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Collaborating between Writing and STEM: Teaching Disciplinary Genres, Researching Disciplinary Interventions, and Engaging Science Audiences

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This poster describes a multi-pronged effort to build a writing curriculum in Physics and other STEM fields at the George Washington University, USA. These efforts include curricular collaboration, a research study conducted by the Physicists and Writing Scholars, and external funding initiatives.

This project first began as a curricular collaboration through our Writing in the Disciplines (WID) curriculum, initiated by observations among Physics faculty that undergraduate students lack Physics specific writing skills. Writing faculty responded to this observation by introducing Physics faculty to the idea that writing can and must be taught, that the genres of Physics can be taught by Physics faculty, and that a focus on the writing process can improve student writing. Our curricular goal was to demonstrate to faculty who are unfamiliar with writing studies that writing is a means to learn in Physics (Anderson et al., 2017).

The first phase of our effort was to persuade Physics faculty that writing contributes to learning in Physics; we describe a collaboration between Physics and Writing faculty that developed assignments and made curricular interventions. This collaboration built upon scholarship in writing studies that argues genre instruction develops capacities and skills for student writing (Swales, 1990; Winsor, 1996). While genre is not a new concept in Writing Studies, for many Physics faculty the idea that they can teach – and have students learn – how to write in disciplinary genres is novel. Collaboration around curricular revisions enabled Writing and Physics faculty to teach students that learning how to write in a new genre is a skill that can be practiced (Ericsson, 2006; Kellogg & Whiteford, 2009). We developed a process for students to follow when faced with types of writing common to Physics, but potentially new to them, such as the abstract (written), lab research notebook (written), article summary (oral), letter to colleague (written), cover letter and resumé (written), elevator pitch (oral), proposal (written and oral), presentation on issues of ethics and equity in STEM (oral), research presentation (oral), poster (written), poster presentation (oral), final research report (written), and Symposium presentation (oral). The collaboration thus created pedagogical exchange between faculty as well as scholarly synergy between the disciplines of Physics and Writing Studies.

Physics faculty have observed that the curricular collaboration has had measurable results for students. Physics student participation in the campus research day has increased dramatically. We attribute this rise partly to the increased, explicit attention in classroom settings to how to engage with Physics genres of writing, especially abstracts and research posters.

While the collaboration successfully brought together a small but solid group of Writing and Physics faculty, it also raised questions about how to persuade a broader range of Physics faculty, and other science faculty, that teaching disciplinary genres can improve student writing, and that writing is a means of learning. Given that faculty in STEM disciplines find empirical research persuasive, our next step was to undertake a collaborative research project to measure the impact of the teaching of writing in Physics. The new curricular focus on genre asked students to conceptualize themselves as scientific writers in relation to specific Physics or STEM audiences. The collaborative research therefore investigates if teaching Physics genres improves writing and enables students to conceptualize themselves as emerging scientists engaged in professional communication (Poe et al., 2010; Winsor, 1996). Our longitudinal analysis of student writing in Physics evaluates writing from three sequenced courses, the first before faculty-developed genre assignments, and then after genre assignments. We developed a rubric that evaluates general outcomes – audience, genre, structure, style – and a rubric that evaluates specialized learning outcomes – acknowledgement of past scholarship, working with models, incorporating scholarship, articulation of research questions, working with graphs, and articulation of methods. Preliminary research analysis shows that explicitly teaching Physics genres increases student’s abilities to write successfully in Physics, enabling students to understand how knowledge is communicated persuasively to audiences. Our goal with this research is to show STEM faculty through research by Physicists and Writing Studies scholars that teaching writing socializes students into the discipline of Physics, leading them to identify as professional scientists (Allie et al, 2010; Gere et al., 2019). This increase is exemplified by the large number of students volunteering to present a poster during the University wide research day, giving them experience presenting to an educated audience outside of Physics.

Thus, a combination of strategies – curricular collaboration and intervention, collaborative research from within the discipline of Physics, and successful external funding – are what demonstrate to scientists that teaching genre and teaching writing are central to science education. Based on this experience, our contribution is that shared pedagogical and research collaborations, and funding, are what make the knowledge of Writing Studies persuasive to scientists.

We have seen success with these efforts. At George Washington, other STEM faculty have observed successes in the Physics curriculum, and have joined efforts to bring writing more explicitly into their curriculum. This year, we began a Writing in STEM symposium that has grown to include faculty in Chemistry, Systems Engineering, Mathematics, Geography, Mechanical Engineering, and other fields. We have also seen an uptick in STEM courses in the WID curriculum. The Physics and Writing research collaboration has led to a National Science Foundation (NSF) submission on genre, and an NSF award for a study of writing and engineering judgement, being conducted by Writing faculty and Systems Engineering faculty.

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