Alumni Perceptions of Writing Transfer

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Introduction

In various ways, undergraduate engineering programs incorporate professional skill development into their curriculum or provide support and resources to develop these skills. The goal of this integration is to ensure graduates go into industry or graduate programs equipped to communicate effectively with the ability to work on teams to support projects and solve problems. The need for these skills is reflected in ABET Outcomes and by what employers indicate graduates need to succeed [1-3]. Despite these efforts, employers indicate that recent graduates may not possess the needed skills to communicate and collaborate effectively [4-5]. Furthermore, graduates may struggle to transition from academic to workplace settings. These challenges demonstrate the need to examine how engineering educators support professional skill development, understand the factors that influence the transition to the workplace or graduate work, and enable graduates to adapt their learning for these new contexts.

Given the goal of these efforts is to ensure graduates can communicate and collaborate effectively, a pressing question is how well do graduates transfer these professional skills into the workplace. However, transfer is rarely clear cut, a challenge that writing studies scholars have acknowledged [6]. Transfer does not occur if faculty just teach students how to write technical documents; research has demonstrated that whether a writer transfers writing knowledge is often a factor of context as well as influenced by writing experiences outside of formal education in addition to if writers have had opportunities to navigate different genres and contexts [7]. Finally, transfer may be facilitated by incorporating a focus on workplace writing in academic settings, but it also requires the writer to receive support and mentoring in the workplace, contributing to their ability to create their own strategies for acquiring the knowledge needed [7].

In this paper, we share our approach to professional skill development in an undergraduate materials science program, focusing on how writing support has been integrated into junior and senior-level project courses. We then present preliminary findings from an alumni survey and two small studies examining the experiences of novice professionals and experiences of teamwork. We conclude by proposing a more in-depth study to learn more about how novice professionals are transitioning into the workplace, to assess the impacts of the current pedagogical approaches, and determine changes to better support the transition from undergraduate program to workplace or graduate school.

Institutional Context

We began working at Boise State University in 2014 (HA) and 2015 (JM). The materials science faculty, HA, tried to incorporate writing and professional skills development on his own, but recognized that he didn't have the vocabulary, theory, or pedagogical practices to teach writing. Thus, he began collaborating with various professionals in writing, communication, and leadership to incorporate these skills, including writing faculty JM in 2017.

Since 2017, the approaches to writing support have evolved. Initially, JM came in for a series of workshops; however, research has shown this approach tends to be less effective for student learning [8-9], whereas more integrated approaches allow for situated learning to take place [10-

11]. After that initial semester, the materials science program opted to instead provide funding to buyout one of JM's courses, thus releasing 10% of workload to be able to work with HA and the department. Thus, we began collaborating, finding ways to integrate writing support into the project courses through a mix of direct instruction, consultations, and developing pedagogical materials. See [12] for more details about this integration.

Preliminary Findings

Overall, findings indicate that the professional skills preparation these students receive is supporting their careers beyond the classroom, though changes could improve their transitions. In this section, we provide a brief overview of the findings from three sources of data: a survey of alumni, a small study of novice professionals, and a small study focused on teamwork.

Alumni Survey

As part of a goal for continuous improvement, the materials science program implemented a alumni survey. The goal of the survey was to capture information about how graduates viewed the program and how prepared they felt. Surveys were distributed to 108 alumni who graduated from 2016 to 2023 and 18 responses were received, with at least one response from each year. The low response rate was likely because the survey came from the department as a whole, rather than individuals alumni had relationships with.

The survey consists of 28 total questions, generally using Likert scale questions or selections, with a few open-ended questions. The questions spanned a wide range, attempting to collect data on demographics, career path, further education, and current positions as well as questions about the materials science curriculum. For the purposes of this research, three questions were most relevant:

1. What forms of written communication do you regularly use?
   Choices are email, memos, reports, graphs, presentations, peer-reviewed publications, other
2. Did you feel prepared to use these forms of written communication in your career?
   Likert scale 1=Not to 4=very prepared
3. How do you compare your writing skills to those of your peers in your place of work?
   Likert scale 1=Less prepared to 4=More prepared than most of my peers

Overall, respondents felt prepared to use various forms of writing and rated their writing skills as high when compared to their peers. Table 1 summarizes their perceptions of preparation and competence relative to their peers. Almost all felt they were prepared or very prepared while one felt only somewhat prepared. How they consider their abilities in comparison with their peers shows they believe they are as skilled or better than their workplace peers. This appears consistent with their reported degree of writing preparation on graduation. An additional survey would be useful to determine the relative contributions of what they learned in school and on the job, as well as how the former supported the latter to inform how we may improve the curriculum.

Figure 1 summarizes the relationship between the genres or forms of writing alumni use and years of experience in the field. According to the survey, email was a primary form of communication that alumni engaged in, particularly if they are recent graduates. However, the data suggest that as alumni advance in their career, the more forms of writing they engage in. This finding might indicate that while novice professionals may not engage in a wide range of writing, as they gain experience and their responsibilities increase, writing and communication become a more significant part of their work. This experience is also reflected in descriptions of how employees experience growth and skill development in the workplace [5]. Novices may not begin writing robustly when they first transition into the workplace; however, to grow in their careers, they will need access to these skills and the ability to develop stronger competencies in these areas.

Table 1. Alumni perceptions of writing preparation in response to questions 2 or 3 above.

Self-Rating	Feel Prepared?	Compared to Peers?
1	0	0
2	1	0
3	4	9
4	13	9

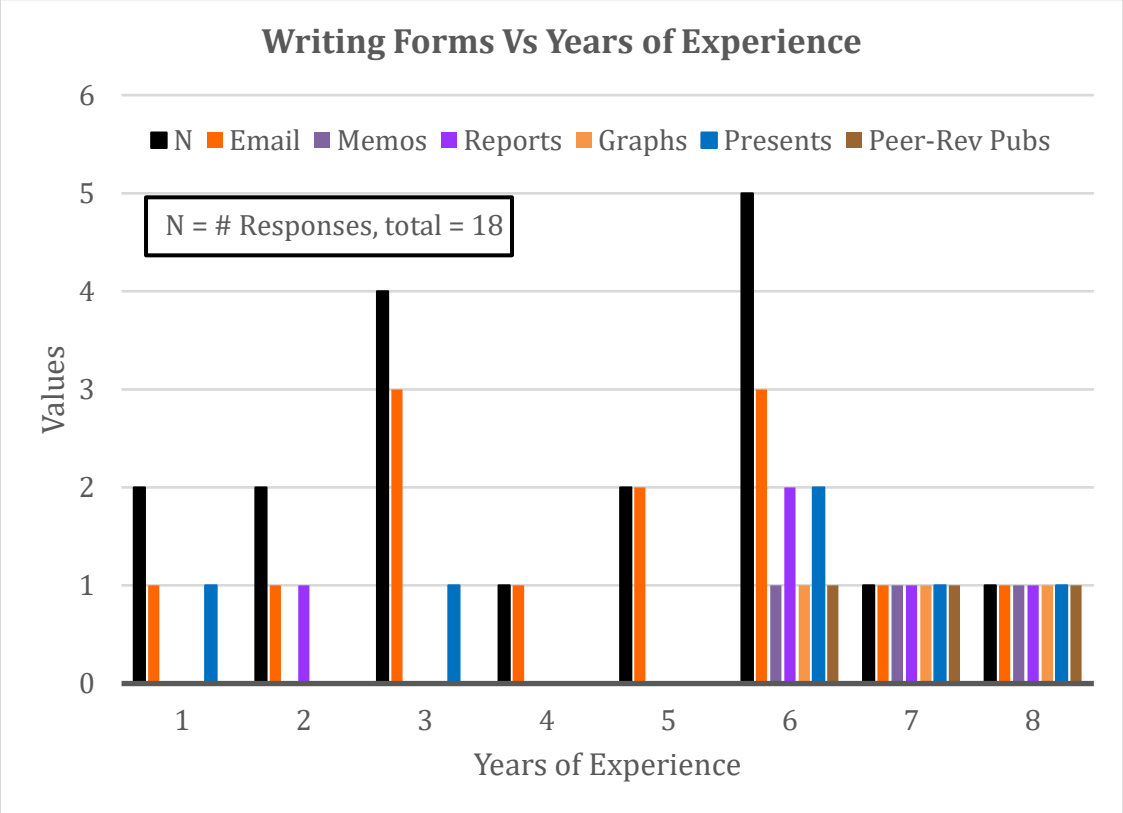

Figure 1. Number of respondents and their reported writing forms used over years of experience.

Study of Novice Professionals

In early 2020, JM participated in a multi-institutional research study investigating the transfer of writing skills beyond the university. See [13] for more details about the study and findings. For this study, five participants were recruited to engage in a series of two interviews, one focused on

collecting data broadly about each participant's writing experiences and a second examining a specific sample of recent workplace writing. Before scheduling the first interview, participants completed a survey that asked them to provide demographic data alongside perceptions of their writing and an overview of the genres they most frequently wrote both personally and professionally. Additionally, in the second interview, participants were asked to draw a representation of their writing process. All five participants in the JM's data set had graduated within the past five years from the same materials science program.

Since the focus of the study was on whether participants transferred writing knowledge from the university into the workplace, the data highlighted project experiences in the material science program, specifically in senior capstone. In the interviews, senior capstone –whether it was a positive or negative experience–was typically discussed as critical to their development as engineers, since this course covered a wide range of applicable technical and professional skills.

For some participants, senior capstone genres, particularly the report writing conventions, were deeply influential to their approach to workplace writing. However, for those less skilled with writing, transfer took the form of them falling back on familiar genres/formats they worked so heavily on in senior capstone. What this meant is that they transferred too directly, without considering the impact of context and how they should adapt the genres for their new rhetorical situations, leading to writing that was potentially less impactful and appropriate for the communication situation. On the other hand, the alumni with more expansive writing experiences were able to integrate senior capstone experiences into their overall approaches and thus seemed more adept at navigating new situations, even without robust mentoring.

Finally, the influence of mentoring (or the impact of its absence), emerged as a key finding in this data set and across the full study [13]. Some participants experienced robust mentoring that allowed them to receive support as they transitioned into the workplace, helping them grow confident in their ability to write and communicate effectively within the standards expected of them. However, other participants received little to no feedback, leaving them to draw upon their university and other writing experiences. For more confident and skilled writers, this meant a few missteps before they figured out how to ensure effective communication (e.g., one participant reported realizing that his emails were ineffective when they received no replies, so he pivoted his approaches). However, for less confident writers, this lack of mentoring led to a lot of uncertainty and hesitation when crafting communication.

Study on Teamwork

In a second study, the researcher sought to examine factors that led to more productive teamwork experiences, particularly focusing on the impact of bias (most frequently gender bias but also race). See [14] for more details about this study. While participants were recruited from a range of engineering programs, eight of the eleven participants were also recent graduates from the same materials science program or were currently enrolled in their senior capstone course, providing another data set to draw from in evaluating the efficacy of the program's approaches.

In this study, participants shared both positive and negative experiences on teams. In general, graduates from the materials science program highlighted their project courses as a space where they had positive teamwork experiences. While one factor was that the students were in a small

program and thus had strong relationships with many members of their cohort and ended up working with teammates they could trust, another factor was the support and training provided in the project courses by HA. Several participants called out this content specifically as influential.

Despite this support, graduates did encounter less positive experiences, typically resulting from either their peers not completing their work, or, at least once, from blatant racial and gender bias toward a participant. Women participants particularly highlighted that the most positive experiences occurred on women-only teams, though some did have positive experiences on mixed-gender teams as well. These participants were able to identify specific experiences that were the result of gender bias; occasionally, participants who were men were also able to identify forms of gender bias and how they attempted to mitigate that bias as well. Overall, the findings point to the logistical challenges that frequently occur in team projects in coursework, as well as bias related to identity, offering insights into what faculty could do to support positive experiences.

Limitations

For both the survey and the small studies, a key limitation is selection bias: the individuals most likely to complete the survey or engage in an interview-based study likely feel connected to the program and satisfied with their education. Thus, the data presented represents those most likely to have valued their time in the program. In addition, in the studies on writing and teamwork, most participants were confident, skilled writers and thus willing to talk about their writing and teamwork experiences because of their skills. However, in the study of novice professionals, two participants may have volunteered to participate because they hoped that the researcher would provide more writing support. Thus, the data presented here likely captures generally strong writers or those less confident in their skills, with few or no participants between the extremes.

Discussion & Next Steps

Given the range of experiences, courses, and projects alumni shared, a key finding is that professional skill development is not just about one class, project, or experience–instead, these skills are developed over the span of an education. Ultimately, the more a participant had to draw from, the stronger their professional skills, and the more they could expand. Several participants highlighted experiences not only in courses, but also undergraduate research, internships, writing center peer consultant work, among other experiences.

One of the advantages of the material science curriculum, however, is that students have more than a single course or semester to work on developing their writing, communication, and collaboration skills. Participants were clear on the value of writing and professional skills instruction and experiences within the project courses, and because JM and HA could spend up to three semesters working with a cohort, students were able to gain repeated exposure and opportunity to practice their skills.

Participants were explicit that they had areas they could have been exposed to while at the university. For example, one participant actively engages with multinational teams, but it was not until he was in that situation that he realized he did not have sufficient cross-cultural communication experience. This example highlights the challenges of context, however, since it is possible that the curriculum could have introduced cross-cultural communication

competencies, but without a space to practice and implement what they were learning, alumni would not retain or transfer that knowledge.

Thus, the central research question is how well does the current curriculum prepare graduates for writing after they graduate in graduate school or in the workplace? Related questions include understanding what writing novice professionals are doing most actively, what we can learn from the alumni that can be incorporated into the curriculum to account for the lag between industry innovation and academic approaches, and how new technologies/approaches are shifting the nature of workplace communication and collaboration. Taking these topics as a starting point, we then identified goals and questions, and determined if these topics were relevant and what method should be used to conduct research, summarized in Table 2 below.

Table 2. Methodology Brainstorming

Topic	**Research Goal**	**Questions to Ask**	**Relevance & Method**
Impact of curriculum	Assessment of current practices	How are you using what you learned? What experiences stuck? Senior project experiences–what has been most directly applicable? What do you wish you had done more of?	Relevant to research question Method(s): survey, interview
What alumni do now	Understand current industry practices; understand what future students may need	Which genres/formats are most used? What writing platforms/tools are being used? How were communication norms and practices shared with you? How many different audiences do you write for?	Relevant to research question Method(s): survey, discourse-based interview
New or emerging content to influence pedagogy	Understand what future students may need Make changes to curriculum to keep up with trends	What is currently a mismatch between pedagogy and industry practice? What do workplaces (etc) focus on that the university is lagging behind on?	Could emerge from findings, but shouldn't be the focus of this study

AI (emerging tech)	What's happening in the workplace (or graduate programs) around AI and other emerging technologies for writing	How are professionals using it? What are industry expectations? What policies (or lack of) are they working within?	Separate study
New knowledge on the job	Understand strategies that help novices learn Identify areas that novices will need to learn	What kinds of skills did you have to learn quickly? What helped you learn these skills? What would you tell a new employee? What would you tell a senior/current student that they should focus on?	Relevant to research question Method(s): Survey, discourse-based interview
Mentoring & support in the workplace	Understand the range of mentoring available for supporting novices	What kinds of support did you receive? What ways do you get feedback on your writing? Ideally, what kinds of support would have helped you? What recommendations do you have for your employer/graduate program to support new folks?	Separate study
What they wish they'd learned	Hindsight and reflection; identity potential gaps; share experiences with current students	What do you wish you had learned in school? What kinds of experiences do you wish you had had access to or participated in (e.g., undergraduate research, internships, projects in courses, etc).	Relevant to research question Method(s): Survey, interview

Based on this assessment, research methodologies would require a layered approach. The first is conducting a survey to capture the broad data about experiences and knowledge, using primarily Likert scale questions or questions that asked for selections rather than open-ended responses. The survey would allow researchers to get data from a wider range of alumni and to focus the questions on writing specifically, instead of educational experiences more broadly.

To date, the alumni survey sent out by the program has a relatively low response rate, likely because it comes from individuals the alumni had not engaged with frequently. To increase response rate, the faculty, who have a robust relationship with students, could send out the survey, including better explanations about why they should respond and why it matters. Additionally, the researchers should include some kind of incentive to increase participation rates. Finally, recruitment could take place on a range of communication platforms in addition to email, including social media and LinkedIn, where alumni would see the information. The program is small enough that alumni records are regularly updated and accurate, so the researchers can leverage that information to invite participants to engage.

However, surveys alone are not sufficient to gain information about the research questions, so a smaller sampling of alumni would be recruited from the survey to participate in an interview. Ideally, some of these participants would be able to share or describe examples of workplace writing they are currently engaged in. Interview questions could surface their experiences of the transition from classroom to workplace or graduate school, what genres they actively write, and what they did not know and how they obtained that knowledge. These interviews would allow the researchers to hear the stories that could provide richer data to complement the survey responses.

Conclusion

Ultimately, our goal is to not only assess the efficacy of pedagogical approaches in the undergraduate materials science program, but to also add to the transfer scholarship and contribute to engineering education. Future research will allow us to elicit more narrative information, including collecting specific types of writing, to understand the pathways that allow alumni to transfer their writing knowledge from the classroom to the workplace or into graduate programs. Another question to consider is how career development occurs over time. If alumni begin their career doing less writing and then build that skill over several years, what might that mean both for transfer of writing beyond the university and for what engineering educators should do to prepare these individuals to take the long view of their professional development? This preparation might then focus on how to learn more, how to build mentoring networks, and how to engage in professional development as a lifelong learner. These findings may then indicate a need to shift the pedagogical focus from specific genres and writing skills. Instead, engineering educators can focus on providing opportunities for graduates to develop the dispositions to navigate new learning situations and building metacognitive skills to allow them to adapt what they know to what their new situations need.

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