# A co-curricular research communication community of practice: Developing research communication competencies for engineering education graduate students

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# Developing research communication competencies for engineering education graduate students through a co-curricular community of practice


## Abstract

Engineers and engineering educators must communicate effectively across a range of genres, situations, and professional contexts, including industry, policy- and decision-making, and academic settings. Developing these abilities means producing the "disciplinary conventions of writing in one's field" [1], which are taught across contexts in a variety of ways [2]; [3]; [4]; [5]. Although studies demonstrate that engineering communication instruction is valued, **these studies focus on training students to communicate in technical engineering disciplinary contexts. Few studies have examined how doctoral students in Engineering Education (EEd) develop competencies for communicating *engineering education research* (EER).** EER's study designs, methods, theories, and communication styles *diverge* from those in technical engineering disciplines, **aligning more closely with the social sciences** [6], fields to which many students (and, perhaps, faculty) have had less prior exposure or formal training. As a result, writing proposals and papers and developing presentations for EER represents a shift in the expected communication skills and literacies needed to be successful. Additionally, for EER PhD students, gaining acceptance and recognition as an EER researcher—part of developing a researcher identity—requires adapting and developing the skills, competencies and conventions for making meaning they learned in technical domains to engage successfully with and navigate the new epistemological frameworks used to make meaning in EER. Because understanding of these frameworks is demonstrated in writing and presentations, researchers must write, and developing a researcher identity includes incorporating a writer identity as well. This paper presents and analyzes a case study of one EER graduate program's efforts to support its PhD students in transitioning to the academic conventions of EER communication and writing. We document how we, a team of writing studies experts, leveraged our expertise in academic literacies [1], [7], rhetoric [8], and genre analysis [9] to establish a communication-focused community of practice [10]-[11] in an EER PhD program at a large, mid-western university. By documenting this project in its pilot phase and the role of our unique expertise in its development, we hope to achieve two goals: 1.) to encourage other EER programs to address and explore the specific challenges and needs of students transitioning from engineering technical domain undergraduate programs to EER graduate programs; 2.) to demonstrate how EER programs can leverage expertise of faculty from writing studies and technical communication to develop evidence-based practices that support students' transition.

## Introduction

Graduate programs within engineering education aim to help students develop the knowledge of disciplinary concepts and theories that overlap and diverge across technical domains and educational and social sciences. In addition to conceptual and theoretical knowledge, engineering education students must acquire and apply the research designs and approaches, conventions, mindset, attitudes, and skills needed to be recognized as expert engineering educators, whether in academia, industry, policy, or the nonprofit sector.
To be successful after graduation, postdoctoral graduates need to maintain or develop communication skills, one of six core competencies outlined by the National Postdoctoral Association [12]. These communication skills cut across professional responsibilities that postdocs perform–writing proposals, grants, and job documents, delivering presentations–as well as contexts–teaching, professional, and interpersonal situations. After completing their doctorates, engineering educators need to write, speak, read, and listen so they can inform, convince, and educate colleagues, students, grant makers, the media, and other decision- and policy-makers. Effective communication is a competency central to the post-doctoral researcher role, regardless of discipline, and developing competency in communication is an essential element of researcher identity in engineering graduate programs.

To develop communication competencies a unique challenge arises for students in engineering *education* PhD programs: while all graduate students must deepen skills and acquire new competencies as they are socialized into their domains of expertise, EER students navigate a departure from or a reframing of many of the skills and competencies--the *academic literacies*--they developed as engineering undergraduates. Arguably, the most pronounced differences across academic literacies in EER and the engineering technical domains are their differences in "meaning making...and what counts as knowledge" [7, p. 369], which are often brought into focus most clearly in writing and reading contexts. For example, Kwan et al. [13] demonstrate clear differences across the "epistemological frameworks" of literature reviews grounded in design sciences (engineering-adjacent) versus in the behavioral sciences (EER-adjacent), reflected in how each paper frames its object of study, evaluative moves, and criteria for establishing significance. Understanding and producing communication that demonstrates the meaning-making conventions of EER is therefore an essential part of becoming an expert in the discipline.

These meaning-making conventions are developed before students begin their graduate educations. By the fourth year of their undergraduate educations, engineering students have internalized the meaning-making conventions of their technical disciplines and reflect those conventions in their writing [14]. Further, Lin [1, p. 11] suggests that engineering students who engage in domain-specific undergraduate research are likely to "espouse different beliefs about knowledge and prioritize different research traditions" than engineering education researchers. Students with these domain-specific backgrounds who enter EER graduate programs need

guided opportunities to explore these differences explicitly to support their transition into writing for EER. Although some EER programs surely support students in this transition via formal coursework, writing support and development for graduate students most often occurs in adviser/advisee pairings.

Advisers vary in their ability to identify, describe, and teach elements of successful writing and communication, so this approach to supporting students in acquiring EER academic literacies is uneven at best. This unevenness also means that some students will receive substantial and ongoing support in developing their writing skills and understanding of the meaning-making structures of EER, while others will not. Additionally, the power dynamics inherent to the adviser/advisee relationship may create barriers for students who feel insecure about writing and communication challenges they are experiencing, especially if they cannot identify or misidentify the source of the challenges. For example, a student might see struggles to grapple with argument structures as problems with their inherent abilities rather than problems with their understanding of EER meaning-making structures.

To address these programmatic challenges around gaining skills in communication and EER-specific academic literacies, *informal communities of practice* [11] may offer a partial solution. Substantial research has documented the benefits of writing and communication-focused communities of practice that incorporate a variety of learning formats and activities, including skill gains in writing quality [15] and productivity as well as increased self-efficacy and confidence, [2], [4], [16]. Moreover, learning communities can remove barriers to degree progress arising from the "difficulty with the process of writing" [17, p. 9], including lack of timely feedback and the isolation that graduate students, especially underrepresented minority students, frequently experience while writing [3]. Understanding how to facilitate effective communities of practice around communication is of significant value for engineering education because of their role in developing students' competencies and providing psychosocial supports associated with student retention.

As in other disciplines, most engineering education PhD students learn, eventually, to produce these conventions and communicate their work successfully. However, EER programs that aim to retain PhD students from a variety of backgrounds and lived experiences may falter if students perceive that the time and effort investment in developing these competencies is too great [17]. All graduate students, and some more than others, benefit from intentional support to produce effective research communication competencies and develop *EER academic literacies* and *writing skills*, including the styles, conventions (including rhetorical and genre awareness), and epistemological frameworks (argument structures, valued theories and questions) inherent to the contexts in which they engage.

**This case study describes in detail how a co-curricular communication program was designed to incorporate writing studies theory and expertise to address the specific needs of EER PhD students. Additionally, the case study highlights the programmatic role and**

**position of writing studies faculty in developing and implementing this type of program.** By demonstrating the role of this expertise, we aim to demonstrate its value in achieving EER program goals and to encourage engineering educators involved in graduate curricula to partner with writing experts across their institutions to design programs and supports for students that develop their engineering education research communications skills.

## Background

Researchers have documented how graduate students in engineering PhD programs learn to write and communicate their research findings effectively. Benefits have been demonstrated through approaches grounded in genre analysis theory [9] and academic literacies theories [7], [1], which aim to introduce students to "disciplinary conventions for writing" [1, p. 10] as they simultaneously take on writing as part of their developing researcher identity [7]. Studies have further demonstrated that this identity development occurs through socialization, including informal conversations, coursework, and formal presentations and papers [1]. Other work suggests development of this researcher and writer identity is also supported when students can engage in the practice of writing and speaking outside of the idealized space of the classroom [7], and in contexts and situations where they can discuss effective strategies and challenges with peers and mentors whose experiences mirror their own [18]. These spaces allow students to form communities of practice [11] where they can draw from and build on peer support [2] as they navigate disciplinary conventions and communication requirements for the dissertation [18], proposals [4], conference presentations, journal articles, course papers, and other genres associated with the professional practice of academic engineering researchers.

Further, research informed by academic literacies theories suggests that students are better supported in developing their researcher identities when approaches to their writing development focus on the *practice of writing* more than *the quality of its products* [19]. Specifically, Lin [1] demonstrates the significance of this approach for EER students.

Writing in graduate school can be isolating, demoralizing, and difficult. Challenges with communication may impact a student's progress to degree substantially. Because the practice of appropriate communication (communication recognized as effective by experienced researchers in the discipline) is an essential element of developing a researcher identity, challenges with successfully developing the communication milestones of the degree—the qualifier exam or dissertation phase—may also inhibit development of the researcher-writer identities associated with a student's entry into the field of engineering education. By creating a space where students can discuss and grapple with the emotional and psychological challenges of program requirements, communication-focused communities of practice can further advance student resilience and retention.

**Motivation**

Professional and technical communication research within engineering education tends to focus on undergraduate and graduate student competency development within the technical engineering domains. Research has demonstrated the efficacy of **situated, contextualized instruction** tied to domain-specific subject matter [20] that emphasizes **sensitivity to audience and purpose** [8] for preparing engineers to succeed professionally.

Research examining how engineers who have been trained in one technical domain shift to function in another domain have demonstrated how an **academic literacies lens** can help engineering education practitioners articulate specific challenges students encounter as they navigate disciplinary differences. A key need that has been highlighted is helping students identify differences in ways of thinking and making meaning (epistemological paradigms), which are reflected in writing and presentations and include epistemic evaluations in critiques and argument patterns [13] and the argumentative moves writers make in to establish their research purpose and significance [9], [21].

Engineering education, similarly to other disciplines that draw from behavioral sciences paradigms for meaning-making [13], requires students learn new ways of thinking and new ways of presenting that thinking in writing, including conventions for:

- Selecting and applying appropriate theories to design effective studies,
- Reviewing and presenting the literature to support strong research rationales and establish theoretical and conceptual frameworks, and
- Structuring and laying out arguments.

To better train doctoral students in engineering education, we must address the fact that these paradigms are outside of the technical domain expertise that most PhD students in engineering education will bring when they begin their doctoral education. We argue that strategic collaborations with writing studies faculty can strengthen support for students in EER graduate programs because technical communication faculty bring knowledge of writing and literacy studies that can inform effective program designs to support EER graduate students' communication development.

Based on this context and background, our team asked: *how can the disciplinary expertise of writing studies faculty inform the design of program experiences for EEd PhD students to facilitate students' ability to communicate their research effectively and identify themselves as EER academics and professionals?*

This paper answers the question by **presenting a case study describing the development and pilot implementation of one EER grad program's co-curricular communication program**. We add to existing work on the significance of the relationship between students and mentors for

development of student sense of self-efficacy [17] by demonstrating how our team leveraged our expertise and programmatic position to establish a community of practice outside of the formal boundaries of the EEd PhD program. Here, we highlight how our writing studies expertise, our position in the department's structure and hierarchies (and the relationship to graduate students that it facilitates), inform the design and implementation of a program with potential to provide unique support for graduate students in the program.

## Case Study: Establishing a Co-Curricular EER Communication Community of Practice

This case study describes how we designed and piloted a co-curricular community of practice around research writing and communication, centering Engineering Education PhD students in one mid-western, R1 university's program. This program includes ~25 PhD students as of this writing.

Although the number of programs focused on training doctoral students in Engineering Education Research (EER) is growing, as of this writing, only a handful of programs in the U.S. confer PhDs specifically in Engineering Education (Engineering Education Departments and Programs (Graduate), n.d.). Many PhD programs in education and STEM education graduate candidates train in educational theory and pedagogy informed by decades of observation and research. However, we argue that a) the relative newness of engineering education as a distinct discipline and b) its range of disciplinary intersections across the engineering domains mean that **the discipline's knowledge systems, values, and conventions for communication warrant separate examination and attention.** Further, the corresponding move to house engineering education researchers and their work in departments and centers outside of "education" (e.g., within a College of Engineering) signals institutional shifts in how EER work is perceived and valued in the university.

Within this broader disciplinary landscape, we narrow the focus to demonstrate how the position of technical communication pedagogy and instruction in engineering education functions in a PhD program. Though the relationship between technical communication instruction and the formation of professional engineers is well established and has been studied extensively [8], we lack similarly robust understanding for how engineers transition from engaging in technical domains to engaging and communicating in education-focused domains, which draw from social sciences epistemic frameworks.

### Program Motivation and Development

In 2023, in response to student requests, a series of informal interviews was conducted by one of the engineering education faculty members to better understand student experiences. These conversations provided insight into students' perceptions of the program, their sense of community and belonging, and program strengths and opportunities. Takeaways from the conversations relevant to this case study included the following: 1.) Students wanted additional

writing support, and 2.) Students wanted more opportunities to engage in and build community with their peers in the program.

Through discussion with faculty and students, our team of writing studies faculty moved to more narrowly define student needs around writing and community while accounting for the many existing strengths of the graduate program. To avoid duplication of existing writing supports and community-building opportunities, we first examined existing structures within the graduate program. In reviewing the program's coursework, we observed that several courses in the graduate program require significant writing products, displayed in Table 1.

**TABLE 1**

EEd PhD program required courses and corresponding writing competencies and products

| **Course Title** | **Competencies and Writing Products** |
|---|---|
| Engineering Education Research Design | Prioritizes rhetorical, claim/evidence approach to defining research questions and outline justifications for research question / research design pairings |
| Career Exploration and Professional Development in Engineering Education | Prioritizes individual reflections on career interests and development of job materials + online brand / social presence |
| Seminar in Engineering Education | Prioritizes individual reflections on EER and topics addressed in this series of guest-speaker seminars |
| Foundations of Engineering Education | Prioritizes developing critiques and connections across foundational EER literature and producing a critical analysis essay and a critical literature review |

*Table 1.* Required course titles, competencies, and writing products in current PhD program curriculum.

These courses in the graduate program provide *structural supports and opportunities* for students to practice developing key writing products required for successful academic practice in engineering education research, including literature reviews, research designs, and job materials. Though several courses involve elements of the writing process (e.g., how to provide constructive peer feedback on writing, producing multiple drafts, integrating feedback) the emphasis in these courses may *prioritize other learning outcomes,* dedicating the necessary time to the *what* of EER research and concepts without adequate time to address the *why* or *how* a literature is structured and produced as it is. For example, students in Foundations of Engineering Education must write a critical analysis essay, critiquing a piece of literature. However, students trained in technical engineering domains may struggle to understand the rhetorical purpose of this type of paper [8] or how to begin developing the analysis, in part because their undergraduate educations have focused on different epistemological paradigms for critique [13], and they have not yet been socialized to value the writing process for planning and

executing such an analysis [1]. Because the transition from novice researcher-writer to expert research-writer occurs over time and experience, students also need support in recognizing how writing activities that support the transition across paradigms are adapted by more advanced writers to achieve more sophisticated results recognized as expert by others in their field. For example, students introduced to a genre analysis approach to outlining the moves of an article's introduction [9] need feedback and support on their own outlines to develop them into compelling texts that persuasively presents the rationale for their work. Models and exemplars can be helpful, but without explicit instruction in recognizing what expert introductions do differently, students may persist in reproducing the novice-level approach.

One course (focused on research communication and taught by our team members) includes a course design consistent with an academic literacies approach [7] to support students' development of a researcher-writer identity. Course activities are designed to grow student awareness of the "disciplinary conventions of writing in one's field" [1, p. 10], requiring consistent practice of critical reading and writing processes, including note-taking, planning, drafting, revision, and providing/integrating feedback. However, this course is not required and only recently has begun consistently enrolling EER students from the PhD program.

Though the PhD program includes structural supports for integrating research-writer into students' growing collection of identities, students' sense of the impact of these supports may be further influenced by *program structure and timing of their enrollment in coursework.* Because the program structure requires only a few core courses and then asks students to choose and enroll in courses across other departments and programs, timing of their enrollment in these required courses may be misaligned with the ideal timeline for development of writing skills, self-confidence around writing, and writerly identity. A further complication may arise from differing disciplinary approaches to argument structures or epistemological frameworks students encounter in elective courses housed in departments of education, psychology, or statistics. This variety, while allowing students to explore and match theories and approaches with their interests more narrowly, may also create writing challenges for students as they work to define and identify what structures and frameworks are expected for their own EER papers and presentations.

Based on these informal student interviews and this initial analysis of the graduate program's structural supports, we developed the following goals for addressing PhD student needs:

- Develop a communication-rich culture among graduate students through regular, low-stakes opportunities to write, present, share ideas, and receive and provide feedback,
- Grow graduate student skill, confidence, and awareness of the writing and communication practices appropriate and relevant to students' intended career pathways, and
- Strengthen graduate student community and sense of belonging.

Our team drew on our writing studies expertise and prior experiences with developing students' understanding of writing and communication and writerly identities to discuss approaches to achieve these goals. We determined that the department could benefit from a *co-curricular* (informal, running alongside but not integrated into the formal structure) communication program that would:

- Provide regular, ongoing and low-stakes opportunities and activities for EER PhD students to practice writing and speaking about their research and professional interests with their peers, and
- Provide 1:1 opportunities for graduate students to discuss writing challenges, identify patterns of error in their writing, and discuss strategies, tools, and opportunities to improve and practice EER writing and communication.

By creating a space to learn conventions for writing and presenting in EER, we also aimed to establish and foster a community of practice [10], [11] where students could develop their researcher-writer identities through regular practice and engagement with peers and mentors outside their PhD committee. By discussing observations and challenges with EER writing outside of the formal structures of the program, we hoped to support students' development of their identities as engineering education researcher-writers.

**Program Design and Pilot**

To achieve these goals, we aimed to design a program that would support the development of students' writing competencies, confidence, and identities as engineering education researcher-writers. We leveraged our expertise and knowledge of writing studies, rhetorical theory, genre analysis theory, and academic literacy studies to design activities to support students' shift from technical engineering domains to engineering education research domains and the corresponding changes in social and disciplinary conventions for argument, evidence, and form.
The overarching framework of the program is informed by academic literacies theory [7] and work on communities and landscapes of practice [22]. This research suggests that gaining writing and communication competencies is a social, contextualized process by which students become aware of and produce the ways of thinking and written conventions that are typical for the discipline through gradual and ongoing negotiations and practice. To inform the content and structure of our program, we are indebted to outstanding resources produced by MIT's CommLab and Johns Hopkins' Technical Communication Lab.

Our approach to designing program content and activities draws from our training in *rhetorical theory and writing studies*, including an emphasis on thinking and writing rhetorically to address specific audiences and achieve one's purpose. We weave this with *genre analysis theory*, which suggests that meeting audience expectations in a given "communication event" [21] involves successfully producing the rhetorical moves or organizational and epistemological strategies that readers expect [21], [9]. An *academic literacies* framework is incorporated across all our co-

curricular program components as they encourage students to reflect on how EER conventions and expectations differ from their previous writing experiences.

The co-curricular program pilot was launched in Autumn 2024 and included four key elements: workshops, work-in-progress group critiques, writing consultations, and a writing group (Table 2).

**TABLE 2**

EER Co-Curricular Communication Program elements during autumn 2024 pilot

| **Program Element** | **Description** | **Theories** | **Frequency** |
|---|---|---|---|
| Writing Group Sessions | Weekly writing group meetings beginning with an accountability check-in to set and track goals. Write-on-site sessions, enjoying snacks and community. Sessions involve celebrating successes, thinking through productivity barriers, and addressing emotional / psychological challenges of writing and research. | Rhetorical and Genre Analysis Theory; Writing as a Process; Academic Literacies Theory | Weekly |
| Writing Consultations | One-on-one meetings with technical communication faculty members to review writing at any stage of the drafting process, from planning to proofreading. PhD students were encouraged to articulate writing challenges/goals ahead of time and bring drafts to discuss; consultations include troubleshooting challenges and strategizing how to move the project forward. | Rhetorical and Genre Analysis Theory; Writing as a Process; Academic Literacies Theory | Weekly |
| Work-in-Progress Critiques | Small- to large-group sessions providing focused feedback on one student's work-in-progress. Authors presented their key concerns or goals for the critique; then, led by tech comm faculty, attendees review and respond to the work and discuss reactions and opportunities. | Rhetorical and Genre Analysis Theory; Writing as a Process; Academic Literacies Theory | 4x / semester |

| | | | |
|---|---|---|---|
| Mini-CommLab Workshops | Small group workshops led by ETC faculty and focusing varying communication-related topics in Engineering Ed, designed to develop students' comfort with academic and professional genres and identify habits for effective research and writing productivity. | Rhetorical and Genre Analysis Theory; Writing as a Process; Academic Literacies Theory | Weekly |

*Table 2 Interventions and corresponding theories included in co-curricular program pilot*

**Writing groups** are a well-documented psychosocial support for writers across disciplines [23]. We chose to use a *write-on-site* model (also known as 'shut up and write') rather than a traditional writing group (where writers exchange and provide feedback on a regular schedule) because we wanted to encourage greater participation: reviewing another's work regularly is a substantial time commitment and graduate student workloads are often already overburdened. In addition, a regular, scheduled time to meet and write fosters the formation of good writing habits by offering a consistent schedule and accountability structure (people notice if you don't come) [24] and a supportive, communal experience. We further encouraged participation and accountability by offering refreshments and encouraging students to reflect on writing progress and set specific goals for each session.

**Writing consultations** help students develop awareness of their writing practices in context of disciplinary expectations, and we valued writing consultations as an opportunity to work one-on-one with students to observe and discuss their challenges. In these sessions, students talked through questions and concerns about their writing practices and goals and received coaching and resources to address problems and advance their projects. As writing studies experts, our consultants do not offer content area advice; instead, we direct those questions to their advisers and we focus on supporting students in addressing feedback, understanding genre, and addressing writing challenges. These conversations often spur us to ask students questions (such as, *What's the purpose of this piece? Who is it for? How are these kinds of papers typically structured? How might you segue from this section of your argument to the next?*) that can foster students' awareness of the conventions in engineering education communication. These sessions also work to support students in understanding that the knowledge-making and writing processes in EER are not purely individualistic, go it alone endeavors but achieved through ongoing conversation in collaborative teams.

**Work-in-Progress Critiques** offer students the chance to practice engaging in peer review and providing constructive feedback. Reading and responding to student work in real time, we modeled close reading and evaluation of argument structures across claim and evidence patterns to demonstrate how professional writers experience and respond to research writing. Graduate student attendees contributed to discussion of writing choices and offered disciplinary expertise in their interpretations of writing choices, which often bled into conversations about disciplinary meaning-making structures and the conceptual value of the knowledge produced. For example,

one session that focused on the structure of a results section segued into a conversation about research questions as well as sample sizes and their relationship to generalizable results. These kinds of conversations also supported graduate students in developing an understanding of writing as a tool for thinking.

**Mini-CommLab workshops** informed by our rhetorical/generic framework include those focused on critical reading and understanding of journal articles, literature reviews, and proposals in terms of how their constituent parts function to support and advance the writer's purpose in effectively conveying the key elements of a project (research questions and motivation, design, and findings) and their significance. Additional workshops operating in this framework where students are encouraged to view each genre through a rhetorical / genre-analysis lens included planning, organizing, and writing literature reviews, and planning and writing proposals.

By creating a space outside of the formal graduate program—led by faculty who do not advise dissertation work—the co-curricular program frees students from some of the power dynamics that can hinder free expression and questioning of how things are done in the adviser/advisee relationship. Further, by encouraging participation across cohorts, graduate students are able to leverage their own growing expertise to support their peers [2].

**Pilot Observations and Next Steps**

Our co-curricular communication program components are informed by many other examples of successful, informal, communication-based programs for STEM graduate students [16], [25], [26]. Our program aims to strengthen community and provide structure to facilitate regular, low-stakes opportunities for graduate students to come together to practice writing and presenting, share ideas and feedback, and explore writing and research concepts outside of the classroom. Here, we present our observations from the program pilot to demonstrate how an *academic literacies* and *community of practice* lens can help identify and address the needs of students who are developing their researcher and writer identities as PhD students in engineering education.

One of our goals for our program was to locate it within the institutional boundaries of the department and PhD program, but outside of the formal, evaluated components required for students to progress to degree (e.g., coursework, exams). By establishing it as an informal, *co-curricular* program, we aimed to foster a community of practice where writing and discussion of challenges around writing were normalized and not subject to the same pressures as other program components (adviser/advisee power dynamics, candidacy exams, balancing committee member feedback).

The benefits of this co-curricular program design—notably reduced pressure to perform and normalizing of writing difficulties—also created challenges, too, primarily in achieving a

consistent base of participants each week. Although there are currently ~25 students enrolled in the PhD program, we saw regular engagement in weekly workshops ranging from 3-12 students, depending on the topic. Over half the students in the program (13) engaged in one or more elements of the program (Mini-CommLab, Consultation, Work-in-Progress Critique, or Writing Group), with ~6-10 participating consistently in weekly activities. We did not collect demographic data on participants, but attendees included men and women and students from a range of racial, national, ethnic, and socioeconomic backgrounds.

We attribute the variation in engagement to a variety of factors, including: *competing obligations* (teaching and work schedules were major factors for part-time students and students with graduate teaching appointment responsibilities) and perceptions that *content is not relevant* (folks at the dissertation phase may feel they won't benefit from workshops on reading strategies or writing style). *Advisers* also played a role in engagement, because some encouraged or directed their advisees to schedule consultations or attend workshops, while others did not.

Student participants also engaged in program elements across cohorts, ranging from first-year, first-semester PhD students to third-, fourth-, and fifth-year post-candidacy students writing up dissertation research. Some students, especially those in their first year of the program, perceived that attendance was required or at least strongly recommended by their advisers, and they tended to be the most consistent attendees. Students further along in their programs were less likely to attend mini-commlab workshops, but more likely to attend weekly write-on-site writing group sessions and to schedule one-on-one consultations.

**General Themes Observed**

For participants who did engage in activities, our key initial observations aligned with Lea and Street's [7] descriptions of how students develop academic literacies and the specific challenges for students transitioning across disciplinary domains, from technical engineering to engineering education [1].

For these high-performing students, the challenge as they cross domains is less about developing writing skills and competencies, and more about *understanding and using the epistemological* [13] *and meaning-making frameworks* [1] *in engineering education.* We observed that many consultation and workshop conversations addressed questions around task analysis and genre analysis [21]. Literature reviews, a challenging genre for any graduate student, can be particularly tricky for engineering education PhD students for whom the argument structures and organizational patterns diverge substantially from those they may have encountered in reading or writing a review in an engineering domain, which might, for instance, use objective, measurable criteria to define and compare processes, products, or characteristics. In contrast, EER literature reviews not only use claim and evidence argument structures instead of objective comparisons across criteria, they also deploy these argument structures across a range of generic functions (scoping vs. systematic vs. integrative reviews) and meaning-making frameworks. In both group

workshops and one-on-one consultations, we observed students who had been assigned to write literature reviews grappling with identifying the most appropriate type for their purpose, as well as how to begin the process of organizing and synthesizing their observations across the texts.

This difficulty in identifying and planning how to approach the genre/task stretched across other contexts and genres, too. For example, one first-semester student who was assigned to write a critical analysis essay for the Foundations Course scheduled a consultation to discuss and better understand the assignment task and how to approach it from a planning and organizational approach. This conversation demonstrated the student's primary challenge in identifying *critical analysis* as a genre within the disciplinary context of engineering education, which involves constructing arguments through close reading, interpretation, and analysis of the text.

In several Work-in-Progress critique group discussions as well as individual consultations, we observed some discomfort with conceptualizing and articulating meaningful, well-developed claims that go beyond description and into analysis and interpretation. First-year students demonstrated some uncertainty in moving away from documenting observations or justifications based on quantitative descriptions (typical of technical communication for technical disciplines) and instead *constructing arguments* informed by observations, the literature, and analysis of qualitative and quantitative data using theoretical lenses. Our observations here were made on a micro-level, arising during paragraph-by-paragraph close reading exercises (during discussions about developing ideas for how to refine a claim based on a survey response or evaluating how the findings in a draft might be represented visually), but they echo the macro-level issues with meaning-making frameworks.

Challenges in navigating meaning-making frameworks are not exclusive to early-career graduate students. Although we observed that students in their first- or second-year of the program are uncertain how to produce and evaluate the argument structures and genres in EER (including critical analyses, literature reviews, conference abstracts), we also observed epistemological challenges for students in more advanced stages of the degree.

Specifically, for students who were post-candidacy and working on dissertation research, we observed challenges in choosing, explaining, and justifying the use of theories and theoretical lenses in research designs as well as applying theoretical frameworks to analyze qualitative and quantitative data. EER embraces theory from a range of disciplines and perspectives, a disciplinary strength; however, we observed students struggling to compare and evaluate theories to determine which best fit the goals and design of their research. For example, a student exploring learning issues related to identity within engineering education might draw from identity theories from psychology, sociology, education, or other fields. Although many theories may be relevant to the research question and feasible to use with the study design, we noted several students who:

- Chose a theory without fully exploring or understanding its implications for their work/study design

- Chose appropriate theories, but struggled to apply them to interpret data

Frequently, we heard students describe *the need to quickly develop competency with understanding and applying theories*, and many students seemed to underestimate the time needed to fully engage with and understand a new theory and use it to develop a framework. When combined with pressures to stay on track for their timeline to degree, we observed a tendency among students to quickly select theories, sometimes more on the principles of topical relevance or simplicity/comprehensibility than on strong alignment with their research design. This observation matches informal observations from some of the graduate faculty, who reported in conversation that students' rush to complete degree requirements was at odds with the deep thinking and work needed to fulfill those requirements. While the financial, personal, and professional pressures for students to complete timely degree milestones are considerable and cannot be ignored, these observations suggest to us a need for opportunities to better support students' acquisition of these academic literacies across the graduate program landscape.

**Conclusions and future work**

Graduate students in engineering education are engaging in a transition that is unique in graduate education writ large. They not only must level *up* in the depth of their knowledge of concepts, theories, and practices, but also be socialized *across* the distinct engineering education domain-specific conventions for writing, researching, and presenting. An *academic literacies lens* highlights the distinct epistemological challenges that arise in this disciplinary transition and demonstrates the value of integrating writing studies faculty members to support students in this process.

This case study highlights how this writing studies foundation, incorporating academic literacies and rhetorical and genre analysis, was used to develop a community of practice around communication within an engineering education PhD program. We show that this framework can provide different perspectives on challenges students face, as well as creating strong supports for students that complement existing programmatic elements.

Future work will include qualitative survey data collection related to student progress-to-degree after engaging in CommLab activities and interviews with engineering education PhD students to augment and extend these initial observations using empirical evidence. We also suggest that graduate programs consider how engineering education faculty might collaborate with technical communication faculty to develop and infuse writing activities into foundational EE graduate courses to grow students' awareness of the meaning-making structures and conventions in EER and how they influence argument structures and patterns in common EER genres.

## References


[1] A. Lin, "How Do Engineering Education Graduate Students Perceive and Negotiate Disciplinary Expectations in Academic Writing?," in *2022 ASEE Annual Conference & Exposition Proceedings*, Minneapolis, MN: ASEE Conferences, Aug. 2022, p. 41155. doi: 10.18260/1-2--41155.

[2] K. Cunningham, "Graduate Engineering Peer Review Groups: Developing Communicators and Community," in *2019 ASEE Annual Conference & Exposition Proceedings*, Tampa, Florida: ASEE Conferences, Jun. 2019, p. 32878. doi: 10.18260/1-2--32878.

[3] P. Lala, F. Langevin Harnois, G. El Boussaidi, C. Desrosiers, and C. Laporte, "Providing Sustainable Scientific Writing Support for Graduate Engineering Students by Creating a Local Scientific Learning Community," in *2018 ASEE Annual Conference & Exposition Proceedings*, Salt Lake City, Utah: ASEE Conferences, Jun. 2018, p. 30909. doi: 10.18260/1-2--30909.

[4] M. Mehrubeoglu *et al.*, "Writing as an URM STEM Community: Increasing Competitiveness and Success of Underrepresented Minority STEM Pre-tenure Faculty and Postdoctoral Researchers through Community Grant and Other Academic Writing Experiences," in *2023 ASEE Annual Conference & Exposition Proceedings*, Baltimore , Maryland: ASEE Conferences, Jun. 2023, p. 44441. doi: 10.18260/1-2--44441.

[5] B. Russell, A. Konstantinou, A. Abdallah, and F. Assanah, "Cultivating Scientific Communication Skills through Professional Development Course Series for the Graduate Curriculum," in *2024 ASEE Annual Conference & Exposition Proceedings*, Portland, Oregon: ASEE Conferences, Jun. 2024, p. 47099. doi: 10.18260/1-2--47099.

[6] M. Klassen and J. M. Case, "Productive tensions? Analyzing the arguments made about the field of engineering education research," *J. Eng. Educ.*, vol. 111, no. 1, pp. 214–231, Jan. 2022, doi: 10.1002/jee.20440.

[7] M. R. Lea and B. V. Street, "The 'Academic Literacies' Model: Theory and Applications," *Theory Pract.*, vol. 45, no. 4, pp. 368–377, Nov. 2006, doi: 10.1207/s15430421tip4504_11.

[8] M. C. Paretti, L. D. McNair, and J. A. Leydens, "Engineering Communication," in *Cambridge Handbook of Engineering Education Research*, 1st ed., A. Johri and B. M. Olds, Eds., Cambridge University Press, 2014, pp. 601–632. doi: 10.1017/CBO9781139013451.038.

[9] C. G. P. Berdanier, "Genre maps as a method to visualize engineering writing and argumentation patterns," *J. Eng. Educ.*, vol. 108, no. 3, pp. 377–393, Jul. 2019, doi: 10.1002/jee.20281.

[10] J. Lave and E. Wenger, *Situated Learning: Legitimate Peripheral Participation*, 1st ed. Cambridge University Press, 1991. doi: 10.1017/CBO9780511815355.

[11] E. Wenger, *Communities of Practice: Learning, Meaning, and Identity*, 1st ed. Cambridge University Press, 1998. doi: 10.1017/CBO9780511803932.

[12] National Postdoctoral Association, "NPA Core Competencies." [Online]. Available: https://www.nationalpostdoc.org/page/CoreCompetencies

[13] B. S. C. Kwan, H. Chan, and C. Lam, "Evaluating prior scholarship in literature reviews of research articles: A comparative study of practices in two research paradigms," *Engl. Specif. Purp.*, vol. 31, no. 3, pp. 188–201, Jul. 2012, doi: 10.1016/j.esp.2012.02.003.

[14] S. A. Crossley, D. R. Russell, K. Kyle, and U. R□mer, "Applying Natural Language Processing Tools to a Student Academic Writing Corpus: How Large are Disciplinary

Differences Across Science and Engineering Fields?," *J. Writ. Anal.*, vol. 1, no. 1, pp. 48–81, 2017, doi: 10.37514/JWA-J.2017.1.1.04.
[15] A. Hanson, P. Lindahl, S. Strasser, A. Takemura, D. Englund, and J. Goldstein, "Technical Communication Instruction for Graduate Students: The Communication Lab vs, A Course," in *2017 ASEE Annual Conference & Exposition Proceedings*, Columbus, Ohio: ASEE Conferences, Jun. 2017, p. 28932. doi: 10.18260/1-2--28932.
[16] A. Clobes and L. Wheeler, "SciComm: An Oral Communication Professional Development Program for STEM Graduate Students," in *2019 ASEE Annual Conference & Exposition Proceedings*, Tampa, Florida: ASEE Conferences, Jun. 2019, p. 33253. doi: 10.18260/1-2--33253.
[17] M. Artiles, H. Matusovich, S. Adams, and C. Johnson Bey, "Understanding the Investment of Underrepresented Minorities in Doctoral Engineering Programs," in *2018 ASEE Annual Conference & Exposition Proceedings*, Salt Lake City, Utah: ASEE Conferences, Jun. 2018, p. 31179. doi: 10.18260/1-2--31179.
[18] J. Cruz, M. Artiles, H. Matusovich, G. Lee-Thomas, and S. Adams, "Revising the Dissertation Institute: Contextual Factors Relevant to Transferability," in *2019 ASEE Annual Conference & Exposition Proceedings*, Tampa, Florida: ASEE Conferences, Jun. 2019, p. 33247. doi: 10.18260/1-2--33247.
[19] K. Elfer, A. Rynearson, N. Hicks, E. Spingola, and K. Fair, "Lessons Learned: Strategies for Creating and Mentoring Diverse Graduate Student Communities," in *2017 ASEE Annual Conference & Exposition Proceedings*, Columbus, Ohio: ASEE Conferences, Jun. 2017, p. 28624. doi: 10.18260/1-2--28624.
[20] N. Artemeva, S. Logie, and J. St-Martin, "From page to stage: How theories of genre and situated learning help introduce engineering students to discipline-specific communication," *Tech. Commun. Q.*, vol. 8, no. 3, pp. 301–316, Jun. 1999, doi: 10.1080/10572259909364670.
[21] J. Swales, *Research Genres: Explorations and Applications*, 1st ed. in Cambridge Applied Linguistics. West Nyack: Cambridge University Press, 2004.
[22] E. Wenger, Ed., *Learning in landscapes of practice: boundaries, identity, and knowledgeability in practice-based learning*. London ; New York: Routledge, 2015.
[23] K. A. Rockquemore, "Shut up and write," *Inside Higher Education*, 2010. [Online]. Available: https://www.insidehighered.com/advice/2010/06/14/shut-and-write
[24] C. G. P. Berdanier and J. B. Lenart, *So, you have to write a literature review: a guided workbook for engineers*, First edition. in Wiley-IEEE series. Hoboken, New Jersey: Wiley, IEEE Press, 2021.
[25] Center for Leadership Education, "Technical Communication Lab." Johns Hopkins Whiting School of Engineering, 2025. [Online]. Available: https://engineering.jhu.edu/cle/technical-communication-lab/
[26] Writing and Communication Center and the English Language Program, "Graduate Communication Survey Results 2023." MIT Comparative Media Studies | Writing, 2023. [Online]. Available: https://cmsw.mit.edu/communication-survey-2023/