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WID Course Enhancements in STEM: The Impact of Adding “Writing Circles” and Writing Process Pedagogy¹

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Abstract: This study reports on a quantitative assessment of enhancements to a Writing in the Disciplines course in Kinesiology. The assessment coded student writing produced in semesters before and after a Kinesiology course was enhanced with both iterated peer review groups and writing-process scaffolding. These enhancements were developed through a sustained partnership between WAC and disciplinary faculty. Analysis of the results revealed significantly higher scores in five Learning Outcomes developed to align with the *Framework for Success in Postsecondary Writing* (2011). These findings offer quantitative evidence that adding writing-process pedagogy and iterated peer review improves student outcomes in both writing and critical thinking.

Writing in the Disciplines (WID) courses are intended to teach the discursive conventions of a particular genre and to enrich learning through the metacognition spurred by writing. These courses can be complex to teach, as they demand expertise in both disciplinary knowledge and writing pedagogy; therefore, the addition of Writing Across the Curriculum (WAC) initiatives provides support for incorporating writing best practices into courses in ways that reinforce, clarify, and enhance learning. However, as Thomas Deans (2017) notes, while curricular models of WID/WAC initiatives are generally considered helpful, their pedagogical impacts are obscured by a dearth of data.

Proceeding from the premise that such initiatives lead to improved student outcomes, it remains to be seen just how and to what extent those improvements manifest in student writing. Data on the impacts of these supports could inform a host of curricular and pedagogical decisions – including which models are most effective, at what point in the cognitive development of the writer, and what they should cover; how to pace and scaffold assignments in a semester; and even how to apportion time in a given class. Accordingly, Deans’ study compares the undergraduate capstone papers produced by students in partial-credit writing courses to those produced in full-credit courses in a variety of disciplines.

Joan Graham’s (1992) taxonomy of integrated writing instruction delineates three types: writing components, writing adjuncts, and writing links. Components are *parts of* full-credit core courses or programs, whereas adjuncts and links are separate writing courses *connected to* core courses or programs. Thus, components are non-credit-bearing in and of themselves, unlike adjunct and linked courses. Partial-credit adjuncts meet less frequently and/or for shorter duration than full-credit links, which

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mirror components in terms of both credit weight and meeting frequency/duration (Graham, 1992). Deans (2017), using Graham's taxonomy, found that adjunct writing courses were broadly consistent with linked writing courses in terms of their impacts on various aspects of student writing measured in the study, specifically, aim/objective, structure/organization, source selection/integration, editing/mechanics, style, citations, and holistic genre fit. This suggests that the adjunct writing courses were more efficient means to the same ends, as they led to outcomes consistent with those observed in the links, but in less time.

While Deans' (2017) study provides empirical support for optimism with regard to the potential, efficacy, and efficiency of adjunct writing courses and sets the stage for subsequent investigation, it also sounds distinct notes of caution. For example, Deans' data indicate that adjunct courses were no better than linked courses in terms of improving "[h]igher order concerns (analysis, argument, source integration, etc.)" in student writing (p. 17). So, while adjunct courses were more efficient overall, they were not more effective means to improvement in higher order aspects of student writing. Further, the efficacy of the adjunct courses in Deans' study was directly correlated to their alignment with companion courses in the same discipline, i.e., the closer and more explicit the connection to the companion course, the better the outcomes. Freestanding adjunct courses less clearly aligned or integrated with companion courses in the discipline were less effective (p. 18). Finally, the adjunct courses entailed "substantial out-of-class grading and conferencing responsibilities" (p. 18) for instructors that were incommensurate with their partial-credit weight (2017). This suggests that the efficiency gains of the adjunct writing courses were asymmetric, e.g., greater for in-class time than for out-of-class time.

Our research confirms some aspects of Deans' (2017) study and builds on others by assessing the impact of adjunct writing courses focused on a particular pedagogy: iterated, facilitated peer review. We assessed student writing in a lower-division Kinesiology course with a writing component – before and after the course was enhanced with WID curricular changes and adjuncts we named "Writing Circles." So, whereas Deans compares adjunct courses to linked courses, we compare the combination of adjuncts and components to components alone. Using a rubric developed through a sustained partnership between WAC program and Kinesiology faculty, we coded blinded copies of the final research proposals in both sections of the Kinesiology component course. Each artifact was assessed in terms of five learning outcomes (LOs): intellectual discovery; synthesis and analysis of evidence; organization; theoretical framework; and format, tone, and style. Analysis of the coding revealed significantly higher scores in each of the five LOs for the WID-enhanced artifacts compared with the pre-WID artifacts.

Our results not only reflect but also reframe Deans' cautions about the efficacy of adjunct courses with regard to higher order aspects of student writing, the alignment of adjuncts with companion courses, and their asymmetric efficiency. Our results also suggest that a strong partnership between WAC and disciplinary faculty – integrating WID best practices with iterated, facilitated peer review – significantly contributes to students' growth as writers and critical thinkers in their disciplines.

Context

Writing in the Disciplines

In distinguishing between "Writing IN the discipline" and writing "OUTSIDE of it," Michael Carter (2007) argues that writing should never be viewed as a general skill outside the discipline; in contrast, successful WID programs benefit from "an integrative relationship between writing and knowing" in that writing plays "a critical role in both recovering knowledge and generating new knowledge" (p. 385-6). As Muriel Harris (2014) and others argue, teaching WID students writing-process and peer-reviewing

strategies helps them use writing to learn their disciplinary content, while at the same time gaining facility with what Anne Beaufort (2007) terms “expert insider prose” (p. 19). John Bean (2011) points out that the broad WAC/WID movement is founded on a shared “commitment to the empowerment of students through a constructivist view of knowledge that demands critical thinking rather than memorization and regurgitation” (p.19). This empowerment is aided by the incorporation of both significant formal, graded writing and multiple opportunities for informal, exploratory writing, both of which at times take the place of assignments that ask students to merely report back information, as described by Dan Melzer (2014).

On our campus, we developed guidelines for WID courses that aligned with the *Framework for Success in Postsecondary Writing* (2011), and we offered two-day summer retreats (led by Kramer and invited guest William J. Macauley Jr.) and many luncheon roundtables throughout the academic year to support faculty developing and teaching these courses; there were modest stipends for participants. Our WID guidelines (Habits of Mind Working Group, 2012) define ideal assignments as scaffolded, “helping students develop their disciplinary writing step-by-step”; including sub-assignments, “e.g., drafting, researching, and revising” and “peer and/or professor feedback”; both teaching and grading of “characteristics of discipline-specific rhetoric, possibly including ... format; terminology; organization; audience; purpose; and tone”; formal writing assignments that require students to “research and think critically about a problem or confront an issue in their discipline”; and informal writing, “such as journals, analytical reflections, summaries, abstracts, and self-evaluations.” As part of WID enhancements, we developed “Writing Circles”: partial-credit, pass/fail, labor-based courses in facilitated peer review.

Kinesiology

Although housed in the School of Liberal Arts, the Kinesiology major is interdisciplinary, with courses in the School of Science, the School of Education, and the School of Economics and Business Administration. As a consequence, the major includes students with a broad spectrum of writing abilities, styles, processes, and disciplinary backgrounds. In 2013, the department redesigned a sophomore-level course – Measurement and Evaluation in Kinesiology (ME) – to become its designated WID course, now titled Research Methods & Writing in Kinesiology (RMW). It is the first course in the major to include a significant writing component.

The ME syllabi implicitly framed that component only as a means to the explicit ends of introducing students to standard measurement techniques and research methods: the principles and practices of experimental design in Kinesiology. Students were not explicitly taught to write in the format, tone, and style of their discipline, that is, to write the expert insider prose of kinesiologists. Indeed, the ME course objectives included only one mention of writing: “discipline-specific communication, both written and oral, which will serve as a means for demonstrating understanding of research, measurement, and dissemination in Kinesiology.” This language explicitly frames writing as a means to other pedagogical ends within the discipline, not an end in itself.

By contrast, as redesigned for RMW, the course now includes scaffolded assignments, with an emphasis on teaching and requiring disciplinary prose. Students learn how to paraphrase and integrate source material, and the process steps of analyzing sample papers and revising drafts are included. In order to accommodate these changes and deepen students’ learning, the culminating assignment – a Research Proposal – was revised to require fewer sources (8 instead of 10) and incorporate a series of scaffolded steps: students propose a topic, identify sub-topics, then gather, read, summarize, and critically analyze disciplinary literature around those sub-topics, and then write their 6-to-8-page research proposal, which includes an introduction, review of literature, and methods section.

Writing Circles

Co-authorship and peer review are standard elements of STEM research, yet such collaborative practices are uncommon in STEM undergraduate coursework that is designed to help students learn to write and research within their disciplines. Susan McLeod and Christopher Thaiss (2014) argue that because WID pedagogy by its very nature introduces students into a field, students should be taught the practices of their instructors. Joining other WAC/WID scholars, McLeod and Thaiss identify student collaboration on writing tasks, including peer review, as one of the hallmarks of successful WID courses. Indeed, McLeod and Thaiss regard the incorporation of “what we have come to think of as the ‘process approach’ in teaching writing – not only allowing revision of student work, but requiring it, often using peer groups in the classroom to respond to drafts” as a “quiet revolution” within strong WAC programs (p. 288).

While using class time for peer review is one way to incorporate collaboration, any gains may be offset by losses in terms of time spent on content instruction and hands-on learning, which could be particularly critical in the sciences. A more generalized issue is that student peer review can be unhelpful or even backfire. Harris (2014) argues that peer review “can’t be briefly inserted into a writer’s learning process without extensive preparation”; she advocates intentionally teaching students how to collaborate with each other (p. 279). We ourselves have witnessed un- or under-structured peer review resulting in students giving each other too little, incorrect, or otherwise unhelpful advice. However, disciplinary instructors might not be sufficiently aware of best practices to guide their students in effective peer review. And even if they could, when would they find the time to do so within a WID course of which so much else is already demanded?

It is against this backdrop that we developed Writing Circles (Circles): groups of three to five students who meet for an hour each week, outside of their companion course, to workshop their writing for that course. Each Circle is facilitated by an instructor who not only trains students in effective peer review, as Harris (2014) recommends, but also continues to structure and support the group every week throughout the semester, helping students navigate the dynamics of team communication. Coffey, Gelms, Johnson, and McKee (2017) note the need for trained facilitators to help students “negotiate team communications” (p. 149). Specifically, the Circle instructor teaches students to practice methods for asking readerly questions and deconstructing each other’s drafts, as well as deconstructing assignment metrics and applying those metrics to their and their peers’ work (Kramer 2016). While the facilitators rightly lack disciplinary authority, they are familiar with the requirements of each assignment of the companion course, such as its key features, format, and other elements, so that they can guide students to understand and prioritize those elements. In fact, we have found that the students’ greater knowledge of their discipline helps soften the authority of the Circle instructor, creating more balance and encouraging the students to step up and discuss the disciplinary content with their peers.

We offer Circles as a partial-credit, pass/fail, labor-based course to all students. Many of the Circles are made up of students in the same course, and some disciplinary faculty elect to mandate Circle participation. Many of the Circles are aligned with WID courses, such as the Kinesiology course of this study; when they are thus connected, Circles fall under Graham’s (1992) description of writing adjuncts.

Because RMW was one of the first WID courses on our campus and because we had access to student papers from before and after the WID enhancements, we chose this course for our assessment project.

Coordination between WAC and Kinesiology

Development of the WID-enhanced course required significant commitment to coordination between the WAC and Kinesiology faculty. We both were fully engaged in the development and delivery of RMW

through scaffolded assignment design and other WID pedagogies, as well as determining Writing Circle topics. Because of this close collaboration, one of the RMW professors (Concepcion) was invited to present the syllabus as a model during a summer retreat for WID faculty.

For the Writing Circles specifically, we held pre-semester planning meetings, and during the semester, the Kinesiology faculty met with the WAC director or associate director and the instructors facilitating the Circles; these meetings initially occurred weekly, then spread out to about monthly. Feedback flowed both ways, as we shared challenges and successes and discussed topics to cover in class and in Circles. The Kinesiology faculty then shared updates to assignments. All of this not only enhanced the pedagogy but also offered reassurance to students, who knew that the Kinesiology and Circle faculty were in sync.

Methods

Study Sample

Participants. Participants in our Institutional Research Board-exempted study were 38 students from two 2012 academic year sections of ME (prior to WID enhancements) and 39 students from two 2015 sections of RMW (with the WID enhancements). This is only the second required Kinesiology course in the major; therefore, the students are Kinesiology majors, mostly in their second year of study, some in their first or third. Of the 2012 participants, 22, or 53%, were in their second year; of the 2015 participants, 29, or 69%, were in their second year.

Artifacts. We gathered electronic versions of Research Proposals from all students, in both groups. Each artifact was deidentified and coded, and then all the artifacts, of both cohorts, were randomly commingled.

Variables Assessed. The objective of a WID course is to increase the critical thinking as well as the writing skills of students, aligning with the WID LOs of our campus. For the RMW students, these variables of writing and critical thinking were discussed and enhanced each week by their Circle facilitators. Specifically, the LOs are for students to engage in critical thinking through high-level written and verbal communication, evaluate and synthesize evidence, unravel complexities of thought within the discipline, and use writing to enhance intellectual discovery.

Instruments. We designed a rubric to assess the five variables of critical thinking and writing, as described above. Each was assessed on a four-point scale (see Table 1).

Table 1. Research Proposal Rubric

	4 - Highly developed	3 - Developed	2 - Emerging	1 - Initial
Intellectual Discovery	Solidly situates writer's hypothesis and research question within the discipline, in the context of a well-reasoned gap in the literature, demonstrating the importance of the	Situates writer's hypothesis and research question within the discipline, in the context of a pertinent, well-defined gap in the literature, demonstrating the importance of the	Discusses writer's hypothesis and research question in terms of the discipline generally, in the broad context of a gap in the literature.	Attempts to form a hypothesis and research question and describe a gap in the literature. May make

	study.	study.		unsupported connections.
Synthesis & Analysis of Evidence	Skillfully summarizes, analyzes, and synthesizes evidence, identifying relevant assumptions and theses and outlining their limits with respect to the research question.	Summarizes, analyzes, and synthesizes evidence, identifying some assumptions and theses and outlining their limits with respect to the research question.	Summarizes, analyzes, and begins to synthesize evidence to support ideas in the context of the research question. May be addressed in a piecemeal or mechanical manner.	Summarizes and attempts to analyze evidence. May not clearly support ideas.
Organization	Uses disciplinary conventions of logical and systematic organization, with clear topic sentences and effective transitions from the general topic, through specific sub-topics, to the research question and hypothesis.	Uses disciplinary conventions of organization, with mostly clear topic sentences and mostly effective transitions from the general topic, through specific sub-topics, to the research question and hypothesis.	Uses some conventions of organization, including some transitions or topic sentences and at least two subtopics, in a piecemeal or mechanical progression.	Mentions subtopics. Minimal attempt to organize, perhaps by source rather than topic.
Theoretical Framework	Clear and concise explanations of key terms, concepts, theories, or principles and their implications in the context of the research question.	Explains key terms, concepts, theories, or principles in the context of the research question.	Discusses key terms, concepts, theories, or principles.	Attempts to identify key terms, concepts, theories, or principles. May be misidentified.
Format, Tone, & Style	Uses >90% professional, concise language. Paraphrases evidence. Integrates sources elegantly, citing accurately in APA. Includes title page, problem description,	Uses about 75% professional, concise language. Privileges paraphrase over quotes. All sources cited accurately in APA. Includes title page, problem description, summary of research,	Uses <50% professional, concise language. Privileges paraphrase over quotes. All sources cited. Includes all and only: title, problem description,	Uses 25% or less professional, concise language. Privileges quotes over paraphrase. Includes some

	summary of research, research question, hypothesis, and references page.	research question, hypothesis, and references page.	summary of research, research question, hypothesis, and references page.	citations. Missing some required elements or includes improper ones.
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In creating the rubrics, we tried to parse and assess the different ways one might use the process of writing to enhance intellectual discovery, synthesis and analysis of evidence, and so on. For example, the skill with which evidence is gathered, marshalled, and brought to bear on one's own research is not only a crucial aspect of students' critical thinking and learning to write in the discipline, but it also breaks down into practical benchmarks or degrees of mastery. Accordingly, the rubric discerns whether students are simply addressing each of their sources in turn, independently and piecemeal, or grouping sources together and addressing them thematically. And further, do those sources bear on the research question specifically, or are they merely associated with the topic in general? Are they merely summarized, or are they analyzed in terms of their relevant assumptions and conclusions, methods, or participants?

Norming. Each reader participated in a six-hour norming session: readers coded three sample essays from sections of the same course that were not part of our study, and then we shared and discussed the results. Based on discussion during norming, we revised the rubric slightly. For example, while writing the rubric's first metric – intellectual discovery – we included the degree to which students situated their hypotheses and research questions in the context of the discipline and a gap in the literature, plus the clear development and articulation of a theoretical framework; however, while norming, we realized the need to break out theoretical framework as its own metric.

Coding. Following norming, seven readers coded the 77 blinded artifacts. Each artifact was coded by two independent readers, who assigned scores on a four-point scale for each metric on the rubric. A third reader was added when scores in any metric differed by one point or more. Each reader worked with a clean copy, and 19% of the research proposals triggered a third reader.² Scores from each of the readers were then averaged, i.e., if there were 3 readers, those 3 scores were averaged; if 2 readers, those 2 scores were averaged. We then compiled the scores and analyzed them.

Statistical Analysis. Significance of differences in mean scores between ME and RMW were analyzed using an unpaired student's *t*-test. Statistical significance was set at $\alpha = .05$, and values are represented as means \pm SE, unless otherwise noted. Effect sizes were analyzed by Hedge's *g* formula, using mean values and pooled weighted standard deviations. Values greater than 0.75 were indicative of a large effect size.

Results

The mean scores with the WID enhancements showed statistically significant ($p < .05$) gains in each category of assessment, when comparing the students' writing scores in ME and RMW (Figure 1). The two categories of Format, Tone, & Style (+48%) and Organization (+40%) saw the largest gains from ME to RMW (Table 2). The other three categories also increased significantly by 26% to 29%.

Figure 1: Mean Scores and Standard Error of the Mean

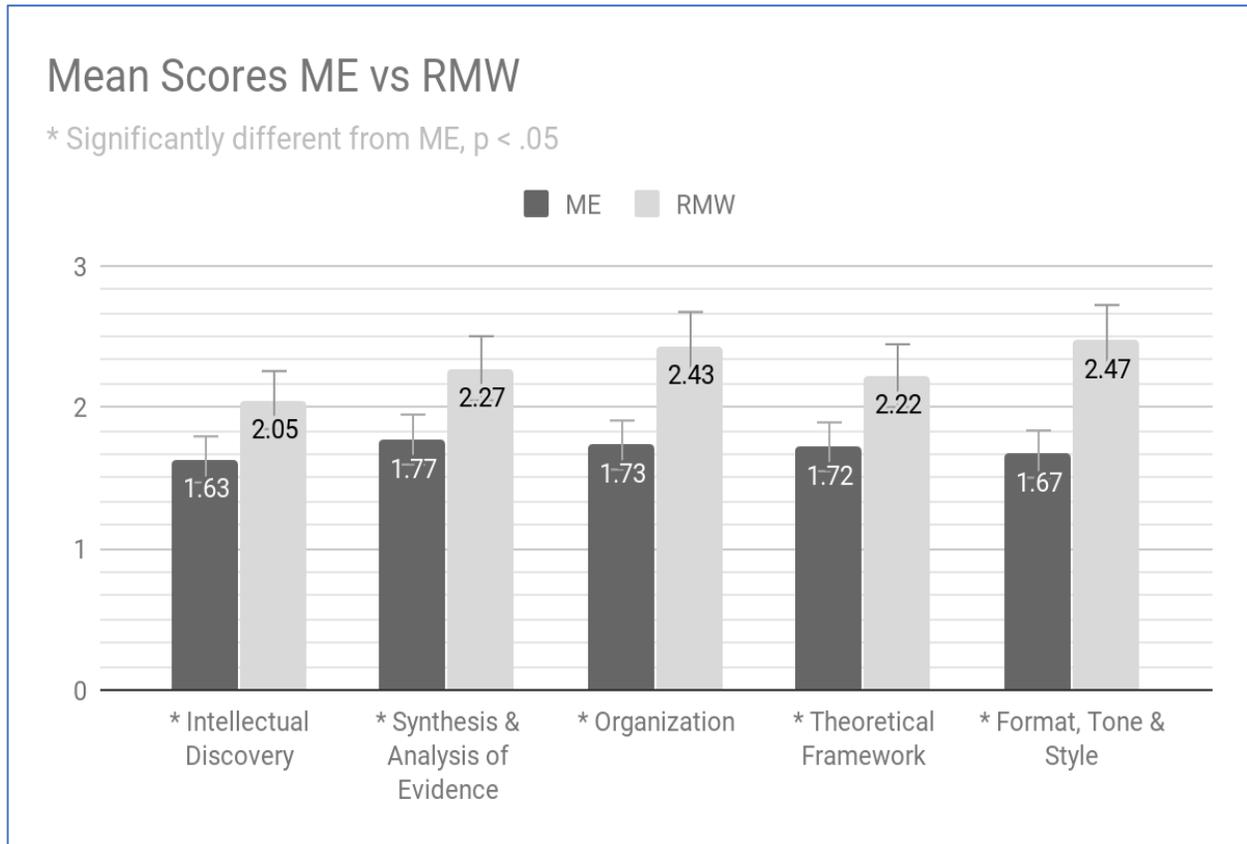


Table 2: Deltas and Effect Sizes Comparing ME and RMW

	Intellectual Discovery	Synthesis & Analysis	Organization	Theoretical Framework	Format, Tone, Style
Large effect sizes of >0.75 are highlighted in bold .					
Delta (ME to RMW)	+26%	+28%	+40%	+29%	+48%
Effect Size	0.46	0.66	0.99	0.65	1.16

Discussion of Implications

We view as most noteworthy the impact of WID enhancements on students’ ability to synthesize and analyze sources and on students’ improvements in the writing-skills categories of organization and of format, tone, and style. Combined, these results indicate interdependent improvements in critical

thinking and writing, as recommended by Carter (2007). Synthesizing and analyzing source material are complex tasks that, to do effectively, require deep consideration, re-thinking, and revision, i.e., critical thinking via writing. They require much more than merely understanding what was read. These are tasks that writers of all levels can struggle with, so we were encouraged to see the RMW cohort of lower-division undergraduates performing much better in this regard than the ME cohort. In RMW, there was class time devoted to teaching how to paraphrase and, separately, to collaboratively deconstructing a sample essay, both of which lessons were aimed at helping students understand and integrate sources. Furthermore, much Circle discussion revolved around peers sharing confusions over why and how sources fit together and helping each other clarify these connections for readers.

Organizing material is the next step to analyzing it. When scoring papers for organization, we looked for “disciplinary conventions of logical and systematic organization,” and the effectiveness of topic sentences and transitions “from the general topic, through specific subtopics, to the research question and hypothesis” (see rubric above). As delineated by these criteria, the ability to organize is clearly connected to the ability to effectively synthesize sources. Thus, critical thinking and writing are inseparably linked. And while the category of format, tone, and style might seem to refer only to mechanics, we view it as also indicative of deep thinking. For this category, we scored papers according to the use of “professional, concise language” and the paraphrasing and integration of sources (see rubric above). The category certainly does also include mechanics, such as APA formatting and citation style, but it also includes tone and style, which do not manifest without study and care. The RMW students spent class time deconstructing Kinesiology writing. Then, during their weekly Circles, they gave each other feedback on how well their prose was adhering to those Kinesiology guidelines. As Harris (2014) argues, peer review needs to be well-structured.

We believe all of these supports largely prevented incidents of what WID professors sometimes lament: students writing as though they are in an English class.

We were additionally interested to find that the scores for ME papers not only were lower in all metrics but also more consistent across all metrics – exhibiting lower SD – than the scores for RMW papers. This could be explained by the fact that before WID enhancements, all students received identical support, all during class time, whereas the RMW students received support during class time as well as in Circles, and there was some variance Circle to Circle. Circles are taught by various instructors, and each Circle meets at a distinct weekly time, adding the factors of Circle instructor and timing, the latter of which could be viewed as significant when paired with the timing of due dates for drafts and other scaffolded assignments. We remain interested in the impact of Circle timing, both within the semester and across a student’s academic career.

Overall, average scores in the RMW cohort were the lowest for intellectual discovery and theoretical framework, two skills which lean on each other: together, they involve comprehending disciplinary terms and concepts in order to employ them in the service of an argument. We are curious why these two scores were lower than the scores of other categories. It could be because RMW is only the second course in the major, and that if we were to assess these same students in their final year of study, we’d see that their grasp of Beaufort’s (2007) expert insider prose had grown throughout their college career. Second-year students can be guided to give readerly responses, sharing what is coming across to them when they read their peers’ work, but they might not have sufficient grounding or confidence in the discipline to identify contextual misunderstandings in the work of their peers. It also might be true that they do not recognize one another as sources of disciplinary expertise and that they operate, instead, within a banking model of epistemology that places their peer group on the wrong side of a divide between the haves and have-nots of knowledge. Seniors may be more likely to offer and receive feedback that relies on

disciplinary expertise and to recognize one another as peers in the process of knowledge construction; this is a question of timing worth investigating, as in, when to offer which kinds of adjuncts (Graham 1992). Another factor might be the reality that while writing skills were discussed during both the class and Circles, Kinesiology theories were covered thoroughly only in class. Furthermore, theory was only superficially introduced in the course. Only with additional, more in-depth disciplinary education would we expect undergraduates to grasp theory at a high level. Although these two metrics showed the smallest improvement when compared with the other metrics, the improvements nonetheless were significant: the Research Proposals of RMW students scored 25% higher for intellectual discovery and 28% higher for theoretical framework than those of ME students.

Limitations

The Kinesiology Research Proposal is a genre of writing with particular means and ends. At the same time, the Kinesiology major at our university subsumes three distinct tracks that draw students from a wide variety of disciplines, suggesting that our results may be more generalizable than they initially appear to be. So, while the participants are all Kinesiology majors and their Research Proposals are all examples of STEM writing – insofar as the students propose scientific studies with empirical research questions and testable hypotheses – the writers are not all students with backgrounds or futures in STEM. Rather, the participants represent a broad cross-section of the undergraduate population and the wide variety of rhetorical experiences typical during the first couple of years of college.

This study did not use randomly assigned participants but rather two intact groups of participants. The two groups were similar in that they both included mostly students in their second year (see Participants description above). The ME students had a slightly lower overall GPA (both in that class and all their classes) compared to the RMW students during the semesters they produced the artifacts we assessed. The average overall GPA of the control group for the semester in question was 6.8% lower than the average overall GPA of the experimental group. However, it is not possible to ascertain why the GPAs differed slightly – was it because the RMW students were slightly stronger academically overall or because their participation in Circles caused them to perform slightly better in all their courses?

Conclusions

Incorporating writing-process steps into disciplinary courses and adding the adjunct of iterated, facilitated, peer-review workshopping can have a significant impact on students' writing growth and critical thinking within their disciplines.

Through regular, structured peer review, students become better readers of their own and others' disciplinary writing. The facilitation of such collaborative peer explorations leads to more reflective and substantive thinking, and aligning Circles with a WID course makes explorations even more profound.

Additionally, we find that in practice, connecting Circles and a WID course ends up impacting the syllabus and assignment designs within the WID course itself. In the case of the Kinesiology WID course, for instance, one impact was on the Newsletter assignment: initially, students worked on the longer research assignment first, then worked on the shorter Newsletter assignment later in the semester; however, feedback from Circle instructors and student feedback surveys helped us see that the large research project was ending just as students were becoming more proficient in peer review, and also that students treated the Newsletter as of little importance after having completed their major assignment. So the timing of the two assignments was reversed. One result was that students began learning peer review

and disciplinary content on the smaller, lower-stakes Newsletter assignment, which helped them grow more quickly and profoundly after pivoting to their research proposals.

The quality of WID student writing is directly tied to what goes on in the classroom and in the adjunct peer review sessions of Circles. Students who are taught writing process steps and are guided during class time to deconstruct models are better able to understand their discipline and write within it; add to that the revelations in writing awareness, critical thinking, and collaborative practice that come through facilitated peer review, and together, these WID enhancements offer students multifaceted opportunities to deepen their learning, their thinking, and their contributions to their fields.

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Notes

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² 154 research proposals, plus 14 third-readers = 168 coded artifacts.

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