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Can They Tutor Science? Using Faculty Input, Genre, and WAC-WID to Introduce Tutors to Scientific Realities

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Abstract: Writing centers can be staffed wholly or partially by tutors with little training in science writing. This article suggests that an emphasis on scientific rhetoric, not content, may be most useful for training tutors and developing handouts and checklists to aid novice science writers in invention and revision. The article also suggests that a training program in science writing can be informed by local science faculty's major concerns. However, these faculty discussions toward tutor training should be supplemented through WAC-WID and genre research to retain a training focus on the connection between scientific thought and scientific writing, science writings' primary genre families, and the delivery of scientific writing to different audiences.

Two decades have passed since Karyn Hollis's 1991 statement that in writing center tutorials with science students, "both student and tutor complained that the sessions were unproductive" (247). Through my own experience as a writing center director who converses routinely with science and medical faculty, I surmise that students, tutors, and faculty remain as frustrated as Hollis reported twenty years ago. My conversations with other writing center directors similarly suggest that most writing centers, regardless of the disciplinary breadth of the tutors (humanities, social sciences, sciences, etc.), experience this problem in different forms. The writing center, staffed by mainly humanities majors, has tutors mostly unfamiliar with science writing. Writing centers with science tutors on staff typically may not have these "science specialists" in the center during all hours of operation. Thus, the science tutorial remains a challenge for all parties involved in writing center activities.

The writing center offers science students a guaranteed chance for collaboration and feedback on writing, which they may not receive consistently enough elsewhere to allow for maximal development as a writer (Hollis 247). If science writing in the writing center is unproductive or produces mainly frustration or reticence, then writing centers must find innovative ways to provide workable tutoring strategies for science writing. Science educators are "today grounded in ideas of situated cognition, social constructivism, and collaborative learning"(Lerner 213). Thus, the vision of science education parallels more and more the collaborative, recursive nature of the tutorial. Perhaps writing centers and composition studies may share with the sciences a conceptualization of human learning and literacy not believed extant in previous decades, wherein writing was considered a skill, not a"conceptual pursuit," by many university faculty (Rose 183). While the mistaken belief that writing is mere transcription of thought may never die out, composition faculty and writing centers may find student writing and the writing process a territory of mutual concern with science faculty.

Yet how to train tutors in science writing remains mysterious. Eric Hobson and Neal Lerner argue that largely humanities-based writing center staff and science faculty have writing and curriculum that "can be quite alien" (168) to each other. Robert W. Barnett and Lois M. Rosen suggest that in writing

center-WAC partnerships, handouts and handbooks on individual disciplinary writing, articles on topics, and materials on proofreading, citation, and invention are beneficial (11), and I would agree. Such materials are standard materials in all writing centers. Yet building stronger materials and training methods to help tutors *own*and integrate basic science writing with their own rhetorical training, as opposed to passively helping students locate a handbook or model, remains an ongoing concern.

This article will suggest that writing center directors' discussions with science faculty can drive the selection of science writing principles for training tutors. These faculty-driven principles are easily supplemented through genre-based WAC-WID research, which means that most of these tools are based in rhetoric, not content. Thus, I make a more basic claim about advanced tutor training in science writing: The focus should supplement rhetorical training, not training in content knowledge.

Defining Local Science Writing Needs

One major locus of many centers'inability to serve science writers is the high degree of humanities students that comprise writing center staff. This is certainly true in my own center, where we are staffed entirely by English majors and minors and have been unsuccessful in recruiting from the social sciences and sciences, mainly because we have no budget to pay tutors; despite a robust two-credit hour training program, tutors receive no payment. My tutors receive English internship credits, which may be undesirable, or irrelevant, to non-English majors. This leaves centers like my own with a low degree of science writing knowledge and no strong rewards for science majors to join the staff. One solution would have writing centers work with science faculty to realign general education or science degree credits to make writing center internships count toward graduation for science majors. While curricular adjustments and recruiting efforts must continue, directors must always prepare non-science majors to tutor science majors.

Ongoing tutor training should review fundamentals and introduce tutors to new concepts of learning or writing. Science writing is new territory for many tutors. Moreover, training, because it constitutes a large part of a writing center's identity, is a powerful way to position a center as one that deals with science writing. As Jackie Grutsch McKinney argues, "a writing center can evolve its identity by pursuing [various paths, one of which is] staff (re)education" (4). However, tutors cannot be expected to achieve full mastery of science writing. Harvey Kail suggests that the training of tutors is a separation-initiation-return sequence where "[t]utors learn to listen and to question, to diagnose, and, as appropriate, to show and even to tell" (81), but this sequence assumes much content and rhetorical knowledge of the tutor in training. If a tutor has no content or rhetorical knowledge, no substantial initiation or return may exist. Thus, directors providing science writing workshops are left with a question as to what forms of knowledge tutors can be initiated toward and what will best synthesize with tutors'existing knowledge.

My own answer to this question developed from my local experience. Through extensive reading and work undertaken while developing WAC training for my campus, and because of discussions on writing center partnerships with faculty in biology and nursing, as well as faculty from multiple disciplines during all-day WAC-WID workshops, I conclude that rhetorical knowledge, not content knowledge, is the foundation and supplementation congruent with tutor knowledge and consistent with the writing center mission.

An Argument for Rhetorical Knowledge, Not Content Knowledge

Donald Samson discusses the lacuna between communication and science students' backgrounds. Samson argues that humanities tutors don't have basic content knowledge requisite in many scientific disciplines, and he defines the limitations of "the technical editor who does not understand the subject matter in the document to be edited: all he or she can do is proofread" (233). However, I would take issue with the latter claim. The claim ignores the rhetorical and genre dimensions of science writing. Genre-based WID research allows us to see genre as a set of social conventions repeated in recurring social situations, the default definition of social theories of genre, which also includes "the action [a genre] is used to accomplish" and"situation and motive" (Miller 151). Thus, the wise selection of and training in science writing's basic conventions may provide tutors the authority to ask questions pertaining not to the correctness of scientific knowledge or empirical procedures, but to the genre-specific rhetorical moves and intertextual references common in science genres.

Although Samson does argue for familiarity with various scientific documents, his science tutoring proposal is dedicated to the proposition that "technical students should be encouraged to become familiar with basic technical concepts" (237) that, in Samson's examples, include a variety of physics-based phenomena. I'd agree that scientific content knowledge would be useful, but scientific and technical knowledge is vast and multi-disciplinary, most likely too vast for tutors to master. The shift from novice to expert in the sciences is based upon content knowledge and involves procedural lab work with faculty mentors (Thomas, Smith, and Trupiano Barry 87), not just a few training sessions from science faculty. Focusing on content knowledge overlooks how scientific procedures are a part of scientific literacy and writing. A focus limited to content also ignores how the matrix of content, methodology, and rhetorical knowledge is deployed differently by scientific genres. It is in this matrix of rhetoric and intertextuality that tutor training and tutors' rhetorical knowledge can find common ground with the science client.

Franklin et al. discuss their center's history of meeting with science students during tutor training to have science students explain scientific concepts to tutors, and this seems productive, but still very narrow. Multiple visits from science faculty and students could not sufficiently cover even limited explanation of limited concepts. Giving tutors scientific knowledge, a content-based approach, may prove that "a little knowledge is a dangerous thing": Research has shown that having tutors tutor content outside their major poses strong dangers. Jean Kiedaisch and Sue Dinitz illustrate that global tutoring strategies applied in non-disciplinary content tutoring can have highly adverse effects on clients' papers (269). Jean-Marie Lutes reports that the adverse effects of non-disciplinary content knowledge can extend into methodology or forms of critical inquiry. In Lutes's study of writing fellows assigned to courses from various disciplines, "the writing fellows' discussions of their own tutoring also suggested that they lacked a framework for negotiating disciplinary differences from a critical perspective" (237). This inability to perform the methods of inquiry of a second discipline is sensible, as critical perspective would most likely require the mastery of two disciplinary discourses and not a single disciplinary discourse, which James Paul Gee suggests is true of any critique of a discourse (9-10). Thus, directors may expect only limited gains in tutor performance through training in the content or critical methods of scientific disciplines. A little knowledge is not enough, and training tutors in science writing returns to a basic question: What features of a discourse may tutors most easily assimilate that would be most useful to the students they tutor?

As an instructor of technical communication courses, I've found that current technical communication pedagogy parallels my suggestion of training tutors toward basic rhetorical knowledge of the sciences. Donna Kain and Elizabeth Wardle's research into technical communication instruction acknowledges that teaching technical *content* to produce technical *writing*is a problem when students come from multiple disciplines and share no common technical content about which to write (118-19). Even

in*semester-length*technical writing courses, such as those often housed in English or writing departments, writing instructors can achieve only a shallow course content to produce technical writing. These technical communication courses with students from multiple disciplines resemble a writing center's clients: a diversity of majors, equally diverse content knowledge, and diverse assignments, genres, and rhetorical traditions. If a semester-long course with an experienced writing instructor cannot sufficiently teach technical content to a group of mixed major students, certainly we should not expect that a thirty-minute tutorial with a humanities tutor will do so.

The field of technical communication has learned that class time and student energies in multi-major writing courses are best spent on building students' rhetorical knowledge through analyzing professional documents and the professional activity fields that produce collaborative, researched professional writing (Kain and Wardle 135; Devitt 201; Dias, Freedman, Medway, and Pare 235). In this genre and activity-based approach, content is just one consideration in the web of communication involving rhetorical practices and activity fields. I suggest writing centers can learn much from writing specialists teaching technical content, including the field of technical communication's pedagogical commitment to rhetoric, not content.

A turn toward rhetorical knowledge is supported by research into collaboration between writing centers and science courses. Hollis reports that writing center direction of peer review groups in science classes helps students' content knowledge, but science students in these sessions "had no particular expertise in composing, organizing, or polishing their prose" (248). Two concepts can be gleaned from Hollis's report. First, science students learn scientific knowledge best from other science students, not tutors. Second, content can distract from a larger discussion of why and how scientists communicate information in particular ways. Thus, too large of a focus on content can distract from what tutors do best—provide writing center clients guided reflection on genre-based invention and revision.

This claim for a focus on rhetoric, not content, is also informed by WAC-WID best practices. WAC-WID training focuses on helping faculty scaffold writing assignments to improve writing instruction and students' engagement in the writing process. Thus, in WAC-WID, faculty handle the content, and WAC-WID coordinators provide the tools to assist in improved writing instruction. Writing centers and tutors are much more an extension of WAC programs; they do not and should not resemble extensions of science faculty or supplementary tutoring in scientific content. Joan A. Mullin makes a similar connection in "Writing Centers and WAC."She reports that writing centers and WAC programs "both draw from some of the same theories, engage in shared practices, and are similarly placed within the academic community […]" (184). The picture that emerges, supported by a variety of writing curricular and pedagogical practices, is one of rhetoric, not content. The signals from writing center and science classroom collaboration, technical writing instruction, and WAC-WID training point to not content training, but a selective, practical knowledge of science rhetoric and genre knowledge to support tutors.

Research into transfer studies also supports training for tutors in rhetoric, not content. Transfer, by its very nature, is defined as the deployment of a skill or knowledge set rehearsed in one domain into a new domain. Clearly writing centers should be seeking transfer of tutor's previous rhetorical knowledge into scientific rhetorical knowledge. Transfer studies demarcates "near" and "far" transfer, also referred to as"low-road" or "high-road" transfer. Near or low-road transfer"occurs when knowledge gets used in situations very like the initial context of learning" (Perkins and Salomon, "Science"2). Conversely, far or high-road transfer requires "deliberate mindful abstraction of skill or knowledge from one context for application in another" (Perkins and Salomon, "Teaching" 25). Clearly rhetorical knowledge, not content knowledge, is the prime candidate for either form of

transfer based upon tutors' richer rhetorical expertise and their lack of robust science content knowledge. The same would be true of the bulk of writing and humanities faculty, if writing or humanities faculty had to tutor science writers; rhetorical knowledge would help humanities experts understand science writing far more than having spent a few hours attending lectures on scientific content.

To be clear, I am not claiming that science writing training would provide complete transfer of new or old writing knowledge into science writing domains. I argue only that rhetoric, not content, is a strong path for training tutors with advanced general rhetorical knowledge to help science writers. As Rebecca Nowacek has argued, transfer occurs best when instructors are"helping students to see a need for transfer. […] Genre is not the only cue for transfer, but it is a powerful and underappreciated cue" (17). Deliberate training in basic scientific genres guides and constrains tutors in the process of transferring their general or disciplinary rhetorical knowledge into scientific domains. General writing features such as claims, evidence, topic sentences, and organization may transfer easily. However, specific moves--for example, locations of intertextuality or summary of methodology in a typical science research genre—are likely a high-road issue that requires abstraction of specific principles, and these specific moves must be initiated through sustained cueing by those who train tutors. Naturally, writing center trainers must define and understand these abstracted principles themselves. I'd suggest such understanding is achievable through a continuing cycle of WAC-WID reading and discussion with their campus's science faculty.

Training in rhetoric and genre may also help tutors' confidence and ability to shift between directive and nondirective tutoring strategies. Peter Carino's discussion of power and collaboration in tutorials acknowledges the importance of tutor confidence and purposeful shifts between directive and nondirective tutoring when tutoring outside one's discipline. Carino discusses tutors who have lost confidence when not able to perform source integration with a client of an unfamiliar discipline, but he also reports on advanced tutors with corporate experience whose direction, not collaboration, may aid writing conferences (96-97). These two situations, with the first situated in a lack of rhetorical knowledge, and the second suggesting a place for directive tutoring based in content or rhetorical expertise, are situations that combust the typical dialogic, minimalist or nondirective tutoring strategy, and Carino offers sound advice when suggesting that "[t]utors should learn to shift between directive and nondirective methods as needed" (110). However, even Carino's fine discussion of power and tutor knowledge does not speak specifically to how non-disciplinary rhetorical knowledge may be useful or may function across the directive-nondirective continuum. Nor does it suggest how writing center directors and tutor trainers may go about providing rhetorical knowledge of the sciences through tutor training.

Simply put, rhetoric may beget revision of rhetoric, or rhetoric may beget revision of content. A tutorial in which rhetorical and genre knowledge initiate a client-led revision of scientific content or rhetoric does not violate the protocol of minimalist, nondirective tutoring or the collaborative, dialogic nature of a tutorial. Thus, rhetoric is most likely the strongest weapon to help generalist tutors engage science writers in the revision of writing or thinking. Additionally, tutor training in limited principles of science writing, chosen or vetted through local science faculty and supplemented by WAC-WID research, will most likely transfer to our tutors' rhetorical training far better than training in limited, perhaps random, disciplinary content. A discussion of scientific rhetoric and genres could, sensibly, shape any discussion of content with clients and extend into collaborative training with science faculty. Appropriately, this proves rhetoric, not content, queen of the writing center.

Making Tutors Comfortable With Science Writing

During training, discussing the rhetoric of science writing through the same conceptual system and vocabulary as past rhetorical training gave my tutors a strong direction and location that would fold new ideas into well-known rhetorical procedures and knowledge. I framed our training discussion by turning to Charles Bazerman's explanation of writing in the disciplines. Bazerman argues that all disciplinary writing is a sociorhetorical configuration of the "knowledge of the many contexts and forces in which the field operates" (*Constructing Experience* 75). This includes, but is certainly not limited to "citation practices, claims, counterclaims, referee's reports, syntheses, interpretations, and codification" (*Constructing Experience* 116). In an examination of science writing and science tutoring through this lens of a discipline's constructed reality, content is not unimportant, but it becomes just one factor in the creation of texts and genres that are a socially-constructed reality mediating subjective self, society, and physical phenomena (Bazerman, "What Written Knowledge Does" 162); similarly, these components can be considered a*disciplinary matrix*(Russell 53) that disciplinary tradition and colleagues accept as agreed upon mediations of self, other, world, and tradition. As Jacob Blumner argues, "Without these practices and guidance, students stumble unnecessarily to enter a discipline" (34). As I suggested previously, tutors may do a better job of providing advice on rhetorical mediations as writing center clients of the sciences enter a disciplinary matrix.

WID research identifies genre as one form of scaffolding. Genre is representative of disciplinary thought, but it is also linked with cognitive development that allows a writer entrance into a discourse community (Bazerman, "Genre" 281-82). Specific features of popular genres provide a protocol from which one can begin compiling the moves of science writing, such as those listed above, for tutor training. Clearly not all of Bazerman's partial list above (from citation to codification) transfer easily into writing center training because of required content knowledge as well as rhetorical fluency. Yet some rhetoric-based features can clearly be taught as rhetorical moves. Directors who read these moves from WAC-WID research, not simply from handbooks, may better provide a richer context when training tutors. Likewise, tutors' and clients' later ability to comprehend the contextual reasons for these rhetorical moves provides both tutor and client a richer context than proofreading exercises and handbook imitation.

This genre- and rhetoric-based approach to tutor training sequences with WAC-WID training is underway at many universities. Thus, tutor training and WAC-WID faculty development would resemble each other, at least in terms of scaffolded assignments, genre models, and well-explained contexts that produce rhetorical moves. During the training sessions that introduced these ideas to tutors, I remember stressing the idea that genres create a disciplinary reality, a reality based in a menu of stronger or weaker rhetorical moves that we could potentially illustrate to clients through checklists and models, with the final decision being the client's, not the tutor's.

Letting Local Science Faculty Guide Training

WAC-WID and genre research also helped me sift through and better understand science faculty suggestions. The creation of training materials based upon ideas from science faculty allowed me to communicate to science faculty that I'm listening, and that faculty ideas can directly influence writing center training. WAC-WID research was particularly helpful when contextualizing and selecting rhetorical moves for training that were as specific as paraphrase preferences, which science faculty

mentioned in my meetings with them. Such items could seem idiosyncratic, but the convergence of WAC-WID reading and listening to faculty produced an overlap to be trusted.

I also found the WAC-WID approach helpful when explaining to science faculty that science writing is a reality and configuration of rhetorical moves that are different than and an extension of FYW. Focusing on writing as a social practice of a discipline created a path for a productive conversation of how each department is responsible, post-FYW, for "pruning" these FYW moves into discipline-specific moves. For instance, during an informal coffee talk, the biology department complained of students using quotation, not paraphrase, in their papers. When I explained that FYW must provide all forms of in-text citation to students because of the multiple courses and various disciplines students enter, the biology department suddenly had a glimpse of the demands and rationale of FYW. Next, perhaps because I was having coffee with the biology department, I jokingly recommended that students leave FYW "bushy." That is, each student is a plant that has grown thick through an introduction to many academic writing moves, and each future instructor or department must overtly mark and "prune"these writing moves to the moves acceptable in the discipline.

I've stuck with this "pruning"metaphor as an easy explanatory device during contact with faculty. Ultimately, my pruning metaphor symbolizes the hand-off between English writing courses and the WAC-WID responsibilities of other departments, where departments find themselves responsible for developing moves that define their disciplinary writing and pruning those that do not. The pruning metaphor provides an instant curricular location. Other departments must acknowledge the space where writing curricula and pedagogy are informed by FYW, yet they can also see where FYW leaves off. The pruning metaphor instantly centers the conversation in this cross-curricular location of the hand-off between FYW and writing in the major. But this metaphor is good for directors as well. I tend to leave meetings of this focus with a stronger understanding of science writing moves, of writing practices in the sciences, and where and how faculty begin writing instruction in their courses. In centering the discussion as a hand-off of students from FYW to other disciplines, I also have an opportunity to advocate for the English department, the writing center, the challenges of tutoring writing, and the complexities of literacy and learning to write at the college level.

The task of turning one's reading on disciplinary moves into a training platform rests in the selection of rhetorical features and models. Using the needs and wants of science faculty to drive my selection of rhetorical features promises that I will be training my tutors to address some of the problems, other than complaints about poor grammar, that science faculty wish addressed. Admittedly, faculty sometimes had trouble articulating what they want, and they are sometimes shocked, yet often awakened, when learning that they must "prune" their students' FYW experience. This is why the use of WAC-WID genre research helps me to help science faculty articulate ways to label and solve their problems. What follows is the training program and checklist I developed.

A Framework and Checklist for Science Tutoring

Samson recommends that tutors would benefit from having professors design assignments in which science students write to tutors, not professors (237). This concept of assignment design can be modified to parallel WAC-WID thought. The binary of professor or student audience is similar to basic WAC-WID advice that often recommends two basic forms of audience: an assignment constructing a professional writing identity for professional audiences, such as a lab report or IMRD report, or an assignment requiring a genre for lay-popular audiences, such as a popular magazine article (Bean 55-59). Chris Thaiss and Terry Myers Zawacki's research on the assignments of science faculty reaffirms that science professors utilize both forms of assignments, depending upon the type

of students in class (degree student v. general education), with science professors leaning heavily toward professional articles and lab reports as students advance in their major (62-63).

Thus, a first step in science tutoring may be to train tutors, first, to distinguish between professional and lay-popular writing assignments. This distinction in audience and assignment purpose is an initial decision that will help tutors understand the types of assignments arriving from the sciences. Tutors can then count or discount writing moves that may be relevant to the science assignment at hand.

Although forms of learning-to-write and writing-to-learn assignments are many and varied, the assignment for a professional audience may be loosely categorized as a learning-to-write assignment, while the assignment for a lay-popular audience may be closer to a writing-to-learn assignment. Neal Lerner differentiates between these two forms of assignments, comparing the lab report in which students “learn the relationship between *doing* and communicating science”with writing-to-learn assignments such as “journals, creative pieces, dialogues, or even essays—the kind of writing that is essential for students to do to engage with the material” (214). Mya Poe, Neal Lerner, and Jennifer Craig substantiate the emphasis on professional writing in science writing education. Their research on science and engineering writing at MIT suggests that science curricula often has “tasks of writing, speaking, persuading, and collaborating that are modeled closely on professional standards" (2), as opposed to traditional academic genres like a FYW or a general academic research paper.

My own experience meeting with science, medical, and public health faculty substantiates the claims that many science and technical faculty indeed use this basic division of assignments, the professional and lay audience. Thus, this basic assignment division is an excellent starting point for tutors to begin a dialogue and diagnosis of a science writing assignment. Training should help tutors make a genre-based diagnosis that can aid both tutor and student in making decisions about the general assignment task as well as the type of information to be reported (e.g., learning-to-write versus writing-to-learn).

In a moment, I will discuss the professional genres of science writing I selected for training. First, I'd like to point out one reason to begin a tutoring session with the professional versus lay audience division: The lay-popular audience assignment can be organized not chronologically, as a lab report or IMRD science article would be; rather, an article for a lay-popular audience can be organized similarly to a FYW or humanities essay. The lay-popular science assignment can be a thesis-driven argument based upon general-to-specific, problem-solution, comparison-contrast, or related essay arrangement patterns. The aforementioned patterns are popular in the humanities and essay writing, but they are also dominant in forms of technical communication (Markel 152-53). Thus, tutors that distinguish a lay-audience from a scientific audience (or genre) when beginning a tutorial may recognize the shared rhetorical moves, such as arrangement patterns, of their own toolbox and the toolbox the assignment requires. This may be an opportunity for tutors to use some of their disciplinary knowledge, at least for diagnosis. Including training and a handout with the basic arrangement styles above provides tutors metaknowledge to make distinctions as to whether or not lay-popular audience assignments resemble the humanities assignments in which tutors have strong rhetorical knowledge. For instance, tutors with a background in journalism may successfully apply their rhetorical knowledge to a lay-popular audience, magazine-style assignment; yet this knowledge would interfere with a professional science genre. Marking this simple division of assignments into a *professional*or *lay-popular*genre during tutor training may help tutors apply or withhold their own rhetorical knowledge during science tutorials.

Surprising, But Useful, Faculty Requests: Specialized Science Citation Practices

One consistent complaint from science faculty that came to fruition in tutor training, with support by WID research, related to poor advice from tutors on secondary source citation in the sciences. At first I believed this was a complaint about my tutors' unfamiliarity with APA or other citation styles. However, I was wrong. The majority of hard sciences do not use quotation, but only paraphrase, in research articles, reports, and lab reports. Through meetings, I learned that the recommendation of quotation, or lack of policing for quotation, by my tutors in these science genres had been a sore point with science faculty for a number of years. Ken Hyland's research on disciplinary citation practices, which notes a complete lack of quotation and block quotes in his study of writing in biology, physics, and electronic and mechanical engineering (702), supplemented science faculty's advice on citation practices and gave me a clearer picture of how to develop training and a checklist that would help tutors and clients make better citation decisions during tutorials.

This focus turned my writing center's attention away from recommendations of a simple, universal "quote sandwich" with clients. Instead, tutors can now consider the discipline they are tutoring. After our training session, I asked my tutors if they were aware of this fairly standard limitation to paraphrase, along with a rejection of quotation, in the hard sciences. None of my two dozen tutors were aware of this fairly strict difference in science's professional genres, and we had an open talk about how many of them had most likely, unknowingly, given poor advice on citation to science students. We all agreed that this small change in science tutoring may redirect or stave off some frustration when meeting with science clients or receiving feedback from science faculty. We were, piece by piece, learning to speak the language of the sciences.

Using WID and Genre Research to Understand Constructed Realities

After providing training and handouts in basic arrangement patterns and targeting specific science practices, such as citation, training can also include the basic genres that both faculty and tutors discuss as most common or problematic. Although variance exists by scientific discipline, I decided to focus on a popular, cross-disciplinary science genre, the IMRD (Introduction-Methodology-Results-Discussion) report. Poe, Lerner, and Craig designate the scientific research article as "the dominant writing task of scientists" (19), and the IMRD paper is a major template for the science article. Because of its Methodology and Results sections, the IMRD genre captures the essential lab or field study procedures that drive the sciences that are typically absent in humanities writing.

WAC-WID research substantiated the importance of IMRD as a container for scientific thought and practices. Brian Budgell's guide for biomedical writers is designed around the IMRD format, breaking each section (I-M-R-D) into several Swalesian rhetorical moves to create a scientific template that contextualizes the merging of content, purpose, and writing conventions. Budgell also uses IMRD to contrast the moves of other scientific genres, such as the case study (41), thus making IMRD an educational and professional flagship of science writing. A study by Thomas, Smith, and Trupiano Barry also reports the use of Swalesian IMRD move analysis in science faculty's critique of master's thesis writing in the sciences (92). IMRD appears to be an interdisciplinary prototype crossing medical and science writing, as well as professional and educational writing, making the IMRD report an excellent tool for training tutors. The genre can be broken into moves nicely, and once again directors or trainers can merge WAC-WID research and faculty training with tutor training.

An IMRD report, rhetorically speaking, is a longer, elaborated version of a lab report and contains sectioned divisions that parallel its shorter cousin, the lab report (*Writing In The Disciplines* 164). IMRD is organized chronologically with a literature review and other forms of intertextuality in mainly the opening and closing sections. The middle sections are reserved for a temporal, procedural explanation of the experiment or study itself, and the chronological arrangement mirrors the scientific process. Claims and counterclaims appear almost entirely in the first and final sections, as would be expected, for these comprise the literature review and the "filling of the gap"—the situating and synthesizing of the lab results amongst the existing literature to close the article or report.

In discussion with my tutors during training, which involved a variety of paragraphs chopped randomly from IMRD reports, my tutors thought that breaking down the IMRD report into four sections with the above characteristics had pay-off. In a role-playing training session, a basic IMRD checklist that included types of information and rhetorical moves helped my tutors identify poorly placed claims, counterclaims, and other intertextual references, each of which should have existed in either the Introduction or Discussion section. During and after mock tutorials, we examined as a group each chopped IMRD paragraph and made a decision as to which section would most likely house this quality of information.

Signposting the chronological arrangement of the Methodology and Results sections was also helpful to tutors. It provided them a protocol to help clients sort or even invent requisite information such as their methodology, lab materials, and related testing or data-gathering procedures. These concepts are non-existent in humanities research writing. Knowing that intertextual references would likely appear in the Discussion section helped tutors see an "end" to the Results section, which should discuss just the experiment or study, then shift the discussion of the results' implications to the beginning of the more intertextual Discussion section.

True, the IMRD model cannot solve all novice errors and is plastic in the hands of an expert, but it provides a basic prototype for many science assignments, and I suggest using the IMRD's arrangement pattern and rhetorical moves as a robust apparatus to help clients invent or revise their material; when clients enter a tutorial confused about an assignment's tasks, tutors may help the client either adopt the IMRD structure or define their writing assignment against the basic scientific procedures and audience (i.e. rhetorical reality) that IMRD provides. In short, IMRD is a starting point to define what an assignment is asking for. It provides tutors the qualities of information or materials common in science but absent in the humanities or even, perhaps, some social science writing. Science students are sometimes unaware they are being asked to write an IMRD paper, or science students may imagine science writing as first-year writing redux, in which case a science student would assume the default format, purpose, and qualities of information of a generic academic research paper. To avoid defaulting from disciplinary thought and its accompanying rhetorical reality, IMRD provides a structured checklist for scientific invention, including a controlled literature review, the presentation of lab materials, experiment design, and other procedural information that is part of science writing but not FYW, the humanities, or lay audience assignments.

The second genre we examined during training, the lab report, my tutors had mentioned specifically as a concern and potential training topic. Most tutors knew the golden rule of science writing: Use passive sentences, but after this, we all felt at a loss to give decent advice. However, after discussing the IMRD report, tutors were able to see that a lab report is, indeed, the cousin of the IMRD report.

The lab report is typically parallel to IMRD in its presentation of information, even if the lab report has slightly different and, perhaps, opaque signposts compare to I-M-R-D. For training purposes, I

had drawn up a poorly written lab report with the requisite active sentences with "I" as the subject, such as "*I put .2 mg of the compound in the test tube*."I also included common out-of-place writing-to-learn statements that students often include in professional science writing, statements akin to "*Undoubtedly nitrogen is an important element for the world and this experiment*."Most tutors recognized these writing-to-learn statements as wrong. However, contextualized through our IMRD knowledge, tutors also had an easier time shifting good information to a more appropriate arrangement, and, in matters of invention, tutors could predict potential missing information from a lab report based upon a model lab report and, again, IMRD knowledge. For training purposes, I included a sample lab report from Harbrace-Court's *Writing in the Disciplines*, which we compared with the IMRD report first, then with my poorly written lab report, which we workshopped in mock tutorials. Throughout our training session, to honor one rhetorical move asked for by science faculty, we also observed the lack of quotation and consistent use of paraphrase in citation practices, and I was sure to include one quotation in my poorly written lab report, which tutors identified as incorrect during their mock tutorials.

Sustainable Science Tutoring: What Should a Writing Center Do?

I'd like to close by summarizing both my own ideas and others' ideas that together comprise a robust science training session, menu of handouts, and science writing checklist.

Franklin et al. note that both a good and poor example of a lab report along with a series of formative questions can aid tutors because "this procedure enables students to see what is missing in a report, or understand where more substantial development is needed" (3). Clearly, models will be a large part of a training and post-training toolbox. Franklin et al. suggest that a handout should include annotated examples that have a) expectations for title; b) commons errors; c) a procedural rhetoric question: Would someone be able to duplicate the study based upon the description section of the lab report? (3). I would suggest that the university's WAC-WID atmosphere could be improved if these annotations could come from science faculty themselves; in the past, I have recommended that each department build their own annotated handbook, no matter how brief. Such a handbook is useful for WAC-WID promotion, as it asks departments to have discussions and make decisions about their writing assignments and pedagogy. Were students or writing centers to be privy to such locally produced handbooks, novice clients, tutors, and training session leaders would have a locally-contextualized tool to guide any dialogic talk or training of writing.

In addition to Franklin et al.'s suggestions, I'd advise training tutors to distinguish science assignments as either professional or lay audience. This will clarify to both tutor and client the basic writing task and what types of rhetorical knowledge will be appropriate. In addition to Franklin et al.'s list above, I'd add that training and handouts can include particular features identified by science faculty. These features can be abstracted as a general rule, and they can be situated in genres commonly assigned by science faculty that appear often in the writing center. Pulling features into genres can provide rhetorical context for rhetorical moves and stylistic choices, and the abstract takes on a richer meaning for both tutor and client.

I'd suggest it is also useful to embed science writing inside of conventional patterns of arrangement, whose numbers vary, but include chronology, general to specific, more important to less important, comparison and contrast, classification, problem-methods-solution, and cause and effect. These basic arrangement strategies gird many disciplines and their socially-constructed realities. By providing these basic arrangement strategies, tutor training would contain the metaknowledge tutors need to assess lay-audience science assignments they encounter that may mimic (but may not mimic) the

chronological, procedural fashion of professional scientific research and lab work. Because lay audience science assignments may have rhetorical patterns similar to the humanities, having tutors probe for audience can help tutors decide if their humanities-based rhetorical knowledge may also apply. This is the strength of IMRD as a point of comparison for all science writing. Potentially, leaders of training sessions may wish to focus on lay science genres and compare their key moves to moves in both the humanities and sciences.

Finally, training should focus on professional genres that science faculty most often assign and tutors most often encounter. Training should make explicit the moves and patterns of these genres, particularly those not extant in the humanities. The lab report and IMRD article, both of the professional scientific genre family, are organized chronologically, capture the process-to-results sequence and, structure their intertextuality in predictable locations. I'd suggest it is important for tutors to recognize the highly chronological arrangement of genres reporting on scientific procedures. The tutor's ability to begin a science tutorial with a question such as "Does this assignment ask you to report the results of a procedure, study, test, or experiment?" may be a way for tutors to sort through the rhetorical possibilities of an assignment separate from the content-based question Franklin et al. ask about the potential of a reader to duplicate the study. Clearly the WAC-WID meta-question of what the assignment is meant to do must be answered before Franklin et al.'s suggestion of whether or not the experiment description is replicable can be achieved; this is only to say that Franklin et al.'s advice assumes that students understand the genre and scientific-method-to-rhetorical-reality of a lab report. However, many clients come to the writing center looking for help with invention, even when writing lab reports, and we should not expect students to fully recognize the rhetorical implications of the differences between learning-to-write and writing-to-learn assignments. Thus, meta-questions, checklists, and training in rhetorical moves that highlight both scientific procedure and intertextual regularities will help tutors and clients who are new to scientific thinking and writing. Recognizing such thinking will help tutors learn *when* to apply their humanities knowledge, and when to use the checklists for professional science genres.

Training for rhetorical knowledge through the processes detailed above may also help tutors recognize moments to be directive on the level of rhetoric, but nondirective on the level of content, with the client being the final arbiter of how to make meaning as a novice, but developing, collegiate science writer.

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