

# **Promoting pedagogical change around writing: Observations of discursive turbulence**

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### **Abstract**

Our work aims to support engineering and science faculty in adapting core concepts and best practices from writing studies and technical communication for their courses. We also study the effectiveness of varied supports, with an aim of improving the diffusion of effective pedagogies. Our Writing Across Engineering and Science (WAES) program includes a semester-long faculty learning community, followed by sustained mentoring, during which faculty and graduate students from our multidisciplinary team work with mentees to develop and implement new pedagogies and course materials. For graduate students, we developed an engineering course focused on engineering and science writing practices and pedagogies.

This paper focuses on one key finding from our analysis: discussions about writing practices involving people from different disciplines often involve irregular and sporadic bumpiness through which foundational changes can emerge. We call this phenomenon discursive turbulence. In our experience, signs of discursive turbulence include affective intensity and co-existing contradictory beliefs. We share four examples to illustrate ways in which discursive turbulence appears, drawn from people with varying degrees and types of engagement with our transdisciplinary work: i) project team members, ii) a faculty mentee, iii) faculty who participated in a focus group on disciplinary writing goals, and iv) engineering graduate students who took our class on writing practice and pedagogy.

Discursive turbulence now informs our mentoring approach. It can be generative as well as challenging. Importantly, it takes time to resolve, suggesting the utility of sustained mentoring during pedagogical change.

### **Introduction**

Calls for improving communication skills during engineering education are both widespread and longstanding [1], [2], but development of these skills continues to be challenging. We apply a transdisciplinary action research approach [3], iteratively developing and revising interventions through tight integration with research into their effectiveness. Our aim is to promote pedagogical change around writing. Specifically, we aim to support science, technology, engineering, and mathematics (STEM) faculty in adapting core concepts and best practices from writing studies and technical communication for their courses.

While a detailed review of these core concepts and best practices is beyond the scope of this paper, we highlight a few as illustrative examples here. One foundational concept is to emphasize the process of writing, as opposed to focusing attention only on the product [4] – [7]. Some best practices include incorporating low-stakes, writing-to-learn assignments [8] – [10] and providing selective, prioritized feedback on work that is in progress [11].

These concepts and practices contrast with several of the ways writing shows up in many engineering classes. In our experience, when asked about writing in their courses or curricula, engineering faculty typically refer only to lab or design reports, or a final paper. These

assignments are typically high stakes and have minimal scaffolding, in-process feedback, or required revision. Where writing-to-learn is incorporated, for example in pre-lecture questions or homework questions requiring an explanation in text form, it is rarely thought of as writing or leveraged as an opportunity to develop writing skills. Assessment practices vary, but usually are heavily weighted towards the final product and its mechanical correctness. These pedagogies resemble current-traditional rhetoric, which focuses on generic textual formulas and standard language correctness, rather than process and ideas [6]. Although current-traditional rhetoric is one of the dominant discourses on writing instruction (in K–12 education as well as engineering programs), it has long been discredited in writing studies and rhetoric [6], [9].

This disconnect between evidence-based best practices in writing studies and pedagogies in common use in engineering courses is not unique to writing or communication; adoption of pedagogies often lags far behind evidence of their effectiveness [12], [13]. Common models for disseminating pedagogies include offering workshops or faculty learning communities, or classes for graduate students. It seems to be relatively rare for such programs to assess their effectiveness at promoting pedagogical changes, probably due to limited resources and the complexity of assessing pedagogical changes. A counter-example that illustrates this point is the Just in Time Teaching with Two-Way Formative Feedback for Disciplinary Faculty (JTFD) Project, which has employed surveys, self-assessments, classroom observations, and student data to evaluate the program's effectiveness at promoting student-centered teaching practices (e.g. [14]), with substantial support from the NSF IUSE program. For writing skills in particular, instructional models include outsourcing instruction to a separate class or embedding a writing instructor within a technical class [15].

Following a local needs assessment, we adopted a model of supporting engineering and science faculty to more effectively incorporate writing in their classes [16] – [18]. Our Writing Across Engineering and Science (WAES) program includes a semester-long faculty learning community that presents core concepts and best practices from writing studies alongside examples from STEM classes, followed by individual mentoring while faculty are in the midst of making pedagogical changes. We are currently assessing the effectiveness of this program at promoting pedagogical change. This paper focuses on one emerging theme: a pattern of turbulence that we have observed as concepts from writing studies are being integrated and adapted by STEM faculty and graduate students. Here, we describe what we call discursive turbulence, illustrate the concept with four examples, and briefly describe its potential implications for promotion of evidence-based writing pedagogies and more generally for diffusion of new pedagogies in engineering education.

### **Discursive turbulence**

During our work, we have repeatedly observed that the process of changing writing pedagogies proceeds in fits and starts. Changing writing pedagogies seems to be intertwined with deeper changes, including ones connected to professional identities and foundational conceptions of writing. Understanding writing as sociocultural activity (e.g., [7], [19]) calls attention to ways that our disciplinary identities and enculturation influence our pedagogies. In our experience, these deeper connections with identities and conceptions of writing often seem to show up as affective struggle and can interfere with pedagogical change, prompting us to look more closely at what happens when people engage at the interface of engineering and writing studies.

Our notion of discursive turbulence grew out of these observations. Within the transdisciplinary relationships that form both our project team and our interventions with STEM faculty and graduate students, we often see new perspectives on writing existing in chaotic tension with deeply held (and often unexamined) conceptions. This is discursive turbulence, an irregular and sporadic bumpiness that appears when different disciplines and discourses are continually mixed. Articulating this phenomenon and investigating it has already informed our WAES program and in particular our mentoring work, and we believe a better understanding of discursive turbulence has broad potential to improve the diffusion of evidence-based pedagogies.

For a more detailed description of discursive turbulence, as well as an exploration of its theoretical framings and its relationship to the various specialized uses of discourse and discursive, please see Ware and Zilles [20]. Here, we present four examples illustrating different ways discursive turbulence can appear.

## Examples

### *Discursive turbulence within our transdisciplinary project team*

Examples from our project team, which includes faculty and graduate students from civil engineering, crop sciences, physics, and writing studies, illustrate how discursive turbulence can be generative. In our first semester of meeting weekly, as we were planning a survey of engineering faculty, we spent many meetings discussing terms and concepts such as genre and process, trying to develop and articulate a common understanding. Reflecting on those meetings, several of us remembered not only how difficult it was to develop that shared understanding, but also our surprise at how much sustained effort it took. During this period of learning how different disciplinary groups described and practiced writing, we experienced discursive turbulence. It was only with the shared understanding that resulted that we were able to envision a truly transdisciplinary approach to improving writing skills in our engineering and science students – the approach that we have taken differs in substantive ways from what any of us expected might come of this work.

Several years into this project, discursive turbulence continues to surface within our project team. Another memorable instance occurred when Ryan Ware brought some excerpts from mentoring meetings to the team and used them to illustrate his idea of “discursive turbulence.” For the next hour, we debated not only the definition of discursive turbulence, but also the minute particularities of the meaning(s) of each word. Productive discomfort and a playful intensity colored our conversation as members of our team from four disciplines turbulently tried to assemble a shared understanding of the terms “discursive” and “turbulence” separately, and then together as a concept. One physicist noted that it seemed like we were describing “impedance mismatch,” but for writing instead of electrical systems.

Our conversation was so generative that a few hours after our meeting finished, a very lively email thread began, taking up, again with playful intensities, what the terms might mean separately and together. Celia Elliott wrote, “I was sufficiently unnerved by the discussion this morning, and the fear that I’ve been using *discursive* incorrectly for all these years, that I looked it up.” She attached a PDF of the Merriam definition and noted that she felt gratified that the way she used the term across her life was correct. She then ended her message, “I am *verklemt*”

(overcome with emotion) — a sign or characteristic of discursive turbulence. The conversation carried on, with Paul Prior drawing on Oxford English Dictionary definitions to clarify what aspects of discourse were relevant to discursive, and the discussion picked up again at our next team meeting, as several members of our team pitched ideas and expressed confusion or dissatisfaction.

Those early meetings contributed to our articulation of discursive turbulence. Other team members are starting to utilize the concept for their own projects. Crucially, we now expect discursive turbulence to appear as we help STEM professionals integrate writing practices into their courses.

#### *Discursive turbulence in a faculty mentoring case*

In this second example, we highlight the time needed to reconcile discursive turbulence. We draw from a mentoring case with a professor in environmental sciences, who was revising a writing assignment for a mixed undergraduate/graduate course [20]. She participated in our semester-long faculty learning community as well as a second semester of individual mentoring (meeting eight times for roughly one hour).

One thread of discursive turbulence centered around this professor's learning objectives related to writing. It began in a fall WAES session where she observed that she had learning objectives related to everything in her class, *except* for an 8–10 page research paper simply named “writing assignment.” Our first few mentoring meetings the following spring revisited this observation; we focused on helping her articulate her learning objectives related to writing. During those conversations, she frequently expressed conflicting ideas, showing both interest in, and resistance to, a broader conception of writing (i.e., that the students would still be writing even for, say, an oral presentation of their findings). Even with the clarity evident in her initial observation about the missing objectives, it took multiple meetings with a WAES team (Zilles and Ware) over a series of weeks for her to interrogate her motivations for assigning writing and to articulate learning objectives. The revised assignment better met her newly articulated learning objectives as well as incorporating a process model (rather than a single-draft product model). Strikingly, after the semester ended, that tension between conflicting ideas continued to be visible. Within the space of a single reflective conversation with the mentoring team, she said that the assignment met her goals and the students largely met the learning objectives – and that she still was not sure she made “progress toward helping the students learn to write better.” In effect, she was noting all the positive aspects of change her hard work brought, but still feeling negative about her efficacy for teaching writing. Observing the persistence of these conflicting ideas first got us thinking about discursive turbulence and underscored the importance of longer-term support for pedagogical changes.

#### *Discursive turbulence in a faculty focus group*

A third example highlights the circling around competing ideas of writing that is characteristic of discursive turbulence. This example comes from a focus group that we facilitated among physics faculty to foster conversation about vertically integrating writing across their undergraduate curricula. The discussion revealed tensions among different approaches to writing instruction.

One of the physics faculty shared her reservations about the vertical integration of writing in physics. She discussed an upper-division course where students were, in her view, “struggling already...with the quantum...it’s like learning a completely new language.” In response, other faculty members suggested strategies to integrate writing with minimal additional labor and time. Julie Zilles pointed out that the course already included writing by requiring written test questions. The faculty member diminished the role of writing in the course, and articulated the ideologies surrounding writing that undergirded her reservations:

“The problem is, it takes a lot of time and energy to actually write something well. I'm just saying...when I write a paper, we edit over and over and over again...it doesn't come out the first time we write it. At least not for me, and not for many people...I guess we can expect— request— require certain things from the lab report. But I'm wondering if we should require a lot.”

She also expressed concerns over “dilution,” questioning whether “heap[ing] too much onto a course” would devalue both existing course content and writing instruction. For this physicist, vertical integration reflected a “piecemeal” approach to writing, and she doubted whether those pieces would add up to substantive understanding of writing in physics.

The physics focus group kept circling around issues of time and labor. Their comments provide an example of discursive turbulence surfacing as tensions between faculty discourses around their own experiences of academic publication and their discourses about student writing and undergraduate writing instruction. Rather building on the implications of the time, effort, and rewards of her own academic writing to apply them to student lab reports, this physics faculty member represented student writing as so different that little could be expected of or achieved through it. At times the focus group treated writing as something that must be added on top of existing instruction, and at others it was seen as an existing part of instruction that could be scaffolded and made more explicit.

The example of the physics focus group illustrates how diverse personal writing and teaching histories can influence the direction of a conversation. In some ways, these different histories blocked the discussion; the group needed more common ground in their conception of writing before they could develop a shared vision for writing objectives or vertical integration of writing. With more time for the conversation, perhaps, the circling around competing ideas might have coalesced around shared goals.

### *Discursive turbulence in a graduate course on STEM writing*

Our final example illustrates another aspect of discursive turbulence: contradictory statements that arise from dissonance in views of writing across different contexts. This example comes from a graduate course developed by the WAES team: ENG 598 WTG: STEM Writing Practice/Pedagogy. In this course, graduate students from six departments across the Grainger College of Engineering engaged with writing studies research and theories, with dual aims of developing their own research writing practices and their tools for writing instruction. To our knowledge, this course is unusual, perhaps unique, in its dual focus on writing for research and writing pedagogies, although there is a natural connection between the two topics. This example

draws on interviews conducted with enrolled students during and after the course, which were part of our research on the impacts of the course.

Although the course was designed with a dual focus, students' histories with writing instruction created barriers between their research writing experiences and their teaching experiences. For example, a graduate student in materials science and engineering, Ganesh Patil, described writing as "an everyday part" of his work as a researcher. However, he deemphasized the role writing played in his work as an instructor, even though grading written reports was a central part of his work as a teaching assistant (TA) for a 200-level engineering course. In fact, he stated that the course was "not focused on writing as such." His view of the potential for writing instruction was also constrained by his lack of control over course design. Ganesh was given a point-based rubric to guide assessment, and the instructor of record for the course told TAs to "not grade based on the quality of the report, because the only objective of [the] project [was] to make students...come up with new ideas." The structure of the undergraduate course encouraged Ganesh to distance himself from the role of writing instructor.

While Ganesh offered rich and nuanced descriptions of the writing he did as a researcher, outlining the variety of genres and audiences he navigated, he had a narrow view of what was possible in undergraduate writing instruction. By the end of the course, Ganesh expressed that he "realize[d] only through this course" that "undergraduate writing could be much more rigorous." However, he still chose to focus on graduate-level courses when developing new writing assignments. While there were signs that his ideologies were shifting, then, his practices were slower to change, and his narrow views of the purpose of undergraduate engineering reports and of his role as a TA persisted. Adapting new conceptions of writing as a graduate TA working within an established course structure and the expectations of the instructor of record creates additional tensions and barriers. This example also illustrates why interventions are likely to be more effective and coherent if they are coordinated across curricula, faculty, and teaching assistants.

### **Take-home points**

We are sharing the notion of discursive turbulence here, early in its development/articulation, because it is informing our work in useful ways. Becoming more aware and better at recognizing the signs of discursive turbulence allows us to talk about, normalize, and manage the bumpiness. It is a useful framing for our mentoring teams – the contradictions that we observe are signs that someone is working through a deep change. And it is a useful framing for our mentees – yes, it is normal to take some time to wrap one's head around these new concepts and approaches. After all, we are so used to writing without thinking about how we are doing it, and helping students complete a specific assignment without thinking about how to support students' development as writers, that it is hard work to articulate our tacit conceptions and evaluate them. While discursive turbulence can be an obstacle to change, especially when it is not recognized, it can also be generative, as illustrated by our project team example. While our examples come from our work on writing pedagogies in STEM classes, we suggest that discursive turbulence may be a general characteristic of transdisciplinary work, of work at disciplinary interfaces.



Discursive turbulence often emerges over time, and it takes time to process and address it. We are coming to believe that sustained interaction is critical for foundational shifts in concepts and practices around writing and writing instruction. If confirmed by further research, this would have far-reaching implications for Writing Across the Curriculum/Writing in the Disciplines practitioners, as well as for many faculty development practitioners and teaching centers, especially given the widespread use of more convenient dissemination models centered on workshops and material sharing.

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