Establishing a Baseline and Future Plans for Exploring Engineering Community and Identity

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Executive Summary Introduction

To make meaningful change in First-Year Engineering (FYE) courses related to pathways through 2- and 4-year colleges, change must be informed by research that identifies the impact of structure, content, and timing on engineering community and emerging engineering identities. To understand and manage change, researchers have classified FYE structures with respect to content areas and institutional policies for admittance into engineering majors (e.g. [1]–[4]). While these classifications are helpful for organizational understanding especially across institutions, student perspectives must also be monitored to craft impactful experiences as changes are implemented. Thus, there is a critical need to identify elements of structure, content, and timing that have positive and negative impacts on students' community and identity as engineers.

Specifically through this work, we aim to answer the research question, *How do students who are pursuing engineering degrees through pathways that vary with respect to first-year engineering structure, content, and timing describe their experience participating in engineering communities of practice and their emerging engineering identities?* This executive summary and poster focus on the first year of a three-phase qualitative case study where we center on an initial three-part baseline survey of students who enrolled in FYE courses in the fall of 2017, as well as the practices used to recruit students for future interviews. The information gathered during the first year of this project has begun to illuminate the elements of FYE which are most impactful to engineering community and engineering identity development which we hope will spark meaningful future change.

Theoretical Lenses

Both identity and community are being examined through the communities of practice framework [5]–[8]. We use Wenger's[5] definition of a community of practice that includes joint enterprise (shared mission), shared repertoire (common knowledge), and mutual engagement (person to person interaction) to define a community of practice. We operationalize identity to be the answer to the question "who are you?" [9]; however, we scope this view within the situated learning perspective where identity is the kind of person you are within a specific community of practice [8].

The community of practice we are focusing on is the community of practice of engineering (i.e., the field of engineering); however, we acknowledge that many communities of practice are part of students' development into engineers (e.g., FYE programs, minority in engineering programs, student project teams, living learning communities, etc.). While we concentrate on the field of engineering in general, we are also considering these other communities and their impact. In this study, we consider engineering students as legitimate peripheral participants in the community of practice of engineering (i.e., they are newcomers to the field of engineering). Through the first year, they develop engineering

communities of practice and identities that support their transition to full participants in engineering.

To further operationalize identity, we use Wenger's [5] definition of identity, which includes negotiated experience, community membership, trajectories, nexus of multimembership, and local-global interplay. We use these ideas as the lenses for scoping our work. For example, Wenger [5] mentions five different trajectories related to identity development and learning in a community of practice (peripheral, inbound, insider, boundary, and outbound) that can be used to focus our analysis. As students move from their first year to second year, we expect that these trajectories will be present and will guide our understanding of identity development. For example for those at community colleges, we expect to reveal inbound trajectories where some students will be new to a 4-year campus and will be "invested in their future participation, even though their presentation participation may be peripheral" [5, p. 154] to the community practice of engineering broadly or other engineering communities of practice at the university. This type of trajectory will guide our analysis.

Baseline: First-Year Student Survey

To begin our study, a three-part baseline survey was administered to approximately 2300 FYE students at Institution 1 and Institution 2. Both universities are large land-grand universities. Institution 1 uses a direct matriculation approach with introduction courses required by all majors and Institution 2 uses a pre-major with a FYE structure. The baseline survey consisted of 20 questions and is based on the work of Jones, Paretti, Hein and Knott [10]. This survey questions sought to measure constructs such as engineering identity, confidence in major and career choice, belonging in engineering, and engineering expectancy and ability. To date, two of the three surveys have been distributed. The first implementation was administered at the beginning of fall semester with the second at the beginning of the spring semester. The third survey will be administered at the end of the spring semester. The results from the first baseline survey have been analyzed using descriptive statistics, and the results have informed the development of the interview protocol for Phase 1. In our poster, we present these results highlighting the key findings that impact our protocols. In future work, we will present the results of all three surveys, concentrating on the trajectory of students through their first year.

Phase 1: Interviews

In addition to our baseline surveys, we have planned our recruitment for our Phase 1 interviews. A recruitment survey will be sent out to all students who were enrolled in FYE courses in the fall of 2016 at Institution 1 or Institution 2, or at Institution 3 or Institution 4, our 2-year college partners. From the respondents, students will be selected for interviews using purposeful sampling. Students will be selected in order to represent a broad range of engineering pathways, including traditional transfer students, campus change students, non-traditional students, and other unique pathways in addition to the typical pathways at each institution. These students will be interviewed again during their junior and senior years for a total of three interviews per participant. This information will

allow us to develop a trajectory for each student to better understand how they move from legitimate peripheral participants in the community of practice of engineering to full participants.

Future Work

Once the baseline survey is complete and the interviews are underway, we will continue with focus groups of faculty and administrators that will be used to better understand and triangulate findings. We believe that those involved in making FYE change must be brought into this research so that informed change can be made in the future. The outcomes of our work will have substantial impact on engineering education because they ensure that the changes made in FYE are positively impactful and help ensure the success of FYE students as it relates to their communities of practice and engineering identity development.

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