Board 29: Initial Qualitative Exploration into First-Year Engineering Community and Identity

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Abigail Clark is currently a Ph.D. student in the Department of Engineering Education at The Ohio State University. She is currently advised by Dr. Rachel Kajfez, and is part of the RIME collaborative (https://u.osu.edu/rimetime). Her research interests include engineering identity development in K12 students, engineering education in informal settings, and women's experiences in the engineering field. Prior to coming to Ohio State, Abigail worked as a researcher at Battelle Memorial Institute in Columbus, OH. She holds a bachelor's degree in mechanical engineering from Ohio Northern University.

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Soundouss Sassi is a Ph.D. student in Engineering Education at Mississippi State University. Her advisor is Dr. Jean Mohammadi Aragh. In 2016 she earned a Master in Aerospace Engineering from the same university. Prior to that, she earned a Bachelor in Aerospace Engineering from the International University of Rabat (UIR)

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Executive Summary Introduction

First-year engineering programs (FYEPs) provide a unique context for students to establish engineering communities and establish their engineering identities. Yet, little is known about how these experiences compare to those students who start in discipline specific programs. More broadly, even less is known about how first-year experiences differ for students from regional campuses or for students who transfer institutions. This project aims to better understand how the first-year experiences of students from various pathways affect their development across their college career through a series of first-year surveys and longitudinal interviews. We specifically focus on students' engineering communities and engineering identities using Wenger's conceptualization of Communities of Practice as our theoretical lens [1].

For this work, engineering communities are defined as the groups, formal and informal, that students engage with during their undergraduate degrees. For our work, we allow the students to define and provide examples of any and all engineering communities; however, we do operationalize them in our analysis using a Community of Practice lens where we are particularly interested in engineering communities that have mutual engagement, shared repertoire, and joint enterprise [1] (i.e., we are focused on communities of practice but recognize that many types of communities may have an impact on student development). We believe these communities are essential for persistent in the field and development of a personal engineering identity. We are interested in the different ways these communities are created, maintained, and have an impact on students through the various pathways from the perspective of the student.

Engineering identities can be operationalized in a variety of ways. For this work, we used an instrument developed by Virginia Tech [2] to begin our analysis and provide a baseline understanding of students' major choice, career choice, engineering identity, engineering expectancy or ability, and belonging in engineering. In our interviews, we are currently exploring identity more broadly and holistically where Gee's [3] framework on identity is used to provide insights on nature, institution, discourse, and affinity identities. Based on our initial analysis, we believe that students' personal engineering identities will be reflected in all of these identities in different was; however, additional work is needed.

Work Completed to Date and Findings

To date, we have completed a series of three baseline surveys related to engineering communities and engineering identities across the first-year engineering experience with one cohort of students from two different universities. This was detailed in our pervious poster [4]. Institution 1 approaches first-year engineering through a discipline specific model while Institution 2 uses the FYEP approach. Information from these surveys was used to inform the development of an interview protocol related to engineering communities and engineering

identities. That protocol was used during our first of three rounds of interviews which were conducted in Spring 2018 with a second cohort of students. These students were second year students while the baseline surveys were administered to first-year students. For our first set of interviews, we interviewed 29 students from two institutions who represent a variety of first-year engineering pathways (e.g., transfer students, regional campus students, students from discipline specific programs, students from first-year engineering program, etc.).

Currently, these interviews are being analyzed and will serve as a starting point for our round two interviews, which will be conducted in Spring 2019. The round two and three interviews will be conducted with the same participants so we can understand their identity development through communities of practice over time as they complete their engineering degree program. Our poster will summarize the findings of the baseline surveys and the Phase 1 interviews along with the initial findings of the Phase 2 interviews.

Baseline Surveys

During the 2017-2018 school year, we conducted a series of three baseline survey investigating the baseline identity and community development in First-Year Engineering students [5]. These surveys were administered at the beginning of the school year, in the middle of the school year, and at the end of the school year. Analysis of the initial survey, based on 300 completed survey responses, indicated that students enrolled in direct matriculation FYE courses (Institution 1) may initially exhibit higher levels of confidence in career choice, engineering identity, and engineering expectancy or ability. Additionally, female students were found to have lower levels of belonging in engineering, engineering identity and engineering expectancy and ability [5]. Due to the number of responses received from students in other underrepresented minority groups, analysis of those groups in the survey data could not be run.

Further analysis of the responses from those who completed all three surveys, fifty-one respondents, were conducted. The survey responses were tested for normality using Kolmogorov-Smirnov tests. All data was found to be normal, so t-tests at 95% confidence intervals were conducted. This analysis indicated that while there were no significant differences between Institution 1 and Institution 2 initially, the mid-year survey indicated that students from Institution 1 had a higher confidence in career choice than Institution 2, and the end-of-year survey indicated that respondents at Institution 1 had a higher confidence in both career choice and engineering expectancy or ability. The difference between the male and female respondents who responded to all three surveys were minimal, which was notably different from our initial analysis of the first survey's results. The results from these surveys were used to develop the interview protocol for our Phase 1 interviews.

Phase 1 Interviews

From our phase 1 interviews with 29 participants, we have learned that when second year engineering students talk about engineering identity, they reveal different identities such as

Nature, Institutional, and Discourse identities. This indicates the coexistence of the multiple identities which is consistent with Gee's theory [3]. There were instances where participants' discussed identity related items that did not seem to fit with Gee's approach. To date, those items have been coded as "General Identity". We are continuing to analyze interviews and are examining additional identity frameworks to understand how our General Identity code may connect to Gee's framework or other frameworks.

Phase 2 Interviews

We are currently preparing to conduct our Phase 2 interviews. These interviews will be complete by ASEE 2019 and initial results will be shared on our poster as appropriate. To analyze these interviews, we are using the codebook developed in Phase 1 as a starting point but will add a longitudinal component to our analysis that will look for changes over time by participant. Ultimately, we are interested in mapping students' engineering communities and engineering identities over their degree completion to better understand their impact.

Conclusions and Future Work

In conclusion by the time of the conference, our team will have completed baseline surveys and two phases of interviews to understand how first-year experiences differ for students from regional campuses, students who transfer institutions, students who are admitted directly into engineering programs, and those who participate in a FYEP. The overall goal of this project is to examine the progression of participants' engineering communities and engineering identities over time. Our results to date, are helping begin to understand these experiences.

The significance of this work is that the insights from this project will allow us to better understand the long-term impacts of first-year engineering experiences on engineering communities and students' engineering identities. For example, if female students are found to have a lower sense of belonging in engineering, communities such as women in engineering programs may be beneficial, in order to help form community outside of FYE. We expect that there will be common trajectories for development for some students but that others will have unique developmental experiences that contribute to their individual views of themselves as engineers. Currently, we plan conduct our Phase 3 interviews in Spring 2020 which will complete our developmental investigation.

Acknowledgements

References

[1]   E. Wenger, *Communities of Practice: Learning, Meaning, and Identity*. Cambridge University Press, 1998.

[2]   B. D. Jones, M. C. Paretti, S. F. Hein, and T. W. Knott, "An analysis of motivation constructs with first-year engineering students: Relationships among expectancies, values, achievement, and career plans," *J. Eng. Educ.*, vol. 99, no. 4, pp. 319–336, 2010.

[3]   J. P. Gee, "Chapter 3: Identity as an analytic lens for research in education," *Rev. Res. Educ.*, vol. 25, no. 1, pp. 99–125, 2000.

[4]   M. J. Mohammadi-Aragh, R. L. Kajfez, and A. M. Clark, "Establishing a baseline and future plans for exploring engineering community and identity," in *American Society for Engineering Education Annual Conference & Exposition*, 2018.

[5]   A. M. Clark, R. L. Kajfez, and M. J. Mohammadi-Aragh, "Work in progress: Baseline survey about community and identity.," in *American Society for Engineering Education Annual Conference & Exposition*, 2018.