the *tools* that they use to accomplish the work (disciplinary and discursive). Specializations or sub-disciplines that differ in object, motives, and/or tools from others are working within similar but not identical activity systems. However, while I think it is useful to think of sub-disciplines as overlapping activity systems within a larger disciplinary grouping, I do not mean to entirely equate sub-disciplines and activity systems. Even a disciplinary specialization is a large activity group; within any activity group that roughly shares object, motive, and tools, there are still smaller possible activity groups: investigators at a particular university, in a particular time, or from a particular research group—even down to a partnership between two researchers.

Several cautionary tales (Beaufort, 2007; Nowacek, 2009; Russell & Yañez, 2003) make it clear that students with writing experience in one discipline (activity system) have difficulty transferring that knowledge to another discipline (activity system) when they are asked to write using a particular discursive tool or genre (e.g., a thesis-driven essay, or a book-report) that looks superficially identical to the one from the first discipline. A major source of their difficulty lies in the fact that they do not have sufficient disciplinary knowledge to understand how the superficially similar form normally serves a very different purpose, to look at different objects and/or for different motives. In this paper, I also explore how the same issue might be true when making smaller changes: when moving from one sub-discipline or activity group to another.

Disciplinary and Sub-Disciplinary Choices within the IMRD Structure

Because epistemological considerations have important implications for the way that investigators communicate (Berkenkotter & Huckin, 1995b; Hyland, 2004b; Petraglia, 1995; Russell, 1995; Swales, 1990), it is not surprising that discourse communities (as defined by Bizzell, 1992) that use the Intro-Methods-Results-Discussion (IMRD) genre make recognizably different choices depending on the precise (sub-)discipline. These differential choices occur because the exigencies of a particular type of inquiry lead to recurring rhetorical situations (Miller, 1984) that can be addressed in similar ways (Bazerman, 1988; Berkenkotter & Huckin, 1995b; Prior, 1998; Swales, 1990). These similarities lead to particular types of solutions that include patterns of reasoning that draw on the epistemologies and values of the particular discipline (Toulmin, 1958) and, over time, give rise in turn to genres and choices within the genres that "signal a discourse community's norms, epistemology, ideology, and social ontology" (Berkenkotter & Huckin, 1993, p. 497).

Below, I review two types of signals that have been especially well-characterized with respect to differences between disciplines and sub-disciplines: rhetorical moves and the linguistic mechanisms that authors use to signal stance and engagement. These signals are especially accessible to instructors considering highlighting differences.

Rhetorical Moves

Drawing on multiple previous corpus analyses, Swales (1990) argued that research articles across a great range of disciplines could be characterized in terms of a limited number of canonical rhetorical moves. Initially, this idea was best elaborated with respect to Introductions, using the *Create-A-Research-Space* (CARS) series of rhetorical moves (p. 141). Move 1 is used in "establishing territory"; move 2 in "establishing a niche"; and move 3 in "occupying a niche." Within the moves, there are further canonical "step" choices; for instance, an author "establishing territory" might do

so by "claiming centrality" or "making topic generalizations." Introductions can use simple M1-M2-M3 structure (Swales, 1990), or cycle, as in M1-M2-M1-M3 (Swales, 2004). This initial framework inspired Swales and others to codify a similar series of moves for the methods, results, and discussion sections, as well as to examine variation within those sections. The outcomes of these analyses suggest that both disciplines and sub-disciplines make recognizable choices in all of these areas, in ways that reflect their rhetorical needs.

Swales (1990) summarized broad disciplinary differences in the introductions, noting that the move 1, step 1 option of "establishing centrality" (p. 141) is less common in the hard sciences. The tendency to outline purposes versus principal results, to explain the importance of the findings, or road-map the paper (move 3) also varies by discipline. In addition to these disciplinary differences, several studies suggest recognizable differences in sub-disciplines. Samraj (2002, 2005) found that writers in two sub-disciplines of biology make different step choices within the M1-M2-M3 structure, as do writers in three engineering sub-disciplines (Kanoksilapatham, 2012). Similarly, Ozturk (2007) showed that two applied linguistics sub-disciplines chose different move cycling patterns. In all cases, the authors argued that the stereotypical differences were related to underlying differences in the sub-disciplines' Biglan classifications.

Swales (2004) noted that the biggest disciplinary differences appear in the methods and results sections. Methods sections contain very "clipped" descriptions in hard fields with well-established methodology, but use an "elaborated" version in softer fields with more variation (p. 220). Similarly, in the results sections, writers in disciplines in which the methodologies and interpretational methods are not well-established are more prone to use persuasive moves to justify their choices. And while all writers review their findings and integrate them into the larger field in the discussion section, the amount of self-promotion varies widely by discipline. Kanoksilapatham (2012) also codified rhetorical move and step choices in the methods, results, and discussion sections within three engineering sub-disciplines and found recognizable sub-disciplinary differences in all three sections.

Stance and Engagement

Drawing on a decade of his own work, as well as earlier work by Swales (1990), Hyland (2005) proposed that interactions with the audience can be mediated by two classes of linguistic resources: stance and engagement features. *Stance* refers to the ways in which "writers present themselves and convey their judgments, opinions, and commitments," while *engagement* refers to the ways in which writers "acknowledge and connect to others" (p. 176). Engagement strategies are those that include the reader in some way, and are designed to "meet readers' expectations of inclusion

and disciplinary solidarity" or to "rhetorically position the audience" (p. 182). Stance markers include hedges, boosters, attitude markers, and self-mention; engagement markers include reader pronouns, personal asides, appeals to shared knowledge, directives, and questions.

Using this classification scheme, Hyland (2005) examined research articles from eight disciplines, two of which were sub-disciplines of a larger engineering discipline. Hyland found that the hard disciplines had a lower level of both stance and engagement markers than the soft disciplines. Hedges were the most frequently used stance resource in all disciplines, but the soft disciplines used nearly twice as many. Hyland speculated that these differences reflect variation in the degree to which a discipline has agreed-upon ways of making claims; when the criteria for acceptance are less clear, it pays to hedge and also to try to use engagement markers to persuade through "sympathetic understanding, promoting tolerance in readers through an ethical rather than a cognitive progression" (p.187). Notably, electrical engineering and mechanical engineering writing showed differences in both stance and engagement markers, suggesting that even disciplines that are in roughly the same space on the hard/soft and pure/applied axes may have cultures and needs that promote different choices.

A Case Study: A Molecular Biologist Co-Teaches With a Cellular Immunologist

At least within the level of specificity appropriate for writing at the undergraduate level, Tip and I did not have serious disagreements about rhetorical moves or stance and engagement markers (although other co-instructors might well have). However, we encountered other areas of disagreement. After systematically exploring the differences between writing in our sub-disciplines and discussing the reasons for our preferences, we uncovered several possible explanations. I offer this reflection on our experience as a way to explore how instructors might use initially disparate expectations as a starting point for articulating their own reasons for their writing choices.

Background of the Instructors and Course

During our PhD work, both Tip and I were pure molecular biologists; post-PhD, I switched to cellular immunology. These two fields share a common hard epistemology, and have considerable overlap in experimental techniques and some specialist journals. However, they differ in the fundamental problems being studied, some of the methodologies and specialist journals, the funding mechanisms, the speed of the research, and the histories of their fields (Levin, 2006), as well as in their position on the pure/applied scale (my approach to cellular immunology, at least, was well into the applied realm).

Our course served juniors and seniors with a declared biology major, many of whom go on to health-professions or graduate schools. The biology major at our small R1 university encompasses six different specialist tracks (e.g., biochemistry, ecology and evolution, etc.), and this course could be used to partially satisfy the requirement for laboratory research for three of the six tracks. Many, but not all, of the students had prior or concurrent experience doing independent research in some aspect of biology or an allied discipline like epidemiology or chemistry.

This course included writing for both "writing-to-learn" and "learning-to-write" (Russell, 2002, p. 311) purposes. We hoped that by writing, students would explore the underlying scientific concepts more deeply; we also wanted them to learn to communicate the process of science using a widely-accepted genre: the research article. In the instructions for their three research write-ups, we explicitly asked the students to write as if they were writing a scientific research article, and our explanations, while they did not explicitly use Swales' (1990) terminology, heavily reflected his concepts of rhetorical moves within an Intro-Methods-Results-Discussion (IMRD) structure. For instance, while we did not use the words *rhetorical move* we did tell students that, in the introduction, the first paragraph gives background (a.k.a. move 1); the second identifies a question or gap in the literature (move 2); and the third provides a preview of the paper (move 3). We asked for an elaborated methods style; similarly, in the results, we asked students to outline their methodology and interpret their findings, as generally happens in disciplines with sufficient heterogeneity to make this necessary (Swales, 2004).

We offered writing instruction in the form of three genre analysis-based workshops with peer discussion. The first workshop focused on figures and figure legends, as these were the fundamental reporting units from each laboratory session. The second, in preparation for writing the first full laboratory report, involved discussing the reasons for the IMRD structure, as well as identifying key rhetorical moves in one sample paper. The third focused on identifying rhetorical moves within all IMRD sections in multiple papers, and integrating what students discovered with comments that teaching assistants (acting as disciplinary insiders) had made on the student lab reports. All workshops drew on examples from a four-paper sample paper set, picked with several ideas in mind. First, the paper set represented the departmental discourse community; it contained papers from three biology department professors (including Tip) and one from me. In addition, the set contained necessary background knowledge about procedures, materials, and methods. Finally, the papers were meant to serve as general models for the type of report the students were writing, and also contain examples of specialized types of writing tasks (e.g., derivation of equations). All papers were published between 1997 and 2001 (Benyajati et al., 1997; Culver & Noller, 1999; Schaefer & McClure, 1997; Sia, Dominska, Stefanovic, & Petes, 2001).

Example #1: Different Expectations About Figure Legend Titles

Figure legends in scientific research articles convey a great deal of critical information in a small space. Ideally, a disciplinary insider should be able to understand the paper's important information just based on the visual elements in a figure and the associated figure legends, without recourse to the larger text.

Tip (Benyajati, 2012) wrote explicit instructions on how to write the figure legend titles:

> A descriptive title that refers to the general type of experiment done. This should give the reader a good idea of the experiment and the technique, but not the details (e.g.: "Restriction digest analysis of TOP transformants on an agarose gel," NOT "2% agarose gel run at 100V"). (p. 10)

This style has two key elements, as executed in most research papers: (1) focus on the methodology, not the result and (2) a sentence fragment form.

When I saw this instruction, I didn't question it. It seemed reasonable, as I had indeed written (in 1997) figure legend titles in this form and the sample paper set contained one of my papers written with that style. However, I was also aware that alternatives existed; in papers that I published after 1997, I used a different form: one that emphasizes the experimental logic and conclusion of the experiment and is formed as a complete sentence.

The difference is illustrated below, in an excerpt of figure legends taken from a paper that Tip wrote (Benyajati et al., 1997):

> Figure 2: *Western blot analysis* using domain-specific antibodies.

> Figure 3: GAGA-519 and GAGA-581 *factors bind* a single GAGA sequence *forming* multiple-related nucleoprotein *complexes*.

Figure 2 is a clear example of the first methodological type; it focuses on the technique (italicized) and does not contain information about the results of that analysis. In contrast, figure 3 is in conclusion style; while it hints about the method (something about binding and complexes), it primarily states a conclusion, expressed as a complete sentence: factors bind, forming complexes.

While I didn't question the instructions, I did notice that I tended to have off-the-cuff answers to student questions that took the conclusion style; I would almost always answer in a complete sentence, as in "Western blot analysis shows protein expression." But rather than explore this issue, I simply corrected myself and moved on, even though the excerpt above suggests that there might be considerable variation in this choice, even within a single paper. What was going on? I initially assumed

that this was a sub-disciplinary matter, because I had used the experimental focus form exclusively in my two papers that I had written as a molecular biologist; a scant two years later, as an immunologist, six of my eight figure legends were in conclusion style. My idea was further supported by an analysis of the sample paper set—all from molecular biologists—that we gave the students to analyze. In those four papers, with twenty experimental figure legends, only two were of the conclusion style, and three of the four papers in the set had no conclusion-style legends.

However, while my hunch was not unreasonable, I could imagine other possible factors, including publication date, the author's home country, the difficulty of encapsulating the whole take-home message, the ease with which the author thinks the audience can identify the take-home message, the sub-disciplinary experimental logic, and individual stylistic preference. To my knowledge, a corpus analysis of figure legend choices has not yet been done in any discipline, so it was hard to say if disciplines or sub-disciplines make recognizably different choices in these areas. Thus, I did a rudimentary analysis of these two extremes in figure legend title formats. (It is not my intention here to do a formal corpus analysis but simply to reflect on a major source of variation that I was able to easily pick out.)

I analyzed figure legend titles from *Nucleic Acids Research (NAR)* and from the *Journal of Immunology (JI)*. Both journals are well-regarded specialist journals for, respectively, the molecular biology and immunology communities. In order to examine trends over time, I month-and-year-matched both my and Tip's sample paper set papers in both journals, as well as examining the most recent issue. I then collated all of the figure legends, excluding purely schematic (data-free) figures, and identified those with titles in the conclusion-style complete sentence format, asking a scientist colleague to randomly spot-check five percent of my assignments (we scored the same way one hundred percent of the time). The results are shown in Table I:

This analysis suggested that my hunch was correct: there are sub-disciplinary differences in the tendency to express the figure legend title as a complete, conclusion-style sentence. However, it also appears that this tendency has been increasing over time in both communities and that there can be significant variation even within a paper. While there are sub-disciplinary factors affecting the choice, there are clearly additional ones.

Table I: Both publication year and journal affect likelihood of expressing the figure legend as a complete sentence.

Journal	Year	Volume (Issue)	No. Papers	No. Legends	% C form legends	% papers with 100% C style
Nucleic Acids Research	1997	25(16)	28	114	5.3	7.1
	1999	27(3)	28	120	10.8	3.6
	2015	43(10)	34	195	47.2	26.5
Journal of Immunology	1997	159(3)	60	381	19.2	5.0
	1999	162(3)	80	475	27.6	5.0
	2015	194(11)	49	319	63.0	38.8

All data-driven articles (excluding commentary, summary, and reviews) appearing within the print volume were analyzed; figure (but not table) legends were included if they contained data (schematic figures excluded). *C style* refers to a conclusion style, with subject and verb.

When I showed Tip this analysis, she noted that she had expected the trend toward conclusion-style legends in both sub-disciplines. Her explanation—one that I agree with—was that this preference reflects the increasing speed of scientific research in all biology sub-disciplines. When readers have to get through a lot, it speeds processing if the author states the result right up front. Similarly, the rapid growth of research techniques, even within a specialty area, necessitates helping the readership draw conclusions, as the author can't be sure that the reader is familiar with any particular technique. She also noted that competition for funding has increased over time, making it more desirable to describe each finding as an exciting conclusion. To explain the fact that, despite the overall increase, *NAR* writers still use fewer conclusion-style legend titles than *JI* writers, she suggested that the *NAR* community has a more constrained set of techniques, and possibly less competitive funding sources, perhaps reducing the need for clearly stated (and exciting) conclusions.

Tip's analysis is highly congruent with Berkenkotter and Huckin's (1995a) analysis of how physicists and biologists read and write IMRD research articles: as a search for "news value" (p. 28). They found that experienced scientists reading in their specialty area first scanned for important new information, by reading the title, abstract, and results sections (including figures and tables). They further argue, based on an analysis of the evolution of elements within the IMRD structure over time, that writers—under pressure from an ever-increasing volume of scientific knowledge as well as real promotional needs related to funding—have made changes to the form that help readers perform this scanning function and see the information as newsworthy. These changes include more informative titles, addition and then expansion of the abstract, sub-headers, and a statement of results at the end of the introduction.

While their analysis did not extend to figure legend titles, the increasing trend toward providing a complete sentence mini-summary in the figure legend title can easily be seen as part of the adaptation to pressures for newsworthiness (one that seems to have gained speed after 1995).

It is clear that our difference of opinion—and, as is clear after our discussions, the disparity between our instructions and the way we ourselves read and write research articles—were interesting from a rhetorical point of view, and we were probably doing the students a disservice by not exploring the difference. Not only were students seeing this sort of variation in one of the papers that we provided as a model, but they were additionally almost certainly seeing similar variation in papers they were reading for other classes or their independent research projects. Our choice, both to codify and to fail to follow up on a difference in choices that I was clearly finding difficult to suppress, may well have confused the students (although I don't have that information). In addition, we had in effect treated genres as static, rather than fluid (Ramanathan & Kaplan, 2000; Smit, 2004) and missed an opportunity to discuss how the field and affiliated writing choices had changed over time (Bazerman, 1984, 1988; Berkenkotter & Huckin, 1995a; Vande Kopple, 2000). We also missed the opportunity to discuss how sub-disciplinary specialties may have different rhetorical needs and conventions/preferences that reflect those needs.

Example #2: Different Expectations about Titles

Titles in scientific research articles are also key elements, as readers frequently decide on the basis of the title and the abstract whether it is worthwhile to read the paper (Berkenkotter & Huckin, 1995a; Hyland, 2003). We said that the title should be "brief and informative"—and interpreted that instruction differently.

Our differences stemmed from unexpected results. The students were trying a new system for cloning a gene and expressing the protein, and the instructors did not know in advance if this approach would work. As it turned out, parts of it did, and parts of it didn't. The students then wanted to know how to represent this complicated situation in the title. The most informative answer is that part A worked but part B didn't, and I first advocated saying precisely that. However, Tip quickly brought up a complication: today, there is a clear preference for "positive results," or results that confirm one's expectation or hypothesis (Fanelli, 2012, p. 891). In addition, most scientists find reports of methods more interesting if the method actually works, as they want to know about possible improvements to their own methodology. Thus, Tip argued that students should make a hedged claim that emphasized the positive but with limits: the first part worked, while the second part worked minimally.

Once again, I found myself emphasizing agreement. We agreed that titles should be informative, and also that you should make the best possible case for something

being interesting, and I emphasized that common ground. However, we *didn't* have the deeper conversation about when one might want to admit that something didn't work. When we discussed it later, it turned out that one consideration involved the difference between my and Tip's views on what genre and purposes the student laboratory reports were approximating. Were they approaching a very technical methods research paper (my thought), in which case it might be appropriate to say that something didn't work in order to save others from trying the same approach? Or were they approximating a research paper (her thought)—a paper that reports only after all difficulties have been ironed out?

In effect, this disagreement stemmed from a common issue in assignment design that we had not made explicit for the students. The lab report is frequently an artificial genre that reflects an attempt to teach at least two skills simultaneously during a laboratory course: the basics of the research report genre and the use of disciplinary technical protocols. It thus suffers from a serious internal complication: it uses the structure of a genuine research report while asking students to report on work that differs significantly from true investigation, in that it focuses on successfully replicating accepted knowledge and/or techniques (Moskovitz & Kellogg, 2011). This issue leads to at least two complexities. First, it makes for difficulties in writing the introduction, as the normal progression from known information to the question at hand requires that students pretend that the question has not already been answered. Second, it can confuse students about the true nature of research, as they are asked to evaluate their work on how well they replicated others' work, rather than finding and integrating something new.

We attempted to address at least the first issue by incorporating a relative unknown that is common in science: would the new system that has worked for similar tasks work in this particular situation? However, this choice created a new problem, as we continued to ask the students to write their introductory material as if they were framing a question about the biological process at hand rather than the technical details necessary to explore the biological process. The lab report instructions had, as Russell & Yañez (2003) put it, "strategic ambiguity" about this complication (p. 342), and students duly queried us. We helped them bridge the difference by instructing them to frame their question/purpose in these terms: "as a first step toward answering the interesting biological question, we need to first determine whether we can experimentally express the protein." However, this solution did not answer the question of which overlapping activity system with different motives they belonged to: one interested in technical details, or one interested in the biological process—and in fact could not, as we wanted them to be interested in both.

This reflection highlights the difficulties inherent in what Wardle (2009) calls "mutt genres" (p.765), or genres that use the forms that are authentic discursive tools

in some activity systems but that fail to match the object and motives of the actual student activity system. By failing to follow up on our differences about titles, we missed an opportunity to discuss our mixed purposes and the difficulties inherent in the lab report genre, as well as how, in other situations, the same set of experiments could belong to two different activity systems, and thus be presented differently.

In addition, sub-disciplinary preferences for self-promotion may also have played a role in Tip's greater tendency to accentuate the positive. In a context when positive results are more highly valued, the desire to frame one's work in terms of the parts that worked is part of the promotional picture. Hyland (2003) noted disciplinary differences in the tendency to cite one's own work (a form of self-promotion). Similarly, Swales (2004) and Kanoksilapatham (2012) outlined disciplinary and sub-disciplinary preferences for explicitly promoting the importance of the work in the discussion sections. In addition, Fanelli (2010) directly addressed the question of disciplinary tendency to report a positive result, showing that the predisposition to report positive results correlates with one's position on the hard/soft and pure/applied axes. Additionally, in a comparison of four different biology sub-disciplines (Fanelli, 2010, 2012), she found important sub-disciplinary differences, although the magnitude of the difference depended on which time period she examined. In papers from 1990–2007, immunologists tended to be less likely to report positive results than molecular biologists (mirroring my preference); however, in papers from 2000–2007, immunologists were more likely to report positive results.

Taking all of this into account, Tip and I may be reflecting our different opinions about the particular activity system under consideration, our sub-disciplinary biases, or perhaps the age at which we first learned to write fluently as members of a scientific community. We might be also reflecting individual attitudes toward publication and self-promotion; many reviewers over the course of my career have said that I am too blunt. The truth may in fact be "all of the above." Regardless of the precise reasons, it is clear that, as with the figure legend situation, I lost the opportunity to engage my collaborator in a discussion that might show students how writing choices are driven by many interacting factors including rhetorical situation, sub-disciplinary norms, and individual preferences.

Engineering Teachable Moments

These examples show that my initial hunch contained elements of truth—sub-disciplinary expectations probably did influence our choices—but was incomplete in that it underestimated the effect of many other rhetorical considerations. What it really showed me was the importance of exploring and articulating the reasons for one's writing choices and sharing those reasons with students.

How might professors engage in this process and harness difference when teaching? I offer some suggestions to choose from that are probably most applicable to upper-level or capstone courses. These draw heavily on Bawarshi & Reiff's (2010) genre analysis recommendations, with an increased focus on designing the genre set and discussion of the rhetorical situation to highlight systematic sub-disciplinary differences, as well as on Thaiss & Zawacki's (2006) suggestions for making clear how classroom writing instructions reflect academic, disciplinary, sub-disciplinary, institutional, and personal exigencies.

During preparation:

1. *Examine genre variations within your discipline*. Actively look for areas of disagreement within your discipline. Compare your writing and your colleague's, and discuss: how are your writing choices different from your colleague's? To what do you attribute this difference? Examine the instructions for authors from journals that you publish in, and compare to the instructions in your colleagues' journals. What can this tell you about the relationship between sub-discipline and genre usage? Consider whether or how to include this knowledge in your teaching. For instance, can you represent different sub-disciplines through readings or explicit mentions during activities?

2. *Explore how rhetorical purpose changes the basic genre forms*. Actively consider how the rhetorical purpose affects form. For instance, a research article meant to highlight a minor improvement in methodology can be very different from one meant to answer to a gap in the literature. If your writing assignment only approximates a specialist genre, consider how the approximation will affect rhetorical choices within the genre, or how you might achieve the same learning goals with a more authentic writing task (Bean, 2011).

While teaching:

3. *Assign explicit rhetorical genre analysis*. Before the first draft of your writing assignment, ask students to do genre analysis (Swales 1990, 2004) and compare their analyses with their peers'. (This would have made sense as preparation for our second workshop on the IMRD structure, and might have made the third workshop unnecessary.) Resist the urge to assign samples that fit some mental ideal and instead actively look for differences to explore. If your course includes papers from a wide time period, consider having students explore differences over time. If it includes a range of sub-disciplines, select journals representing these overlapping specialties, give students a little information about the areas, and then ask them to see if they can identify which elements seem to be common and which vary depending on sub-discipline. This approach, growing out of the extensive

body of literature on genre analysis, is a potential point of contact with first-year composition (FYC), especially if FYC has been taught with a comparative genre analysis approach (Wolfe, Olson, & Wilder, 2014).

4. *Assign reflection about how choice relates to discipline or sub-discipline.* If students originally write the report targeted to a particular disciplinary or sub-disciplinary community, have them include a reflection describing what they learned during genre analysis about the (sub-)disciplinary community to which it was targeted, and what rhetorical choices they made within the overall framework to appeal to the community's particular needs and values. Or, ask students to re-write part of the report as if they were members of a second sub-discipline, and then have them reflect on what choices they had to make to appeal to the second audience.

5. *Map the discipline and its communicative practices.* If your departmental curriculum or course draws on multiple sub-disciplines, consider mapping the sub-disciplines for the student. Then ask them to reflect on the reading and writing tasks that they have been asked to do in other courses and note whether they can identify any sub-disciplinary differences. While this activity could take place as an extended discussion over a semester, using a writing-about-writing approach similar to one that might take place in a FYC course (Downs & Wardle, 2007), it could also work as a single workshop, especially if students are asked to do some genre analysis in preparation.

6. *Embrace disagreement.* If you are team-teaching, allow time to explore any differences that the students notice. In addition, encourage students to reflect on places where your suggestions sound contrary to something they have heard before. By all means, highlight any underlying areas of agreement—but don't "elide difference." Instead, explore the reasons for the difference, and try to articulate reasons that link to the rhetorical needs of the particular community in a particular time.

The above suggestions focus on what an individual instructor can do or what WID specialists might offer workshops on doing. It is also important to consider how these elements fit in with the overall curriculum. Student writers develop over their four years in college, and writing instruction—both at the level of FYC and in disciplinary writing—must consider how to facilitate writing transfer, or the ability to take skills from FYC and use them to develop greater facility with disciplinary writing (Beaufort, 2007; Bergmann & Zepernick, 2007; Driscoll, 2011; Nowacek, 2011; Wardle, 2009).

Based on the increasing recognition that students are having difficulty with transfer, the past decade has seen an increasing number of calls for development of *vertical curricula* for writing (Beaufort, 2007; Hall, 2006; Jamieson, 2009; Melzer, 2014;

Miles et al., 2008; Rhoades & Carroll, 2012; Smit, 2004; Yancey, Robertson, & Taczak, 2014). A vertical (or integrated or connected) curriculum considers what disciplinary reading and writing skills are desirable or required by graduation, and then designs a series of courses, starting with FYC and extending into the disciplines. Ideally, these courses should fully integrate the disciplinary content, sequence writing tasks appropriately, use consistent terminology for writing skills, and integrate metacognitive thinking about writing as well as peer feedback (Melzer, 2014).

While this is still an ideal rather than a widespread, fully integrated practice, some aspects of my experience may be applicable to the emerging design of such curricula. In particular, disciplinary departments might consider how different sub-disciplines are represented in their department and how the writing tasks and conventions differ within those sub-disciplines. Using this information, they can organize some writing instruction around discovering these differences and developing facility with discovering when one has entered a new disciplinary sub-community.

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