

Introduction

Nationally recognized think tanks and academic institutions argue that Western engineering culture has increasingly created a gap between the professional and societal expectations and educational training of engineers (Prados, 1998). Over the past sixty years in American history, the gap between engineers and the communities of people they design for has become increasingly ingrained in our societal norms. After all, understanding the people of the community helps to better “engineer” the community space. As this gap interacts with the specialization of engineering work, engineering design efforts decreasingly align with community wants and needs, as a lack of communication, perspective sharing, and collaboration prevails (Wisnioski, 2012). A series of university programs in the past 20 years have begun to combat these societal norms and disconnects via community-centric engineering training, and our team believes that an additional community-centric engineering course at Lafayette College would be beneficial to the College.

This project focuses on Lafayette College’s engineering department and the implementation of community-centric education within Lafayette’s borders. Community-centric education entails a curriculum which initially teaches engineering students how the cultural emphasis on technical skills came about, why it creates problems in effectiveness and sustainability of engineering design, and how students can use non-technical skills to break from cultural norms and increase the quality of their work. A community-centric course will increase students’ ability to recognize the gap between engineers and society and will help them act as social agents in engineering once they enter the workforce. Additionally, the prominent lack of

satisfaction amongst engineering professionals leads this project to focus on the development of a community-centric engineering education course as an effort to redirect Lafayette's Engineering division. Lafayette's engineering department prides itself on the fact that it "not only provides an outstanding technical education, but also prepares students with the ability to think creatively, imagine broadly, communicate effectively and influence change" ("Engineering...", 2017). This curriculum will focus on the understanding, learning, and implementation techniques of community-centric design, in order to increase the explicit community-centric knowledge of Lafayette's graduating engineers.

We address Lafayette engineering's weaknesses by pushing and requiring students to involve the community in their design thinking. A history of engineering culture which emphasizes technical over non-technical skills leaves our team with the opportunity to halt this path within Lafayette's borders, as an increasing number of other engineering programs have started to shift since the 1980s (Prados, 1998). Given this problem, our team used literature review and outreach in the Lafayette engineering community to design a 200-level engineering course that can better prepare Lafayette students for the non-technical components of engineering professions. This course's curriculum aims to show Lafayette students the importance, relevance, and value of this skill set while actively integrating it into their problem-solving strategies.

In creating a thoroughly analytical and concretely focused project, our team focused on three research questions to guide us:

- a) What is the most effective way of integrating community-centric education in Lafayette's existing engineering program?

- b) In a new engineering community-centric curriculum, how can we define success in a way that elicits support from Lafayette's engineering students and professors?
 - i) What are the core takeaways and objectives of this course?
- c) In what ways can the integration of a community-centric curriculum change the engineering culture at Lafayette?
 - i) How will this community-centric mindset be received and adopted by stakeholders in Lafayette's engineering community, in terms of this class and in future curriculum creation and adaptations?

Through research and community outreach, our team evaluated the many different approaches of solutions to this cultural and educational problem. Our cumulative research led us to design the most effective form of a community-centric course, in the form of a 200-level course. This course will be primarily geared towards Engineering Studies students, but will ideally be open to all engineering students as an engineering elective. The Engineering Studies division aims to “[bring] together the four divisions of campus—engineering, humanities, science, social sciences, for a truly liberal arts education,” and therefore is an additionally relevant major for our project (“Program...”, 2018). If our curriculum is utilized first in this division, it will gain traction and will be more feasible to adopt by other Lafayette engineering majors in the future. This course will be literature and seminar based, as to sufficiently educate students in sustainable community development and engineering ethics. These students’ solid background in these non-technical skills before they participate in their capstone courses will allow them to experientially utilize these developed skills. As our team has determined the general characteristics of this course, future Engineering Studies capstones could potentially

expand on this research by furthering course specifics. Future students could also potentially broaden our curriculum idea to incorporating community-centric curriculum in higher level or capstone level courses.

Potential challenges to the successful creation and implementation of this curriculum include faculty support regarding the Accreditation Board for Engineering and Technology (ABET) accreditation of this course. Logistical questions regarding department participants and level of requirement (for which majors would this course be required for, if any?) still exist. Additional uncertainties include syllabus specifics and professor availability. The challenge of “preparing engineers to become facilitators of sustainable development, appropriate technology, and social and economic change” fuels our project, and “meeting that challenge may provide a unique opportunity for renewing the leadership of the US engineering profession as it enters the 21st century” (Amadei, 2010, 84). Our team aimed to overcome these challenges by looking at other schools and what types of sustainable community development courses they have. In addition, outreach with engineering professors regarding accreditation challenges and existing their perspectives guided our course development.

As our project developed, we unwrapped the current and potential relationship between engineering education and community. We considered the social, political, economic and technical contexts of the project. Our social context serves as a thorough literature review on engineering sustainable community development and related engineering practices through historical and cultural perspectives. Our social component also analyses economic benefits to add support as to why this course should be integrated into Lafayette’s curriculum. Our political context aims to identify stakeholders, relevant policies, and relevant processes on both national

and local scales. We identified key educational policies and codes and their impact on the development of curriculum in the Lafayette Engineering division. Our curriculum design component includes a review of similar curricula at other engineering schools, empirical evidence of stakeholder perspectives on Lafayette's campus, a review of ethical practices in engineering, a potential syllabus, and proposed learning outcomes of this course. The research and outreach involved in each of these contexts helped our team in determining the feasibilities and necessary components of our proposed course and acknowledging that this type of education should be implemented on Lafayette's campus.