

A Degree is Not Enough: Promoting Engineering Identity Development and Professional Planning through the Teaching of Engineering Résumé Writing

Catherine G.P. Berdanier
The Pennsylvania State
University
cgb9@psu.edu

Mary McCall
Purdue University
mccall0@purdue.edu

Gracemarie Mike
Rowan University
mikeg@rowan.edu

Abstract—Undergraduate engineering students are often taught to create their engineering résumés early in their academic careers as part of first-year composition or technical writing classes. Often, these classes are not taught by engineering faculty, and few resources exist for engineering-specific résumé development. A corpus of 31 engineering résumés was collected, representing engineers across experience levels and engineering fields and analyzed through genre analysis methods in order to understand the linguistic mechanisms by which engineers present the merit of their work in a condensed résumé format in order to develop an intervention to help instructors of technical writing and first year engineering develop engineering résumés in a disciplinary context. The intervention facilitates student reflection on authentic engineering résumés leading them toward their own learning regarding effective presentation of engineering experiences on a résumé, as well as to encourage engineering students to plan effectively for the experiences that will help them achieve their desired careers.

Keywords—*engineering résumés; communication; professional development*

I. INTRODUCTION

According to the National Academy of Engineering, the “Engineer of 2020” has “strong analytical skills” in addition to being adept in leadership, innovation, professionalism, and communication, among other traits [1, p. 53-57]. Similarly, ABET guidelines specify that engineering programs must prepare students to be able to apply mathematical, scientific, and engineering concepts, to design and conduct experiments, to analyze data, and to be able to use modern engineering tools, among other technical competencies. Communication is also strongly encouraged since the same guidelines stress how students must be able to participate in multidisciplinary teams, work ethically, and have “an ability to communicate effectively,” among other traits [2].

The venue by which engineers first convince their employers of these abilities is through their résumé. Unfortunately, many engineers only receive formal guidance for their engineering résumés in technical writing courses or through internet resources, usually extrapolating résumé advice meant for general or business audiences to their

engineering context. Without strong examples for engineering résumés, technical writing instructors and students may be both unaware of innovative ways to present engineering competencies, and may not be exposed to potentially important activities that they should include on engineering résumés. In order to effectively articulate their engineering abilities and craft a professional engineering identity through such a document, though, students need to learn the types of communication tasks they will be expected to undertake within their respective industries.

II. LITERATURE REVIEW

There is significant literature within business and technical communication and engineering education that focuses on the kinds of writing that students do in terms of the classroom—either in communication courses or major engineering courses linked to communication ones—to help them better understand disciplinary genres and expectations and thus hopefully become more prepared for workplace types of writing. A popular approach to facilitating this type of work is through situated learning. Situated learning is often used by instructors teaching rhetorical writing practices to help students prepare for the transition from classroom to workplace writing. In her study of the writing assignments within a Chemical Engineering Lab and Chemical Process Design course, Herrington [3] concludes that writing can introduce students to disciplinary contexts, but that this practice can become difficult when students shift from a school community to a professional one. Thus, students and instructors need to work collaboratively to create a community in which to learn disciplinary conventions [3, p. 354-357].

Paretti’s [4] analysis of students’ communication skills via situated learning outcomes focuses on how instructors need to be critically conscious of the social actions that genres have to communicate both the “how” and the “why” of these documents as well as their differences across classroom and workplace contexts (p. 500). Similarly, Artemeva, Logie, and Jennie [5] also take up genres and situated learning to analyze how instructors can use assignments to facilitate the transition from an academic to workplace environment. On the whole, Artemeva et al. seem to favor communication courses that are

connected in some way to content courses so that assignments in the former can have direct connections to the latter by allowing students to “negotiate meaning and promote learning” (p. 313) through both sets of classes and to build on this learning through scaffolded assignments.

Combining or linking communication and engineering courses cannot take place without critically articulating the academic and professional connections between them. As Sullivan and Kedrowicz [6] make clear, both communication and engineering instructors need to acknowledge the stereotypes that can accompany their respective fields given the metaphors of “hard science” and “soft skills” (p. 598). Simply combining the courses without also directly addressing these dichotomous (and gendered) metaphors could potentially lead to students resisting non-technical instruction and seeing such material as a distraction from the “true” content of the course—engineering [6,7]. If engineering faulty circulate narratives that writing is a “distraction” or is “bad” or “boring,” students will pick up on these and potentially dissociate writing from a professional engineering identity [8, p. 108]. Such an association not only harms the development of critical communication skills, but also contradicts ABET and other institutional guidelines about the importance of communication skills for engineers.

In addition to creating a “dialogic environment” [5, p. 313] between communication and content courses as well as between classroom and workplace spaces, the relationship between writing and professional identity is also stressed within the literature about “novice” and “insider” perspectives about engineering workplace genres. Manuel-Dupont [9] discusses how students’ approach to writing should reflect their appreciation of “how they will be disseminating information to various audiences as a practicing engineer” (p. 39) and Wheeler and McDonald [10] advocate how students must be shown how writing is “in a strong sense, the presentation of themselves as professionals” (p. 485). Artemeva [5] connects these ideas to genre learning by describing how agency, cultural capital, domain content expertise, formal education, private intention, understanding of the improvisational qualities of genre, and workplace experiences all contribute to “the formation of professional genre knowledge” (p. 172). Instructors must appreciate how rhetorical awareness of this genre is a continuum from “novices” to “experts” in the field and only becomes further enriched as students increasingly gain more professional experience [11, p. 258].

Consequently, our résumé analysis reflects the trajectory that an engineering identity can take the more one professionalizes in their industry. We stress that students can prepare for and more effectively articulate their evolving professional identities by critically applying the range of rhetorical moves available to them via résumé writing.

III. THEORETICAL FRAMEWORK

Wenger [12] offers a helpful theoretical approach to identity formation through his research on communities of practice, which defines identity as the fulcrum between the

individual and the collective, positing that the collective and the individual are not diametrically opposed in the concept of identity, but that they “enhance” each other through the intermingling of the two. Identity is shaped by one’s engagement with their communities of practice, which can range from the home to the workplace as well as within academic disciplines, sports teams, clubs, and other social interest groups. To better understand the processes of learning and identity formation that can take place as individuals encounter and interact with different communities of practice, Wenger [12] describes three distinct modes of belonging: engagement, imagination, and alignment (p. 173-174). Engagement involves the relationships, interactions, and practices that one undertakes in the negotiation of meaning within community work. Imagination considers the images that members can have of themselves, their world, and their past and future. Alignment describes the synchronization of members’ energies, actions, and practices to their respective communities of practice. These modes do not exist in isolation, but work together to balance each other’s potential drawbacks.

Almost 20 years later, Wenger-Trayner, Fenton-O’Creevy, Hutchinson, Kubiak, and Wenger-Trayner [13] expound upon this work by considering how the “body of knowledge” of a professional cannot be confined to a single community of practice alone. Rather, they coin the concept of a “landscape of practice” that consists of “a complex system of communities of practice and the boundaries between them” (p. 13). An engineering landscape of practice, then, includes not on the industries and professions of its various sub-disciplines, but also its research, teaching, regulations, associations, and more. Furthermore, Wenger-Trayner et al. [13] clarify that a professional within any community within a larger landscape of practice must have competence—a “mix of personal experience and accountability”—of their particular field, which is not only individually attained, but also socially recognized by the other members of that community (p. 14). And yet, competence, which is ascribed to a single community of practice, should not be conflated with knowledgeability, which “manifests in a person’s relations to a multiplicity of practices across the landscape” [13, p. 1]. Such a concept can be tied back to résumé-writing in the sense that engineering students should not only convey their particular competencies of their particular discipline, but should also demonstrate their knowledgeability of the field, which makes them “recognizable as reliable sources of information or legitimate providers of services” [13, p. 23] to more established engineering professionals.

IV. METHODS

A. Participants and Recruitment

A corpus of engineering résumés was collected through snowball sampling methods [14]. We sent a recruitment email to the division chairs of within the American Society for Engineering Education (ASEE), and requested that they forward our research request email text to the members of their division. We selected this venue because the ASEE

community is comprised of researchers and practitioners that have access to the engineering professional and educational communities, and promote research for the development of future educational innovations. The recruitment email text included our research purpose as well as a link to an online survey, where participants were asked some short demographic and basic questions on the perceptions of educational preparation for undergraduate engineering students, and were instructed to upload a copy of their most current engineering résumé. The recruitment text also asked participants to forward the study request to other engineers or engineering students in their professional or personal networks. We did not quota sample for gender, experience level, or engineering discipline. A total of 125 people responded. After the data were cleaned for missing responses and the participants who uploaded their curricula vita (CV) instead of résumés were removed from the data set, a final total of 31 résumés covering a variety of educational and experience levels were used to characterize aspects of engineering résumés.

B. Analysis and Prior Work

First, the résumés were sorted according to an existing rubric, developed by the College of Engineering at the University of Iowa [15] in order to determine which résumés were of strong, moderate, and weak quality. While most of the rubric is specific and precise, the section characterizing use of disciplinary language is vague and leaves much to the interpretation of engineering students and others using the tool. To modify the disciplinary discourse component of the rubric in prior research [16] the American Association of Engineering Societies' Engineering Competency Model [17] was used to qualify and quantify disciplinary discourse employed in an engineering résumé, positing that the use of the combination of may promote stronger methods for teaching the use of engineering discourse and rhetoric to engineering students [16].

The purpose of this particular work in progress is to use the results of our prior work to develop and ultimately test an intervention that helps undergraduate engineering students write and identify characteristics of strong rhetoric within engineering résumés, and also develop a sense of engineering identity in planning what types of engineering experiences, internships, co-ops, and leadership activities are strongly desired in engineers. This paper outlines an intervention that the authors developed to promote this reflection within the context of résumés developed from those of other engineers (student and practitioners), then turning the discussion to help students identify what they would like their résumé to look like at the end of their undergraduate program. Ideally, this intervention would be targeted toward first year engineering students either in an introduction to engineering or a technical writing course, where résumé writing would already be in place. We have used prior research results to develop the intervention we describe here, and are currently planning the pilot testing phase for Fall 2016. We envision a large scale intervention study that will be conducted using pre-and post-tests of student résumé quality before and after an intervention

paired with a workshop. The intervention will be recorded through focus group methods, so that the discussion between students can be recorded. Post-intervention interviews with individual students will further characterize the engineering students' ideas regarding characteristics of strong engineering résumés as well as their (potentially changed) ideas on the experiences they will pursue as part of their undergraduate engineering career.

V. INTERVENTION: ENGINEERING IDENTITY DEVELOPMENT THROUGH ENGINEERING RÉSUMÉS

A. Pre-Intervention Discussion

Before the intervention, the instructors will rate each engineering student's résumé according to the résumé rubric and Engineering Competency Model [17] as discussed from the first part of the research to establish a pre-test score for each participant. Then, the first part of the introduction will be an instructor-led discussion of the role of rhetoric and rhetorical strategies in engineering résumés, including but not limited to: Word choice, design, inclusion of specific disciplinary discourse, and inclusion of engineering projects and experiences, as well as appropriate ways to "show" instead of "tell" the audience (a prospective employer) one's engineering expertise. Students may be familiar with some of the topics, but this background should convince students that each entry on an engineering résumé holds rhetorical power over the reader that should be maximized. In other words, the specific language used can either convince a prospective employer to select or dismiss the résumé, hiring a different candidate instead. The immediate applicability of the content can be harnessed to motivate student interest and dialogue.

B. Description of the Intervention

The intervention is designed to be conducted in small groups of between four and six engineering undergraduate students. In each of four "rounds," the students will spend 10 minutes discussing the content, design, and style of two résumés, ultimately deciding which is better, and which résumé shows a strong engineer. The rounds are scaffolded to have more obvious differences in the earlier rounds, and have subtler differences holding multiple levels of ambiguity in later rounds. Résumés selected to be used in the intervention will be modeled closely on selected résumés collected and analyzed in the prior research, but de-identified and given gender-neutral names (e.g. Jamie, Taylor, Pat, Charlie, Riley) to avoid gender bias in résumé assessment.

1) Round 1: "Strong" undergraduate engineering student résumé vs. "Weak" student résumé

The goal of this round is to help students practice implementing critical reasoning as it applies to résumé content, design, and style. Students are expected to easily select the strong résumé as the clear winner of this task, on the basis of use of engineering language, inclusion of specific content "showing" not "telling" engineering experience and potential, and the aesthetics of the résumé design. Other topics of conversation include how the linguistic style of the "weak" résumé could be improved to make it more legitimate in the

eyes of an engineering employer, or what activities could make this person more appealing to engineering employers.

2) *Round 2: "Strong" undergraduate engineering résumé with "strong" engineering graduate student résumé*

The purpose of this round is to help students develop an appreciation for the breadth of activities that can be a part of the successful educational experience for engineers, including undergraduate research, co-op programs, engineering internships, and research programs. The conversation deciding which résumé is stronger should be centered on the use of engineering discourse and the amount of engineering experiences held after several years of engineering education. Furthermore, language used should represent more authority and responsibility for project management as well as familiarity and ownership of engineering discourse.

3) *Round 3: "Strong" early career engineering résumé vs. "Weak" early career engineering résumé*

The objective of this round is for students to come to the conclusion that even adults working as professional engineers may not be appropriately communicating their engineering expertise through their résumé. Students will likely critique the style and design choices of the engineers represented through the résumés, but may arrive at the conclusion that for practicing engineers already employed, the demonstration of engineering expertise through the content and language may be more important than the design of the document, but that strong engineering résumés will excel in not only content, but design and language styling as well. Students may note how the "weak" résumé could be improved to be more competitive, including simple changes in word choices or aesthetic design.

4) *Round 4: "Strong" professional engineering résumé vs. "Strong" professional engineering résumé.*

This final round of the intervention pits two strong professional engineering résumés against each other. There may be many differences between the two, even though they are both strong. This will lead the students to begin to understand that the more complex the roles held by engineers throughout their career the longer and more flexible the categories and format of the résumés may be. In terms of engineering rhetoric and professionalism, as well as engineering identity, the students will realize that the "rules" are adaptable, and really support the fact that a "strong" résumé is one that best presents one's expertise to the audience at hand. Therefore, there may not be a clear winner, and personal preferences for design and style may come in to play, which is an authentic issue in the design of any résumé.

C. *Post-intervention Workshop*

After the intervention, the engineering students will workshop their engineering résumés, critiquing them through the lens they have been using to evaluate the other engineering résumés. A post-intervention score will then be assigned to their final résumés. After the résumés are turned in, each participant will be interviewed in order to ask them about future professional development plans and what activities they intend to pursue in order to develop their "ideal" résumé that

they would like to have at the end of their undergraduate careers in order to achieve their ideal engineering career.

VI. ANTICIPATED RESULTS

Based on this intervention, we anticipate several outcomes toward professionalizing students. First, we expect that students who participate in this intervention will gain a stronger awareness of the rhetorical nature of résumé writing. That is, students will come to understand résumés not as neutral recordings of their experience but rather as an intentionally-designed document which aims to persuade potential employers of their skill level. Based on this knowledge, students will begin to understand the characteristics, in terms of both content and verbal and visual design, that help to distinguish weaker and stronger résumés. Though the pre-intervention discussion and intervention activity, students will discern that there are multiple approaches to "good" résumé design and that, as writers, their goal is to select the approach that will best portray their qualifications to their readers.

Ultimately, this intervention will result in students gaining a better understanding of the types of professionalization activities that will enable them to develop identities as competent engineers. Through analysis and discussion, the authors anticipate that students will identify gaps in their experience in comparison to the skills exhibited in stronger résumés and make plans to fill in these gaps through professionalization experiences. We also anticipate that students will gain proficiency with verbally portraying their experiences in order to maximize readers' understanding of the expertise they have gained.

REFERENCES

- [1] National Academy of Engineering. *The Engineer of 2020: Visions of Engineering in the New Century*. Washington, D.C.: The National Academies Press, 2004, ch. 4, pp. 53-57.
- [2] ABET 2015 Standards. (2015). *Criteria for Accrediting Engineering Programs, 2016-2017*. [Online]. Available: <http://www.ieee.org/documents/ieeecitationref.pdf>
- [3] A.J. Herrington, "Writing in Academic Settings: A study of contexts for writing in two college chemical engineering courses," in *Research in the Teach. of Engl.*, vol. 19, no. 4, pp. 331-361, 1985.
- [4] M.C. Paretti, "Teaching communication in capstone design: The role of the instructor in situated learning," in *J. Eng. Edu.*, vol. 97, no. 4, pp. 491-503, 2008.
- [5] N. Artemeva, "Stories of becoming: A study of novice engineers learning genres of their profession," in *Genre in Changing World*, C. Bazerman et al., Eds. Fort Collins, CO: The WAC Clearinghouse and Parlor Press, 2009.
- [6] K.R. Sullivan and A.A. Kedrowicz, "Gendered tensions: Engineering student's [sic] resistance to communication instruction," in *Equality, Diversity, and Inclusion: An Internat. J.*, vol. 31, no. 7, pp. 596-611, 2012.

- [7] D.P. Dannels, "Learning to be professional: Technical classroom discourse, practice, and professional identity construction," in *JBTC*, vol. 14, no. 1, pp. 5-37, 2000.
- [8] S. Read, "The negotiation of writer identity in engineering faculty-writing consultant collaborations," in *J. of Writing Research*, in vol. 3, no. 2, pp. 93-117, 2011.
- [9] S. Manuel-DuPont, "Writing-across-the-curriculum in an engineering program," in *J. Eng. Edu.*, vol. 85, no. 1, pp. 35-40, 1996.
- [10] E. Wheeler and R.L. McDonald, "Writing in engineering courses," in *J. Eng. Edu.*, in vol. 89, no. 4, pp. 481-486, 2000.
- [11] J.A. Leydens, "Novice and inside perspectives of academic and workplace writing: Toward a continuum of rhetorical awareness," in *IEEE Transactions on Profess. Comm.*, vol. 51, no. 3, pp. 242-263, 2008.
- [12] E. Wenger, *Communities of practice: Learning, Meaning, and Identity*. Cambridge: Cambridge University Press, 1998.
- [13] E. Wenger-Trayner et al., Eds., *Learning in Landscapes of Practice: Boundaries, Identity, and Knowledgeability in Practice-Based Learning*. London: Routledge, 2015.
- [14] A. Koerber and L. McMichael. "Qualitative sampling methods a primer for technical communicators." In *JBTC*, vol. 22, no. 4, pp. 454-473, 2008.
- [15] University of Iowa College of Engineering. (2015). *Engineering Professional Development Career Resource Manual*. [Online]. Available at: <http://www.pageturnpro.com/University-of-Iowa-College-of-Engineering/67540-Career-Resources/default.html#page/1>
- [16] Authors (unpublished). *Résumés in the Development of Undergraduate Engineering Identity: A Genre Analysis with Teaching Implications*. Abstract accepted to *IEEE Transactions on Profess. Comm.*, 2016.
- [17] American Association of Engineering Societies. (2016). *Engineering Competency Model*. [Online]. Available: <http://www.aaes.org/model>