

The Formation of Undergraduate Engineers as Engineering Leaders

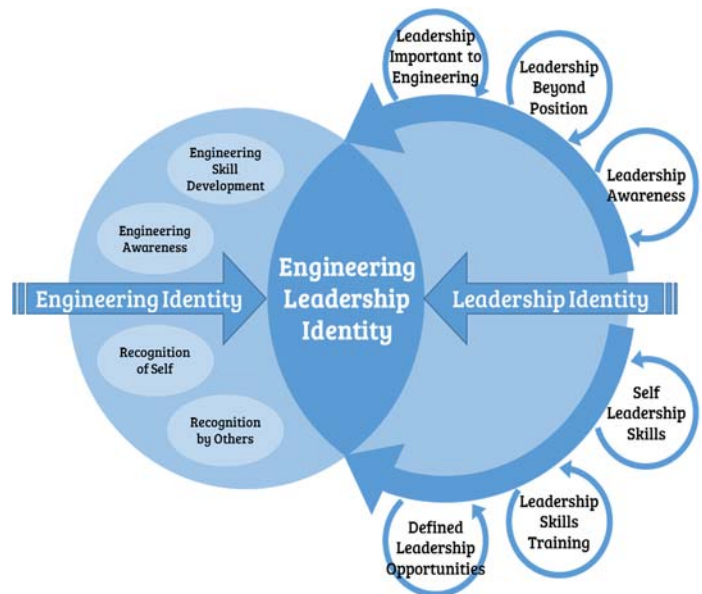
Project Summary

Developing solutions to many of the greatest challenges facing society will require collaboration from interdisciplinary teams. For these collaborations to harness the diverse capabilities found in these groups, effective technical leadership must be deployed. Therefore undergraduate students need to learn how to be effective leaders during their formation as engineers.

To date, there is little empirical work in the engineering education body of knowledge that illustrates the role leadership concepts play in the formation of an engineering identity. The proposed project seeks to understand how formation of a leadership identity happens within the formation of an engineer. These development processes together constitute the formation of engineering leaders. The proposed approach is novel because it examines engineering leadership development as an identity development process, not just a collection of experiences or series of learning outcomes. The project leverages the centrality of identity to learning in order to develop a grounded theory of engineering leadership for undergraduate engineering students. This grounded theory will emerge through work to answer two research questions: 1) How does leadership identity in engineering students compare to those in other fields? 2) What is the relationship between leadership identity and engineering identity? To accomplish this, the project will employ a mixed methods approach by first analyzing baseline national data on student perceptions of leadership from UCLA's Higher Education Research Institute and Indiana University's National Survey of Student Engagement. Findings from analysis of these national data sets will be used to develop a grounded theory study of engineering leadership, using interview and focus group protocols for deployment with groups of engineering students at Montana State along with two partner universities (UT-Arlington and CU-Boulder).

Intellectual Merit

The formation of engineers is fundamentally an identity development process. One theoretical framework that has been widely used to explain how students develop an engineering identity is Lave and Wenger's (1991) communities of practice model. This model holds that learning is a social process situated within a specific context of a community of practice, thus, the ultimate goal of learning is not solely mastery of the practice, but becoming a full participant within that community of practice. To understand how engineering students might cultivate a self-concept as a leader, we utilize Komives, et al.'s Leadership Identity Model, which argues that college students develop a personal sense of identity as a leader when they view leadership as a process, not merely a position. Bringing these two models together, the proposed work seeks to understand how the components of engineering identity and leadership identity converge to develop an engineering leadership identity in undergraduate students. The conceptual framework for the work is depicted in the figure at right.



Broader Impacts

Today leaders of industry and government are calling for increasing numbers of engineering graduates in order to maintain the future competitiveness of our nation. Often lost in these calls is recognition that the expected positive impact from an increased number of engineering graduates will be limited unless the full capabilities of these graduates are harnessed through effective technical leadership. The proposed project will generate two clear broader impacts: 1) **Improve U.S. economic competitiveness** – by better understanding how engineers can develop a leadership identity and leadership skills within their formation as engineers, the project's findings will provide a foundation to better prepare more technical graduates capable of leading in today's complex environment, 2) **Promote the development of a diverse globally competitive workforce** – by building awareness of engineering leadership at two minority-serving institutions and constructing a career path into leadership for engineering students, the project will improve recruitment of underrepresented students who the literature shows may see engineering as a limiting career option. This approach may specifically appeal to women in engineering who, on average, seek careers with communal values that influence positive change in the world.