Developing an English for Academic Purposes Course for L2 Graduate Students in the Sciences

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Abstract: Graduate students face a fundamental change in identity when transitioning from undergraduate writers to graduate writers. In their new role as graduate writers and researchers, they must move from consuming knowledge to producing knowledge through their writing. Often, they must learn new genres of writing, new disciplinary conventions, and new rhetorical models. For non-native English speakers, these tasks are even more complex because of the advanced language skills required and the cultural differences in rhetorical models. This article explains teaching strategies for an inter-disciplinary, graduate-level scientific writing course for non-native English speakers. For Teaching English to Speakers of Other Languages (TESOL) instructors who are accustomed to general undergraduate writing, this article will offer suggestions for scientific writing at the graduate level. For composition instructors who do not specialize in TESOL, this article provides ways of adapting graduate-level scientific writing conventions to an audience of international students.

Keywords: Scientific Writing, English for Academic Purposes, Graduate Students, L2 Students, Interdisciplinary, STEM Disciplines, Disciplinary Conventions, Rhetorical Models, Courses

Graduate students form a distinct group of nascent scholars—neither established faculty nor novice undergraduates—who are becoming acculturated into their disciplines through the process of writing about their research. These students occupy a unique place in the academic community: They are transforming from students learning about a discipline to bona fide members contributing knowledge to that discipline (Abasi, Akbari, & Graves, 2006). Expectations for graduate student writing are different and more rigorous than undergraduate writing, including more emphasis on synthesizing literature, constructing original arguments based on their own data, and integrating data from other research into a cohesive argument (Moore, Tatum, & Sebetan, 2011; Ondrusek, 2012; Sallee, Hallett, & Tierney, 2011). Through their writing, graduate students are shifting their identity from learner to producer of research in order to make new knowledge claims in their field and to join the research community for that discipline. Making new

knowledge claims involves an identity change in academic status as well as an epistemological change in relation to the field; graduate students must learn how to critique previous knowledge claims, articulate a gap or niche in the field, and argue that their research addresses this area by contributing new knowledge. From the sociocultural perspective, research writing for graduate students is not simply "writing up" results; rather, the writing process socializes these students into the norms of the discipline and begins to offer them legitimacy as scholars in that discipline. Making new knowledge claims requires a sophisticated conceptual framework as well as an authoritative voice, both of which are challenging for emerging members of the discipline.

A growing body of literature articulates the need for specific graduate writing support to aid in such development, including courses, writing groups, tutoring, and mentoring (Delyser, 2003; Harris, 2005; Kamler & Thomson, 2004; Polio & Shi, 2012; Rose & McClafferty, 2001). Previous studies highlight the benefits of these endeavors: Writing groups, for instance, help writers to navigate between the macro-level conceptual framework of the dissertation and micro-level revisions, develop peer review strategies, and articulate connections between different parts of the dissertation (Maher et al., 2008). Similarly, group peer critique has been identified as the central pedagogy for improving writing because groups provide a demonstration of the dialogic nature of writing and "a heightened sense of the processes and craft of writing when readers were not content specialists, [and] access to alternative non-discipline-specific perspectives" (Aitchison, 2009, p. 909). Simply remaining accountable to a group or course, practicing writing on a regular basis, and having a support system in place contributes to productivity and confidence throughout the process (Belcher, 2009; Brooks-Gillies, Garcia, & Manthey, this collection; Ferguson, 2009; Kim & Wolke, this collection; Maher et al., 2008). As seen in the literature, graduate writing courses have been developed by faculty teaching in various disciplines as an attempt at scaffolding and direct integration of writing skills into the curriculum (Delyser, 2003; Harris, 2005; Sallee, Hallett, & Tierney, 2011). Many graduate students have not taken a writing course since early in their undergraduate career, if ever, and the transition to graduate writing places a host of new demands on these students. Their undergraduate writing assignments may not have required the same skill sets as graduate writing in terms of engaging in academic discourse, and this skills gap leads to considerable frustration and anxiety by both students and faculty (Belcher, 2009).

Beyond the challenges faced by graduate writers in general, multilingual writers must overcome cultural differences in writing style; for instance, in American academic writing, the argumentative style emphasizes stating the main point first and then supporting it rather than inductively circling the main point and leaving the conclusion until the end (cf. Lakoff & Johnson, 1980). Compounding the difficulties of mastering argumentative frameworks, students also encounter new

rhetorical/linguistic conventions for academic writing and disciplinary conventions for research writing in their area. Recent research has noted multilingual writers' difficulties in establishing new knowledge claims because these writers are doubly removed from the linguistic and social context in which authorial identity, voice, and academic discourse are established (Abasi et al., 2006; Polio & Shi, 2012). Abasi and Graves (2008) note that second language (L2) students need extra development in order to implement writing conventions for making new knowledge claims, critiquing previous knowledge, and establishing an authoritative research identity because they are seeking to acquire the norms of American academia, the writing conventions of their field, and the general language ability to write original research articles.

English for Academic Purposes (EAP) courses provide one way to focus on rhetorical conventions for research writing by analyzing experts' examples, offering rhetorical strategies, and providing extensive feedback on students' drafts (Fenton-Smith et al., 2017). EAP courses can provide a safe space for fledgling scholars to receive developmental feedback on writing and to explore conventions in their discipline. As universities develop curricula to support multilingual writers, these courses offer a productive way of equipping students with writing skills that promote academic success throughout their college careers (Crosthwaite, 2016; Fenton-Smith, Humphreys, & Walkinshaw, 2018). EAP courses allow for linguistic experimentation and growth with coaching from composition experts who can model rhetorical conventions and help students gain writing confidence through course activities.

In this chapter, I describe a pilot writing course for multilingual graduate students in the sciences, Science Writing for Non-Native English Speakers. I approach the development of a graduate writing course for L2 students as an action research endeavor that brings together the iterative processes of action research and the writing process itself. As described in the *SAGE Handbook of Action Research* (Bradbury, 2015), this type of research is grounded in practice and is fundamentally collaborative in "researching with" stakeholders rather than researching *about* a phenomenon. Action research, similar to academic writing, relies on a dialogic and iterative process that continues to evolve through ongoing inquiry, as noted by Carter (2012). The emergent nature of this research means that it includes ongoing learning, adaptation, and action through cycles of dialogue. Developing, teaching, and revising this course brings together the key tenets of the action research process in collaborating with stakeholders in the class—students and a writing consultant—as well as adapting to the conventions of the disciplines represented. Much like academic writing consists of argument, evidence, dialogue, and iterative revisions, the course likewise evolved through ongoing evaluation and response. This course arose from a specific need at the university, and the process of responding to that need provided the foundation for this action research endeavor.

The development of this course arose because of my unique role at West Virginia University. Beginning in 2009, I created and directed professional development programs for graduate students across the university. Many of these programs were based on core competencies for career success, as defined by the Council of Graduate Schools, Science Careers, the Versatile Ph.D., and other disciplinary societies. Writing, one of these core competencies, became a concern because specific writing support at the graduate level is often scarce or lacking. Although the university's Writing Center offered tutoring to both undergraduate and graduate students, no graduate courses focusing on research writing existed at the university level. Interest in this type of course had been expressed by students and faculty during events and individual meetings. Many of the graduate professional development programs attracted a large number of international students, who often commented on the difficulty of improving their writing and completing drafts of their research papers. Based on this feedback and my background working in composition and ESL programs, I was motivated to develop more writing resources for graduate students, and especially multilingual writers. This course was first conducted in Fall 2012 at West Virginia University, a Carnegie classification high-research university with approximately 5,100 master's and doctoral students. The course was available to all students in the science disciplines, broadly defined. Scientific writing was chosen because the format for research papers usually follows consistent sections (introduction, methods, results, discussion), and the conventions of scientific writing are more uniform than for humanities writing. Fourteen students and a visiting scholar enrolled in the course, from the disciplines of geology, geography, forestry, wood science, physics, psychology, chemical engineering, human and community development, biology, and public health. Students ranged from first-year master's students to third-year doctoral students. The course met twice per week for fifty minutes each session.

In keeping with research on the primary skills needed for graduate writing, this course focused on both higher-order and sentence-level skills needed to compose academic writing at the advanced level required for graduate school. Graduate writing courses, as described in the literature, recognize the importance of scaffolding in order to break the complex task of writing a research paper into more discrete tasks, such as writing a literature review, writing article critiques, and presenting data (Delyser, 2003; Harris, 2005; Sallee, Hallett, & Tierney, 2011). In keeping with this strategy of breaking down the academic writing enterprise into more manageable chunks, I focused on the idea of rhetorical moves as a way to frame academic writing discourse and associated tasks (Thonney, 2011). This concept of "rhetorical moves" has been examined in order to analyze commonalities and differences across a corpus of academic writing (for instance, Chang & Schleppegrell, 2011; Petrić, 2007; Tankó, 2017). For that reason, my course structure drew on *Academic Writing for Graduate Students* (Swales & Feak, 2012) because it provided

a welcome blend of global and sentence-level strategies that could be analyzed and practiced across an array of disciplines. Organizing the course around rhetorical patterns provided a way to examine aspects of academic writing that remain fairly similar across disciplines as well as conventions that change depending on discipline or sub-discipline (Fenton-Smith et al., 2017).

The course outline focused on major skill sets in research writing, such as general-specific texts, data commentary, processes, problem-solution texts, and critiques in the context of research paper sections, such as introductions, methodology, results, and discussion areas. By the end of the semester, students practiced all the major components of creating an original research paper or dissertation chapter. During the course, many of the writing assignments were based on practicing the specific skillset at hand, such as writing an introduction that establishes the research gap and the contribution of that paper; writing a literature review to synthesize rather than simply summarize sources; and writing about data from students' disciplines. Assignments, then, were tailored and adapted to the specific students in the course based on their disciplines and their goals at that point in their program. The following sections will outline teaching strategies employed in the class, challenges associated with each strategy, and future directions for revising the course design.

Teaching Strategies

Strategy 1: Consultations

In order to make the course's writing assistance more personalized, I partnered with an ESL specialist, Iwona, to provide individual writing consultations with the students on a biweekly basis. This specialist had a wealth of experience teaching multilingual writers on the secondary school level and was eager to return to the university setting, where she had taught earlier in her career. She attended each class session, circulated among groups to offer feedback and suggestions, and addressed specific grammatical or rhetorical questions that had arisen during individual consultations in order to help the whole class think about a particular point. Iwona's own status as a multilingual writer also helped her to have affinity with the students as she could relate their process of language learning with her own. Her perspective also enriched the course because of her exposure to different areas of research writing through her partner in the forestry department. During twenty-to-thirty-minute individual consultations, students often talked about drafts of work they had produced for class, and on which Iwona or I had already commented. In meetings, then, Iwona could further interpret and expand on comments while helping students find solutions to their language questions. Some students also brought external work to appointments if they had other pieces of research papers or assignments

due. Iwona was able to talk about general language conventions and often answered questions that the students were reluctant to pose at first to their advisors; in this way, her consultations created a safe place for students to articulate questions or ideas before meeting with their advisors. She noted differences in students' questions based on their level of experience. She states:

> In general, the more advanced students (the majority of them already at the end of their Ph.D. process) were actually coming with specific questions and passages that they wanted to work on from the grammar and style standpoint. They would actually point to the specific sentence, phrase, or paragraph and ask my opinion on how it worked in the whole of the paper. . . . The beginner Ph.D. and master's students were lost and overwhelmed with the format of the work and they were trying to figure out what they needed to do in what order. Working with them and following our textbook outline of how to build a research paper was a good exercise for them. (I. Cynk-Dahle, personal communication, March 20, 2013)

These comments align with the research on academic discourse communities in noting that students begin without a conceptual framework for developing a research paper and need to learn the large conventions of framing research questions before focusing on specific sentence-level revisions (Abasi et al., 2006). More advanced students seemed to have internalized the overall structure of research writing and sought more help on specific passages. Iwona and I met regularly to discuss the interactions in these individual meetings and to adapt class activities according to student needs. For instance, if many students struggled with switching between active and passive voice in their introduction sections, I developed a class activity examining published samples and providing guidance on this point. In this way, the class curriculum was responsive and adaptive to the writing needs articulated by the students, and evaluation of the curriculum was an ongoing activity.

She also noted that her position as a tutor rather than a teacher allowed students to be more open with her about their questions. She observes:

> I think I was able not only to help with the writing process but I also in a few cases answered some interesting cultural questions concerning interacting with teachers in other classes. Many of the students we had last semester were new here. They do not feel comfortable asking questions and do not know the convention of interacting with the teachers. Since I was not a de facto teacher, I made the point to speak to them about some of the issues openly. Some of the students needed to go back to the lead

teacher [in their department] and ask some specific questions to help them with their writing. (I. Cynk-Dahle, personal communication, March 20, 2013)

These comments reveal the difficulty of negotiating cultural expectations in a new academic system while simultaneously negotiating scholarly identity within the discipline. Multilingual students encounter the challenges of entering the American educational system, working with new professors, and completing complex writing assignments in a different language (Gilmore, Strickland, Timmerman, Maher, & Feldon, 2010). Although the course did not specifically collaborate with content-area experts, Iwona and I were sometimes asked by students to interpret comments that faculty advisors had written on students' work. This role of interpreter carried both advantages and disadvantages for instructors and students: While students benefited from having another source to triangulate information they were receiving, we instructors were wary of making definitive judgments that might not align with the faculty member's opinion. One benefit we could provide was a way for students to ask more productive questions of their faculty advisor after their individual writing sessions in this course. Having a preliminary discussion in the context of the course provided students a framework to make a revision and ask their advisor a focused question for additional feedback.

These interactions with students highlight the pros and cons of teaching writing as a set of advanced skills versus teaching writing *through and within* disciplinary content (Fenton-Smith et al., 2017). Examples of interdisciplinary writing courses as well as discipline-based writing courses show that both models provide value, but their emphases may be different. One argument in favor of an interdisciplinary writing course is that students of different disciplines provide a broader perspective on genre and rhetorical expectations, both outside of disciplinary silos and outside of a particular faculty advisor's writing style. However, a discipline-based course would provide more critique of the research content and integrate content with discourse in a different way.

Strategy 2: Templates

Activities in the course provided different forms of language scaffolding, both at the level of rhetorical moves and specific grammatical points. Since students often articulated their writing weaknesses in terms of grammar, it was important to acknowledge and spend time on grammar practice, as I will discuss in Strategy 5. However, for the purposes of understanding the dialogic nature of academic writing and the idea that research must enter into a conversation within the field, it was equally important to establish frameworks for students to position their work. This process of positioning is an integral part of the shifting identity from learner

to producer of knowledge; students in essence must begin to view themselves as peers with other researchers in their discipline and enter into the scholarly dialogue around a particular research area. Even more important, students need to articulate why their own research is unique or significant in relation to other work. This type of declaration requires several rhetorical moves in order to establish the claims of previous work, show a gap or unanswered question, and explain how their research addresses this gap.

Textbooks used in the class aimed to help students negotiate the rhetorical conventions necessary to join the academic dialogue. The primary text, *Academic Writing for Graduate Students* (Swales & Feak, 2012), operates on the valuable "Creating a Research Space" (CaRS) model of framing research projects while offering specific rhetorical and grammatical solutions for writing tasks, including writing definitions, identifying a research problem, commenting on data, describing methods, and discussing results (Swales & Feak, 2012, p. 331). A secondary resource, *They Say/I Say: The Moves that Matter in Academic Writing,* 2nd edition (Graff & Birkenstein, 2010), was used in a limited way for the idea of identifying writing patterns in texts. This book is aimed primarily at undergraduates, but it is valuable for multilingual writers because it provides templates for agreeing, disagreeing, commenting on sources, and articulating an argument. Narrow portions of this text were used as a resource for the purpose of constructing a sentence and paragraph structure based on templates, as adapted to research writing in different disciplines. Both texts offered a wealth of specific language strategies for framing a research argument and composing segments of that argument. The accessible tone and reading level of *They Say* made it an effective entry point for students to grasp the dialogic nature of academic writing even as they delved into more sophisticated explanations in the *Academic Writing* text.

During the course, I often employed templates from the texts or created my own templates in order to help the students practice rhetorical moves in class. For instance, based on a problem/solution paragraph the students had revised, we used various templates to practice different patterns for linking past research with present research. Each of the templates below uses a different approach to reference past research and create a transition to the present topic.

- Experiments showing _____ and _____ have led scientists to propose _____.
- Because _____ does not account for _____, we instead chose _____ method.
- Our data support/challenge the work of Zhang by showing that _____. (adapted from Graff & Birkenstein, 2010)

Working with templates provides students with tangible, practical structures that help them overcome initial language barriers when expressing research ideas.

The templates can be easily adapted to different disciplines and allow students to insert ideas from their own research area. Templates help to break down the complexities of research writing into manageable chunks of argument while also reducing some of the writing fatigue that occurs when writing in another language. To encourage students to write drafts in English rather than writing in their first language and translating, templates provide an avenue for creating effective, grammatically-acceptable sentences.

The generalizability of templates is also their weakness; any one template may not match the typical disciplinary vocabulary or sentence structures employed in a particular journal. For this reason, templates are a good building block for exploratory writing but may not always contribute to final drafts. Templates may also appear disconnected from the larger argument structure unless deliberate connections are made between the specific template and its place within the CaRS model, for instance.

Students in the course often used templates when constructing their homework drafts; learning to manipulate these templates to match their writing needs was itself a valuable exercise in understanding rhetorical strategies and sentence forms. This technique could be extended by asking students to create their own templates based on analysis of journal articles in their disciplines, similar to the corpus research of Blazer and DeCapua (this collection). Identifying common sentence structures across several articles would help solidify disciplinary writing conventions while building a foundation of rhetorical moves that introduce specific research components.

Strategy 3: Textual Analysis of Research Writing

In order to help students understand the conventions of research writing in their disciplines, we spent extensive time analyzing excerpts of articles in class. Adapting to the group of students in the course, I selected articles that aligned with one of the disciplines represented in the class: for instance, a public health article on the effects of coal mining in Appalachia or a geology article on mine runoff into watersheds. Students were also assigned to find articles in their own disciplines, preferably related to their research areas. Some homework assignments required them to analyze a specific aspect of the text and share their findings in a small group during the following class. During class, our group composition varied, but most often students worked in interdisciplinary groups, which proved to be a great advantage for students explaining or commenting on disciplinary conventions in the chosen writing sample and from their own discipline. Explaining both the general content of a research article and the mode in which that research is presented provided the students an opportunity to step back from their own fields and speak about the norms that they had perceived in the writing. An added benefit of the course was

this blend of formal and informal academic dialogue that encouraged both oral and written communication adapted to a broad audience. For instance, the psychology students were accustomed to working with qualitative research, in which the writers often have to describe their instrument and coding scheme in detail, while the biologists were accustomed to genomics-based research that emphasized the equipment and specific procedures that were conducted in the experiment.

Based on our topic at a given point, we would analyze the excerpts for specific rhetorical functions, such as how the writers identified their research problem, how they described figures, how they presented results, or how they cited previous research.

Example 1: Presenting limitations in previous research

Students analyzed the transitions (underlined), "limitations" language (*italicized*), and "future directions" language (**bolded**) in a short passage to determine how the author critiqued previous research (as in the following example). We could then discuss how to introduce gaps in the field and ideas for future projects.

> Although long fire history data sets will be required to validate models and determine whether fire regimes have experienced a change of state, these data are difficult to collect, are limited in occurrence, and inferences are restricted by the spatial and temporal resolution of the data. As previously noted, few regions of the world maintain long observational records of past fire activity, and satellite records are currently too short to detect change. Climatic variability and human activities are also strong drivers of fire activity, therefore studies of anthropogenic climate change and fire must take these variables into account. While fire history data have the potential to address some of these challenges, inferences remain somewhat limited. (Hessl, 2011, p. 399)

Example 2: Reading abstracts

Students read the following "Editor's Choice" abstract from *Science* and answered these questions:

- What is the major research question or problem?
- What is the gap that this study fills?
- What is the novel finding in this study?

This exercise helped to present the CaRS model in a condensed space and helped students to understand the importance of writing for different audiences; in this case, the abstract uses a football analogy to make the study relatable to a lay audience.

Abstract excerpt from "A Strategic Defense":

> Just as in American football, during the immune response, the
> location of your defenders is key. One player out of line can
> make the difference between a sack or a touchdown, or in the
> case of the immune system, a localized versus systemic infection.
> How the immune system orchestrates this careful defense, how-
> ever, is not well understood. (Mueller, 2012, p. 17)

This introduction helped the students understand the use of an analogy for a complex scientific topic and the differences in writing for a specialized audience in the discipline versus a layperson. The abstract continues:

> Kasternmuller et al. now demonstrate that the organization of
> cells within the lymph nodes of mice is critical for preventing
> pathogen spread during the first few hours of an infection.
> Infecting bacteria drain to nearby lymph nodes, where they are
> immediately collected by a specially localized population of mac-
> rophages. (Mueller, 2012, p. 17)

Reading abstracts demonstrates that a significant scientific contribution can be condensed into a brief explanation if skillfully constructed. This brief genre essentially supplies students with a thumbnail sketch of an entire research dialogue in which new research fills a need or a gap within the discipline. By seeing the research space represented in such a brief format, students then could find these moves in longer research articles.

These exercises helped students understand rhetorical conventions in the Creating a Research Space model, and they gained strategies for positioning their own work. Textual analysis also helped to reveal differences in research writing between disciplines. For instance, some engineering papers do not follow the introduction-methods-results-discussion format if they are proposing an algorithm, system, protocol, or other model. In these types of papers, the sections generally follow a progression of explaining variables or aspects of the model in detail before presenting the results of running that model in a test or simulation. Explaining the model often appears similar to a mathematical proof in which variables and assumptions are systematically defined using present tense verbs. Contrasting this genre, research papers in many basic and social sciences rely on procedural methods sections, using past tense verbs, that are often quite short in relation to the results or discussion. When students encountered these sub-genres of research writing, they then considered the specific norms within their discipline as they related to the larger enterprise of academic writing. Seeing differences helped to solidify their understanding of conventions within their own discipline.

Strategy 4: Peer Review

Students frequently came to class with short pieces of writing, making peer review a key component of class time. The process of peer review—learning to critique others' writing and provide constructive comments—is a central part of acquiring scholarly identity and becoming a competent academic writer (Aitchison, 2009, p. 906). Consistent peer review also reinforces the iterative and dialogic nature of the writing process. For students who felt insecure about their writing, having a supportive community created a "no-failure" type of environment in which questions and suggestions were encouraged and accepted. Based on the *Academic Writing for Graduate Students* text, many of our writing assignments dealt with specific tasks in academic writing, such as creating definitions, forming problem/solution pairs, commenting on data, or describing a process. During peer review, then, we used the core components of that task in order to decide the elements of the critique.

Example: Peer review of definition paragraph

Look at your partner's draft and answer the following questions:

- What term is the writer defining, and what are the key traits of that term?
- How is the definition organized? Does it have a logical order? How could the organization be improved?
- As a reader, do you have questions about this definition or notice any information that's missing? What information would make the definition easier to understand?
- Look at the structure of the sentences. Do you notice any grammatical errors that could be changed?

Peer review in our interdisciplinary setting offered students fresh perspectives on their own research projects because they needed to explain the project, as well as their own writing conventions, to others who were not in the field. The most productive discussions in the course occurred as students summarized their research questions or processes to others who were unfamiliar with the area. Peer reviews offered a layer of comments, different from instructors' comments, to augment the writer's perspective. Peer reviews often led to issues we could discuss as a whole group, such as what common terms from the field could be used without citations, or what an acceptable paraphrase would look like.

Strategy 5: Grammar Warm-Ups

Students appreciated the opportunity to review thorny grammatical issues, such as pronoun agreement, compound/complex sentences, run-on sentences, and verb

tenses. I incorporated grammar warm-ups using common resources such as online grammar worksheets and Dave's ESL Café. Including grammar exercises at the beginning of class helped the students transition into language-thinking mode, in which they were attuned to common language issues. Many grammatical constructs, such as prepositions and articles, require years of practice and "ear training" to implement because rules are often inadequate to explain their usage. When practicing specific elements, such as the construction of compound sentences with semicolons versus coordinating conjunctions, students developed a large base knowledge that we instructors could use in future paper comments. Rather than trying to write out the grammatical rule, we could refer students back to the exercise as a reference for improving the sentence in question. The *Academic Writing* book incorporates grammar exercises as they apply to different rhetorical tasks, such as using linked passives to describe a process in the methods section of a paper. Students reviewed these grammatical structures and then look for them in research articles or individual writing for that day. I sometimes followed up on a grammar warm-up by asking students to rewrite one of their own sentences using a point we had just practiced, such as including a semicolon correctly.

Strategy 6: Dialogue

Although this was a writing course, students benefited from *speaking* about their research to other graduate students across different disciplines. Throughout group exercises and whole-class discussions, they explained their research projects and responded to others' writing. The physical and mental work of public speaking reinforces language learning in a different way than the act of writing. Both are valuable for encouraging clear explanations of difficult research topics and contextualizing their research within the larger field. Even the act of asking questions during class and engaging in dialogue about writing conventions prompted students to create more complex language frameworks. In other words, dialogue promoted building connections and deepened understanding through extended explanation and elaboration.

Near the end of the semester, students were also asked to give a two-minute elevator speech about their research projects. They delivered these elevator speeches as a dialogue, in which another graduate student asked them follow-up questions about their projects. Coming at a point when students had great rapport with each other, this exercise showcased their increased ability to articulate their research niche. The exercise helped to confirm their changing identity from learner to producer of new knowledge. In a larger sense, this exercise was also in keeping with the transferable skill of scientific communication, as evidenced in burgeoning activities such as the 3Minute Thesis competition and the American Academy for

the Advancement of Science's initiative on communicating science. Since these students would later have to present their work in formal defenses or conferences, this exercise also helped to provide a friendly foundation for other public speaking. Interestingly, the low stakes nature of these presentations seemed beneficial to this group, while other research on integrating oral presentations into an EAP writing course found that students regarded the presentations as an extra high-stakes assessment (Salter-Dvorak, 2016). Creating a classroom culture and building the presentations in at the right time appear to be key in their benefit to students.

Discussion and Future Directions

In general, this course was successful in providing students with necessary feedback to make progress and continue their academic journeys. One student commented:

> Thank you so much for this email and also for great experiences that we shared in class. I made great (HUGE) progress in my "writing process" development, although it's not looking like that. Before this semester, every time when I have to write something, and it is more then [sic] 5 sentences long I had headaches. Now it's much better situation. Probably, the reason for that is that you gave me confidence and also I know that there are lot of other people with same problems as mine. I just needed to "start", and this class literarlly push [sic] me into that. Now everything is much better. (Personal Communication, December 7, 2012)

Following the first iteration of the course, the writing consultant, Iwona, and I evaluated the class format, content, and activities based on student performance and feedback throughout the course. We also considered the aspects of the students' writing that would benefit from more attention, and we adapted the curriculum accordingly in the second iteration. This dialogic adaptation and action based on a variety of inputs allowed this course to proceed as its own form of action research responding to the needs of a diverse and decentralized graduate culture at the university.

To revise the course, I implemented several specific changes in Fall 2013: First, the course moved from two credits to three credits, which allowed a change from 50-minute class periods to 75-minute class periods. This significant increase in class time provided more opportunity for in-class writing, student interaction, and writing exercises. Second, I introduced the Creating a Research Space model (Swales & Feak, 2012) immediately as a way to frame the writing tasks in the semester. Some students commented verbally that they did not grasp the big picture until the latter

stages of the semester when this model is introduced in the *Academic Writing* textbook. By introducing the model early, we framed specific writing tasks throughout the course within the larger goals of the research paper.

For in-class activities, I revised my lesson plans with several considerations: Although we sometimes included self-assessments on writing assignments, I ensured that we always completed this step so that students could direct their readers to focus their critique. Students also tended to form consistent groups for peer review. This continuity created rapport and a high comfort level for the students, but the contents of critiques were limited by the perspective of those group members. I then ensured that peer review groups rotate on a regular basis in order to provide different perspectives for the writers. Further, we incorporated more writing time to revise work in class based on peer reviewers' comments. Making immediate changes helped to consolidate the learning and improve the draft quickly, thus allowing the student to turn in a revised draft at the end of class.

In addition to changing the logistics of writing exercises, increasing the frequency of short, verbal presentations based on homework assignments ensured that every student contributed to discussion. The students made more frequent, informal class presentations on articles in their own disciplines in order to target the writing conventions of their field. Having one or two students present to the entire class during each session increased their accountability to examine articles closely and ensured that they were articulating trends from the literature in their discipline. Likewise, asking the students to produce an introductory elevator speech in the first week, a mid-semester speech about their research progress, and a final speech about the significance of their research helped to reinforce the CaRS model and prepare them to attend conferences or job interviews. In addition to spoken dialogue, students completed more in-class writing based on the samples we examined. For instance, when we analyzed an abstract, students then composed a three to four sentence abstract of their current research and shared it with peers during the class. To integrate rhetorical analysis with grammar instruction, isolated grammatical structures need to be consistently applied to the students' own writing through follow-up exercises and peer review checks.

In order to foster long-term writing progress, students developed a writing plan at the beginning of the semester to indicate their goals and the major project they would complete. Since students in the class were at different stages of their graduate work, having one static research paper assignment was not feasible. Rather, students worked on projects appropriate to their stage: literature reviews, review articles, thesis prospectuses, and portions of their dissertations. Students charted their writing goals so that more assignments throughout the semester could be targeted toward their own projects. Many of their short writing tasks then contributed to the larger project in a more meaningful way. In addition to considering a full-semester plan, including self-assessment on a daily basis would help to chart

students' progress. During individual consultations, we followed a standard writing center practice in which students articulate their concerns at the beginning of a session and their action plan at the end of the session to encourage continued work.

Challenges arose in all aspects of the course in working with the various disciplines represented, yet the variety of disciplines also enriched the course greatly by offering a range of research projects and writing patterns to study. To work with this group of students, both Iwona and I analyzed journal articles in the students' disciplines in order to understand the conventions at a reasonable level. Placing more responsibility on students to regularly analyze and report on these conventions in journal articles from their own disciplines provided one avenue to deepen their learning experience (Fenton-Smith et al., 2017). Asking students to analyze examples of academic writing in their research areas helped them to differentiate methods of interpreting previous research, identifying a research niche, and creating an argument for new knowledge. Students need to be coached to find these conventions and practice them in a structured environment (Abasi et al., 2006, p. 114). Asking the students to analyze articles in their field more regularly also helped them to develop templates and recognize common rhetorical moves in their discipline.

Research on rhetorical moves in academic writing helps to suggest norms that students might examine throughout the course. For instance, students should analyze the citation practices and the functions of citations in their disciplines in order to understand how new knowledge claims are constructed (Dong, 1996). Research on L2 writers provides the groundwork for these activities. In one study, Chang and Schleppegrell (2011) explore the CaRS model to identify "expansive and contractive" rhetorical devices for identifying a research area and narrowing the niche. As they note, the social sciences place more importance on explicit interpretation of sources compared to the hard sciences (Chang & Schleppegrell, 2011). Perhaps these differences in interpretation arise from the nature of the data; more qualitative data may call for more interpretation of results in order to relate them to the student's current study. By asking students to identify and practice these expansive and contractive rhetorical devices, they can see the specific means of narrowing the research niche within their target journals.

Lim (2012) also employs a cross-disciplinary comparison of specific language for indicating a research gap. Sharing his findings and figures on linguistic mechanisms—essentially, groups of templates—for indicating a gap would allow students to seek the most common mechanisms in their discipline and emulate those mechanisms. Further, techniques for incorporating citations in order to make new knowledge claims need to be further explored. Mansourizadeh and Ahmad (2011) have examined citation practices of novice and expert writers and have found that novice writers use citations in less complex ways (i.e., attributing previous knowledge) than expert writers (i.e., justifying findings or supporting methodology). These practices are complicated by the fact that hard and soft disciplines rely

differently on integral vs. non-integral citations (whether the researcher is named in the text) (Mansourizadeh & Ahmad, 2011). Since literature reviews are a foundational component of most graduate programs, asking students to analyze the purpose and method of citing sources would make these practices more apparent in defining their own research projects.

If this course were adapted for specific departments in the future, I would advise a co-teaching model in which a content specialist from the discipline team-teaches with a writing specialist who can elucidate the rhetorical conventions. Since content specialists have already been socialized into disciplinary norms, often without formal instruction, their ability to articulate or explain these norms may be limited (Abasi & Graves, 2008). A co-teaching model provides the advantage of a professor with content knowledge and discipline-focused writing projects alongside a professor specializing in writing instruction targeted to that discipline's norms.

Although courses focused on English for Academic Purposes are one way to offer writing support to multilingual graduate students, other resources at the university also help to provide this scaffolding for graduate students in general. To increase attention to writing as a core competency for graduate students, I partnered with the Writing Center to offer week-long dissertation boot camps open to any graduate student in the dissertation stage, and a faculty member taught a cross-disciplinary grant writing course as an introduction to that genre of writing. My office offered financial support for two graduate assistants from the Department of English to offer graduate writing consultations through the Writing Center for the first time. These graduate assistants were already experienced instructors with prior tutoring experience, enabling them to work with graduate writers producing dissertations or other high-level research writing across disciplines. All of these efforts increased the attention to graduate writing instruction as a whole and provided additional scaffolding for graduate writers' advancement. Initiatives such as the graduate writing tutors provided enhanced opportunities for multilingual writers to receive more intensive instruction, aside from taking the course.

As emerging members of their disciplines, graduate students need specific writing instruction in how to articulate their research contribution to their field, and multilingual students benefit from additional training that combines the rhetoric of academic writing with specific language concerns. Students are transitioning from the role of learner to that of scholar, from internalizing previous work in the discipline to creating new knowledge claims in the discipline; these tasks require scaffolding to recognize and apply writing conventions. This science writing course for multilingual writers provides one model that relies heavily on responsive instruction, developing rhetorical templates, analyzing articles from students' fields, and writing frequently about students' own research. At the same time, the collaborative and dialogic nature of this course provided fertile ground to implement action research on graduate writing in the L2 context. The project of creating,

teaching, and revising the course revealed that this type of course could be beneficial for graduate students across disciplines and stages of their program. Beginning from composition strategies vetted in the literature, my colleague and I were able to assess and critique these strategies through two iterations of the course to offer a productive learning environment that supported student growth in their writing skills. As an ongoing contribution to graduate student success, I hope to refine this model in order to provide even better assistance to aspiring researchers.

Epilogue

Since 2015, I have held a leadership position in graduate studies at an institution serving adult learners in online programs, many of whom are in the military or public service professions. In my graduate studies role at American Public University System, I support curricular quality as well as initiatives to increase student persistence and retention in our thirty-five master's programs. These degrees are intended for working professionals and frequently integrate application into the research because of the practitioner emphasis. For our adult learners, whose average age is 37 at the master's level, academic writing for graduate courses continues to be one of the greatest challenges students face in acclimating to graduate school and succeeding in their programs. Many students also rely on Veteran's benefits or military tuition assistance to complete their education, and taking extra courses for credit is prohibitive to completing the degree. Given the unique circumstances of these working adults completing their master's degrees online, I have employed techniques from the scientific writing course in new ways to offer academic support without the cost of additional courses. Specifically, I have developed seven self-paced, ungraded online modules that students can opt to complete through our virtual campus platform. These self-paced modules are organized according to typical sections of a research article, beginning with two introductory modules that establish expectations for the scholarly dialogue in graduate writing, followed by additional modules that focus on writing introductions, literature reviews, methods sections, results sections, and discussion sections.

Each self-paced module incorporates a short video to explain the central purpose of that research paper section, and the majority of the module provides examples of rhetorical moves drawn from published articles that mirror the predominantly social science disciplines at the institution. To illustrate a rhetorical move within an article, I developed infographics that pair a brief excerpt from an article with a commentary about the rhetorical move taking place in order to mirror some of the exercises used in the writing course. Students can then apply the same technique to analyze a segment of an article they are reading for a class or research project.

Throughout the modules, students have the opportunity to submit brief, formative assessments in which they analyze articles from their own discipline to trace the rhetorical moves and assess their effectiveness. These modules are advertised in our graduate student orientation as a writing resource, through course announcements embedded in the curriculum, and in the *End of Program Assessment Manual* that guides students toward their capstone experience. Students who are entering academic probation are instructed to complete these modules as a way of strengthening their writing skills and promoting better performance in the program. To date, over 3,600 students have self-enrolled in these modules. Examining the data on module completion versus graduation rates and academic standing will be the basis of a future project.

Reflecting on the complexities of teaching and learning academic writing skills, I am encouraged by the fact that these rhetorical models continue to be relevant despite differences in learning modality, student demographic, and type of degree program. As adult learners increasingly return to school seeking graduate degrees for promotion or career change, these models can be applied and transformed to serve different purposes and support learning across higher education institutions.

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