

Engineering Students' External and Internal Frames of Reference for the Construction of Professional Identity

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Introduction

Engineering education can be seen in part as a process of acculturating students into the world of professional engineering practice. An essential component of this acculturation process is students' construction of their professional identities, a social and a personal process by which they learn to situate their own knowledge, interests, and sense of self within the larger context of professional engineering. In doing so, students learn to find their place among a community of practitioners.

Current research suggests that professional identity can be formed through a variety of common experiences: internships and co-ops, group work, and other social activities. The student's relative success in constructing a professional engineering identity, however, can be a powerful influence and a determining factor in their retention in engineering programs, their learning, and their adaptation to the workplace.

Engineering students may not be able to build a coherent sense of their professional selves when such identity construction is treated as an epiphenomenon of existing educational experiences rather than a pedagogical goal in itself. Just as students need their learning made visible in active learning activities, they also need our support to make the transition from being a student to being an effective member of a professional community of practice (Lappenbush and Turns, 2007).

The goal of this study is to investigate individual student's approaches to constructing an engineering professional identity. Participants engaged the explicit task of constructing professional identity through the creation of a professional portfolio, which could include artifacts from a variety of sources including coursework, internships and co-ops, volunteer work, etc. The research questions driving this study are as follows:

- Are students capable of purposively constructing professional identity?
- How do engineering undergrads approach the task of constructing professional identities?
- What challenges do students face when they attempt this task?
- How can we better support them, wherever they are in their academic process?

The remainder of this extended abstract is structured as follows. First, the nature of professional identity and identity construction are briefly reviewed. Several studies in the formation of engineering identity are then reported. We next describe our study procedures. Finally, we report the emerging findings of this ongoing study and unpack their implications for how we can better support engineering students in their attempts to construct an effective and authentic sense of self within the professional engineering context.

The Nature of Professional Identity

For the purposes of this study, identity construction is seen as an iterative process involving interaction between the self and the social environment (Roth, 2004). As individuals, we continually construct and refine identities by reconciling our own experience of self with

feedback from family, peers, institutions, and society at large. This discursive process results in the construction of identity “narratives,” complex accounts of who we are as people and as members of the various social groups to which we are associated (Sfard and Prusak, 2005). From this perspective, identity is constantly in flux as we engage new contexts and as the norms and values of social groups change around us.

Gee (2001) proposes four general perspectives on identity, each of these perspectives describing the relationships which stimulate the construction and revision of identity:

- Affinity-identity: reflecting the traits of a group to which we belong or wish to belong
- Institution-identity: reflecting a designation by a particular organization
- Discourse-identity: reflecting ideas and interactions in the environment
- Natural-identity: reflecting our innate cognitive/behavioral traits and physicality

Professional identity can be seen as a combination of Gee’s identity perspectives that is organized around the perceived norms and values of a professional role. Professional identity for engineers may include affinity identity with engineering as a whole as well as with particular disciplines and roles, institutional identity that can include place of employment and place of education, discourse identity built from recurring interactions with others, and natural identity built around innate traits such as problem-solving ability or appreciation of design aesthetics. These types of identity interact to form the individual’s narrative sense of self as a professional engineer.

Research suggests that engineering students construct some elements of professional identity during their time at the university. Tonso (2006a) describes how engineering students create/acquire campus engineering identity through cultural forces amongst students and faculty. Foor et al. (2007) suggest that students’ ability to see themselves as part of “this whole engineering group” is particularly challenging when gender, ethnicity, and socio-economic status are involved. For these students, there may be institutional and social roadblocks to their efforts to build their engineering identities during their time in school (O’Connor et al., 2007). Both Tonso (2006b) and Dannel (2000) pinpoint a number of opportunities where students grapple with their professional selves in coursework and extra-curricular activities, although the exigencies of the classroom may keep students more focused on grades rather than the potential realities of professional practice.

For engineering students, professional identity formation can also be seen as involving the ongoing construction of “possible selves.” Markus and Nurius (1986) describe these identity constructs consisting of “individuals’ ideas of what they might become, what they would like to become, and what they are afraid of becoming.” Ibarra (1999) suggests that possible selves are closely tied to sense-making, motivation, and performance:

“In observational learning, possible selves guide social comparison choices and help people develop particularized and individualized guides for action. As concrete knowledge of what is possible and desirable to achieve, they direct attention to certain role models among those available and help people identify what behaviors and attitudes to acquire from them. In experiential learning, when people adopt the demeanor associated with the roles to which they aspire, they are in effect creating possible selves. Finally, possible selves serve as benchmarks for interpreting and judging one’s own behavior.”

Professional identity construction can then be seen as a response to a multiplicity of factors, including interactions with family, peers, faculty, and employers; all of which can contribute to the production of “professional engineer” possible selves. In the next section, we describe our study in which we engaged students with the task of describing themselves as

professional engineers, conducted with an eye toward a better understanding of how engineering undergrads construct professional identity.

Engaging Professional Identity Construction Explicitly

Students can certainly engage the process of constructing professional identity at any point in their educations. Based on our previous work in this area, however, we believe that students would benefit from structured opportunities that help bridge educational experiences with the professional context. A crucial component needed for the design of such experiences is a better understanding of how students engage professional identity construction. This paper reports findings from a study in which engineering students grappled with the identity construction process explicitly during the production of a cross-curricular professional portfolio. During this activity, students were to create a portfolio with artifacts from a wide variety of sources, with two stated objectives in mind: 1) To convince others that they were ready for professional practice and 2) to communicate “what makes you stand out as an engineer.”

Participants were 36 undergraduate students from a variety of engineering disciplines, who ranged in academic standing from freshman to 5th year. In this study, they attended four 90-minute workshops where they were given simple instructions for creating the professional portfolio and were given opportunities to peer review one another’s work. Between workshops, the participants wrote a professional statement in which they made claims about their readiness for engineering practice, selected 5 artifacts which represented their best work, and annotated each artifact with a short description and an explanation as to why the artifact was notable.

Currently, we have completed the workshops and collected data in the form of survey responses, workshop observation notes, and interviews with a subset of participants. The results from four online qualitative surveys administered during the workshops are being analyzed via qualitative thematic analysis for indications of students’ engagement with professional identity construction. The following section presents current results emerging from the analysis of the survey data as well as observations of students in the workshops.

Emerging Results

It was our goal to investigate students’ existing approaches to constructing or refining their own professional identities. The first four themes, which have emerged from our data analysis, describe students’ fundamental orientations to this task. The fifth theme describes a challenge faced by many students: incorporating a new vision into their currently evolving selves. The final two themes highlight elements that affected the students’ overall engagement with the task.

- 1) **Purposefully constructing professional identity.** Students went beyond simply documenting their achievements and actively engaged topics related to their professional identities including preferences, goals, interests, and their fit in the engineering profession. This was evidenced in part by the many challenges they described when attempting to condense their educational and life experiences into the limited confines of the portfolio.
- 2) **External frame of reference for professional identity development.** Some students framed issues related to professional identity in terms of what they thought an employer/recruiter would expect to see. This finding was somewhat expected given how the portfolio activity was described. Students frequently discussed the hiring process and their perceptions of what it would be required. They selected materials that would demonstrate their engineering skills “in the best light possible.” When describing challenges, participants using this frame of reference struggled with demonstrating their professionalism and their breadth of experience. For these participants, their

professional identities were based in particular professional abilities and the interface of those abilities with the demands of the workplace.

- 3) **Internal frame of reference for professional identity development.** Many participants also described an inwardly directed process of self-discovery. Using language such as “going deep into myself,” they examined their own strengths, personal interests, and goals. Participants using this frame of reference tended to use more emotion-laden language. When describing challenges, these participants also struggled with presenting a more holistic vision of themselves. For these participants, their approach to constructing professional identity reflected a need for an authentic presentation of self.
- 4) **Combining frames.** While external and internal frames of reference have been described as separate and distinct, participants often used some combination of the two in their process of creating professional identity. In some cases, there was a temporal component with students beginning the process using extrinsic language and then incorporating more intrinsic language as they completed the portfolio. Other participants used a combination of extrinsic and intrinsic language from the beginning.
- 5) **Managing multiple identities.** Participants described challenges with reconciling a professional vision of themselves with pre-existing identities based on academic standing, personal interests, and family background. In many cases, these challenges manifested as participants attempted to construct a well-rounded vision of themselves rather than a “one-sided” vision that was focused solely on their attributes as an employee.
- 6) **A new approach to constructing themselves as professionals.** When asked about their previous experience with professional portfolios, participants named a number of activities that they felt had similar qualities, including writing resumes, cover letters, and applications for college programs. Yet participants also described this current task as qualitatively different – especially in terms of framing specific activities (course projects, internships) in terms of professional ability and future professional role.
- 7) **A multiplicity of futures.** When asked about future plans, participants in this study intended to work in industry as engineers, go to graduate school, or pursue other career tracks. Participants also varied on the specificity of their future plans, ranging from “no idea” to specific positions at specific companies. A high incidence of participants planning graduate education in this study resulted in a stated uncertainty about the nature or purpose of professional identity in that context.

Concluding remarks

At this point in the research, we find our results both provocative and intriguing. Students in this study engaged in thoughtful consideration about themselves as engineers. They turned to ideas about external expectations and conditions to shape their professional selves. This approach may seem a natural outcome of the study procedures, given how the task of building a professional portfolio was described to participants. But a number of them also turned inward to construct an intrinsically new sense of self as professional engineers, discovering and/or refining abilities, preferences, and goals.

Each of these approaches has its own implications for engineering education. In terms of those with external frames of reference, how are students scaffolded to meet professional norms/expectations in their coursework? In an especially poignant moment in the workshops, one student expressed his chagrin at only being able to find two artifacts out of all of his coursework that he thought would be of acceptable quality to show to potential employers.

In terms of those students with internal frames of reference, at what point are they given the opportunity to reflect in a structured setting on their relation to professional practice? Are these students currently given feedback in terms of their specific contributions to the profession? A number of students expressed that the study activities “got me to think” about themselves in a way that was new to them. How can we provide such opportunities as part of their core education?

In the full paper, we will report the final results of our investigation into students’ construction of professional identity. The paper will include a further explication of the identity literature related to professionalization, results from a second-level analysis that more deeply situates the findings in the identity literature, a delineation of the themes included in this abstract through excerpts from specific survey responses, and additional themes rising out of further data analysis. We will also unpack some of the implications of our results, including the use of professional portfolios as one means to support students as they transition to the professional engineering context.

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Bibliography

- Dannels, D. (2000). Learning to be professional: technical classroom discourse, practice, and professional identity construction. *Journal of Business and Technical Communication*. 14(1): 5-37.
- Foor, C., Walden, S., and Trytten, D. (2007). “I wished I belonged more in this whole engineering group:” achieving individual diversity. *Journal of Engineering Education*. 96(2): 103-15.
- Gee, J. (2001). Identity as an analytic lens for research in education. *Review of Research in Education*. 25: 99-124.
- Ibarra, H. (1999). Provisional selves: experimenting with image and identity in professional adaptation. *Administrative Science Quarterly*. 44(4): pp. 764-791
- Lappenbusch, S., and Turns, J. (2007). What portfolio construction efforts reveal about students' search for engineering identity. ASEE 2007 Annual Conference & Exposition, Hilo, HI.
- Larson, G. and Pepper, G. (2003). Strategies for managing multiple organizational identifications: a case of competing identities. *Management Communication Quarterly*, 16(4): 528-557.
- Markus, H. and Nurius, P. (1986). Possible selves. *American Psychologist*. 41(9): pp. 954–969.
- O'Connor, K., Amos, D., Bailey, T., Garrison, L., Lichtenstein, G., Loshbaugh, H., Jones, M., Seward, D., Perhamus, L., Stevens, R. (2007). Sponsorship: engineering's tacit gatekeeper. In *Proceedings of ASEE 2007 Annual Conference*.
- Roth, W. (2004). Re/making identities in the praxis of urban schooling: a cultural historical perspective. *Mind, Culture, and Activity*. 11(1): 48-69.
- Sfard, A. and Prusak, A. (2005). Telling identities: in search of an analytic tool for investigating learning as a culturally shaped activity. *Educational Researcher*. 34(4): 14-22.
- Tonso, K. (2006a). Student engineers and engineering identity: campus engineer identities as figured world. *Cultural Studies of Science Education*. 1(2): 273-307.
- Tonso, K. (2006b). Teams that work: campus culture, engineer identity, and social interactions. *Journal of Engineering Education*. 95(1): 210-229.