

Developing Leadership through an Immersive Service-Oriented International Internship

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Abstract

Clemson Engineers for Developing Countries (CEDC) is a student-driven service-oriented program whose mission is to provide sustainable, engineered solutions to communities in the developing world. One of the most successful features of CEDC, from both undergraduate education and community development perspectives, is the structured and innovative internship experience. In addition to in-class student participation in design, planning, and project implementation, a few students are selected annually for an internship in the host community where they have the opportunity to develop and enhance their leadership skills in an international and diverse setting. The internship program consists of Clemson University engineering students living in rural Haiti for 6-12 months, where they lead infrastructure projects around their host community with a team of local Haitian foremen, skilled workers, and general laborers.

While many other programs and student organizations provide leadership experience in a classroom context through capstone projects and extra-curricular activities, CEDC interns are tasked with working with local citizens towards a common goal and tangible results. Interns are supported by CEDC's unique organizational structure that allows students in the classroom to lead design projects that are implemented by the interns in Haiti, with supervision from industry advisors in the United States. CEDC's project-oriented framework provides students real-world responsibility and accountability for small construction projects that are implemented in Haiti. This real world responsibility enables the development of leadership skills by allowing students to fully immerse themselves in a project's success or failure in a scaffolded setting. This paper discusses the perspectives and skill sets gained from the internship for both interns and students on campus, including significant leadership development and the ability to engage with people and work within a community across cultures and backgrounds to execute a project. Supporting data, collected by surveying former CEDC interns to better understand their experiences and leadership development in the program, will be presented. The authors build on lessons learned to provide suggestions of how the program could be replicated to provide similar leadership experiences at other academic institutions or within other student organizations.

Introduction & Background

Engineering problems today require a vastly different standard for engineering education and practice (Duderstadt, 2008). The flurry of technological advances in the 21st Century, coupled with burgeoning globalization, has pressured the engineering profession to establish a new set of guiding principles when it comes educating the next generation of engineers (Amadei, 2009). One of these guiding tenets is leadership; engineers must possess professional skills that complement the hard technical skills inherent in the engineering curriculum (Kumar, 2007). With the baby boomer generation reaching retirement age, more engineers than ever are needed to fill the void and take leadership positions in order for the United States to remain competitive in the global technological and commercial marketplace (Dunn, 2009). Despite the growing number of leadership development programs across the country, there is still a major gap between the educational institution and the needs of the engineering profession (Graham, 2009).

For the purpose of this paper, the term leadership will be used to represent a variety of competencies that have been shown to demonstrate effective leadership skills in students (Ozgen, 2013). These competencies include client orientation, commitment to learning, drive for excellence, integrity, interpersonal communication, responsiveness to change, results orientation, and teamwork (Ozgen, 2013).

In a 2009 survey, employers indicated that real-life engineering application and effective communication skills are some of the most important aspects of professional engineering skills (Dunn, 2009). Typical curricular engineering classes are not sufficient to produce these ideal employees, much less multi-faceted engineering leaders; students need experience outside the typical classroom environment (Kumar, 2004).

Extra-curricular activities play a valuable role in developing leadership skills. One study indicated that students who demonstrate leadership in extra-curricular activities are more likely to acquire better jobs and are better protected against unemployment (Stuart, 2011). In addition to extra-curricular activities and independent leadership programs, leadership modules can also be integrated into engineering curricula.

One way to provide students with such valuable experience is through project-based learning. This education model enables students to hone their leadership ability by challenging them to ‘think and learn’ on a team that focuses on tackling real-world problems in a classroom setting (Kumar, 2007). Many university programs use capstone design courses to provide students with these project-based experiences that foster leadership and provide practical experience (Dutson, 1997). However, most of these experiences only take place during a student’s senior year (Howe, 2006).

Service-learning, the inclusion of social entrepreneurial and service in academic curriculum, takes project-based learning to the next level by adding new dimensions such as community interface, professional communication, and tangible application of engineering education (Lima and Oakes, 2006; Jawaharlal, 2006). Service-learning can be applied to normal classes to promote leadership and acquire new or diverse perspectives (Dukhan, 2008). Other universities offer project-based service-learning programs that pair teams of multi-disciplinary university students with local government agencies, non-profits, or under-served communities (Davis, 2012; Duffy, 2011; Coyle, 2005).

One such project-based program is Clemson Engineers for Developing Countries (CEDC), a student-driven service-learning program at Clemson whose mission is to provide engineered solutions to communities in the developing world. By utilizing a unique organizational structure that fosters continuous student involvement throughout their undergraduate experience via classwork and an internship program, CEDC is able to achieve a broad range of student learning outcomes (Ogle, 2016). Such outcomes include globalization, teamwork, and communication (Plumblee, 2010). CEDC offers students tangible and practical experience on engineering projects as well as the greater impacts of engineering in a global context by engaging students for multiple semesters, offering biannual travel opportunities, and fostering a long-term relationship with a specific community in Haiti’s Central Plateau (Bargar, 2016).

One of CEDC's most valuable features is the structured and innovative internship experience. In addition to student participation in the classroom, a select few students are chosen annually for an internship in the host community where they can enhance technical and professional skills while engaging with a different culture. While many other programs seek to provide these outcomes in a traditional classroom setting, this program's project-oriented service-learning framework closely mimics the experiences they will face in a professional setting and provides each student with unique and precious leadership experience. In addition, the program provides in-class students the experience of serving as a 'home office' to the interns, bringing a unique level of responsibility and accountability to the classroom setting.

This paper discusses the perspectives and skill sets gained from the previous CEDC interns, including significant leadership development and the ability to engage with people and a community across cultures and backgrounds to execute a project. Supporting data, collected by surveying former CEDC interns to better understand their experiences and leadership development in the program, is presented. Furthermore, major leadership development is witnessed by CEDC students who never participate in the internship. The authors build on lessons learned to provide suggestions of how the program could be replicated to provide similar leadership experiences at other academic institutions or within other student organizations.

Program Overview

CEDC was created by a small group of undergraduate and graduate engineering students who demonstrated an interest in using their technical skills to serve (Bargar, 2016). Shortly after its inception, a local religious organization approached CEDC to help upgrade and replace a water distribution system in Cange, Haiti (Gordon, 2017). The project was technically challenging, yet within the skillset of the university students under guidance from professionals, who would later become CEDC advisors.

As construction progressed, the need for enhanced continuity within the program led CEDC to vertically integrate the program from freshman undergraduates to doctoral students. A select group of students traveled during Fall and Spring break for several semesters to inspect construction, deliver and discuss new design documents with the community, and identify new needs, concerns or challenges.

There were significant cultural and technological challenges between the American student-engineers and Haitian contractors, leading to miscommunications concerning the specifications and design. The lack of engineering standards in rural Haiti coupled with the complexity of the design delayed the project and necessitated costly rework. In order to overcome these obstacles, CEDC deployed a full-time student intern in Cange in order to provide the necessary oversight, project management, and project control. Once the water project was completed in 2012, CEDC maintained the fledgling internship program so that further projects could be researched, pursued, and completed. The CEDC model for executing projects in Haiti is summarized in Figure 1 (Bargar, 2016).

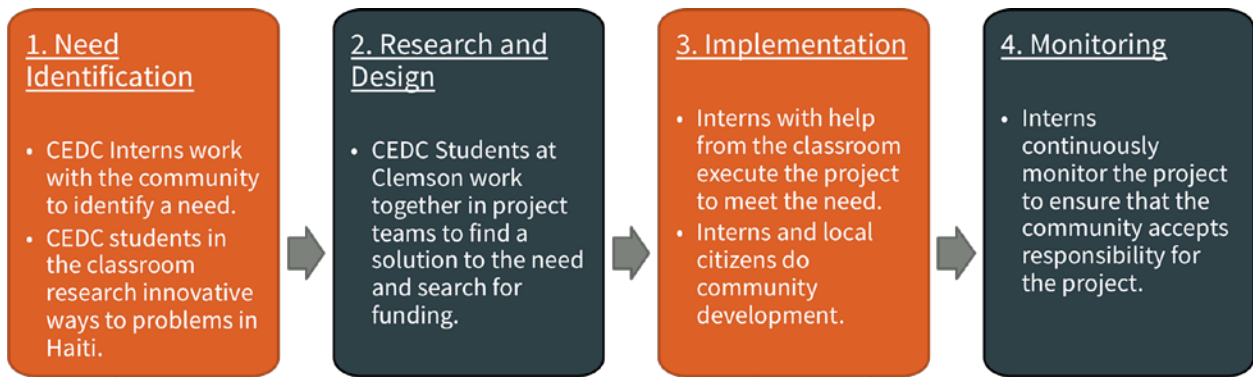


Figure 1. The CEDC project model (Bargar, 2016)

CEDC has three distinct levels of student engagement in the program, as seen in Figure 2. At the classroom level, students enroll in CEDC for a one credit-hour course. They may participate in the program every semester if they wish, from freshman year all the way through graduate school. These students can move into leadership roles, participate in multiple projects, and gain valuable leadership experience without ever leaving Clemson’s campus. For those wishing to gain experience outside the classroom, they may travel to sites in the Central Plateau of Haiti for five to ten days during the spring, summer, and/or fall. These trips help provide students the opportunity to better understand the cultural context for projects, actively collect information for their team and other teams, and take an active leadership role in sundry projects. Thus far, CEDC has funded nearly all student trips to Haiti.

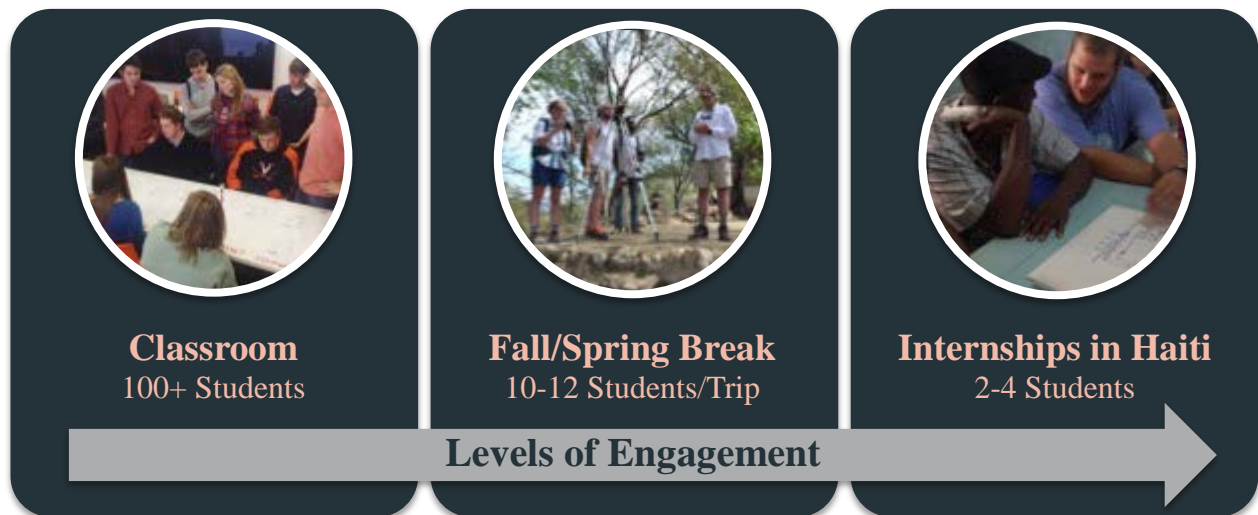


Figure 2. Various levels of engagement for CEDC undergraduate students.

Internship Overview

For the most involved students, CEDC offers the aforementioned internship, a keystone of CEDC's program and its continued success both in Clemson and abroad. Interns oversee all projects, serving as CEDC’s field engineers, liaisons with the community, and project managers. Interns’ travel and living expenses are paid by CEDC, and interns receive a nominal stipend for miscellaneous expenses. Since May 2011, CEDC has maintained the internship program and

kept a relatively constant student presence in Cange. Current CEDC students typically volunteer for the internship by contacting one of CEDC's advisors. From there, CEDC's student leaders and advisors interview the interested student and determine when, if at all, the student can begin his/her internship. To date, it has been found that this program has been self-selecting or that the students who express interest in this intense experience are those students who are best equipped to handle the challenges.

As a CEDC intern, students have a broad range of explicit and implicit responsibilities. Ultimately, these few students are responsible for all CEDC-related activities in Haiti. Their duties include the following:

- Manage payroll for CEDC projects in Haiti, including ensuring payment of workers.
- Track all financial transactions and send a monthly budget report to CEDC advisors.
- Oversee the continuing operation and maintenance of the Cange water system and other past CEDC projects.
- Work with advisors to implement funded projects by being an active and dedicated follower and a trustworthy and enthusiastic leader.
- Submit a monthly intern report that summarizes all work underway and completed.
- Keep all stakeholders involved and updated about relevant projects throughout the project life cycle.
- Make a devoted effort to learn the local language and understand local culture.
- Prepare for CEDC trips and help create an itinerary with the CEDC students at Clemson.
- Maintain regular communication with all advisors (including checking and responding to emails daily) and engaging in weekly intern Skype calls with the CEDC advisors.
- Behave in a safe manner while remembering that the internship is a privilege not a right.
- Act in a professional manner when corresponding with advisors, other students, locals, and industry personnel.
- Serve as humble ambassadors to CEDC, Clemson, and the United States.

CEDC interns must demonstrate an extremely high level of autonomy, especially when considering their geographic distance from supervision and the vagaries of internet connections and technology in rural Haiti. These responsibilities deviate from the classroom experience, but the in-class work both supports and is supported by the intern experience, as seen in Figure 3. While most CEDC students experience several unique learning outcomes ranging from professional skills like communication to more technical skills like basic plumbing (Plumlee, 2010), CEDC interns have a much more in-depth experience.

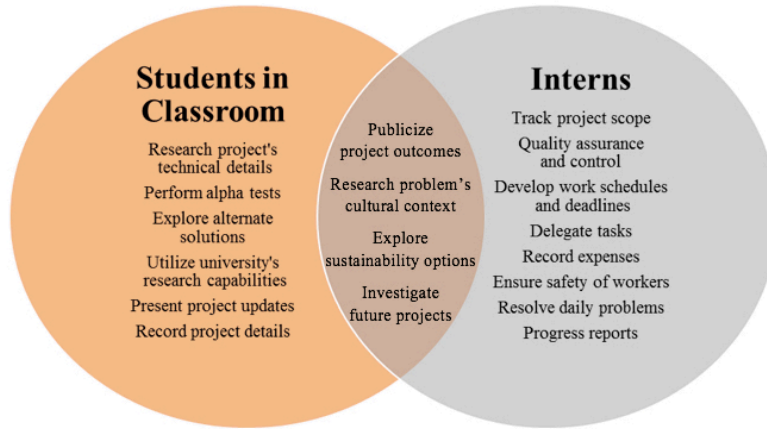


Figure 3. Responsibilities of CEDC students and CEDC interns (Bargar, 2016)

Method

The questions for this study were based on previous studies of service-oriented project-based learning programs at Universities in addition to student leadership competencies in engineering (Huff, 2015). These questions are heavily related to the competencies that have been shown to demonstrate leadership quality including commitment to learning, drive for excellence, integrity, communication, responsiveness to change, results orientation, and teamwork (Ozgen, 2013). The survey was anonymous and queried the students as to what extent their CEDC experience contributed to a variety of leadership-related traits related to the competencies above. Students then responded with “Not at all,” “To a small extent,” “To a large extent,” or “To a very large extent.” These responses were coded from one to four respectively.

Ten of the fourteen previous CEDC interns participated in the survey. The data was analyzed quantitatively and several quotes were used to reinforce themes identified in this paper. Due to the small sample size of both target populations, no statistical analyses were performed on these data sets in this paper. Future studies will perform statistical analyses as larger populations are sampled.

The same questions were presented to a randomly chosen sample of sixteen CEDC undergraduate students with at least one semester in the program, from student directors to students who have never held a CEDC leadership position. The survey targeted CEDC students who are heavily involved with the day-to-day operations of the program. Since nearly one hundred students participate in CEDC every week, there is a wide spectrum of student immersion. For the purposes of this paper, the authors wanted to highlight students who are fully engaged with CEDC’s translational approach rather than students on the periphery who may only be exposed for a short time. No graduate students were included in this particular study since no current graduate students had been in the program for a full semester at the time the survey was taken. Nearly half of these students served as project managers in the classroom at some point and 30% had never held a CEDC leadership position. The sample includes students who have participated in CEDC from three to six semesters and had never interned in Haiti, but may have traveled on a Fall or Spring break trip to Haiti with CEDC.

Leadership Development

All students (both interns and classroom students) indicated that CEDC played a large role in developing their sense of responsibility in addition their ability to manage projects, lead independently, and utilize their time effectively. These results were of particular interest because several CEDC classroom students (non-interns) surveyed had never held a distinct leadership position.

CEDC student interns demonstrated higher responses to nearly every outcome surveyed, as seen in Figure 4. Most notably, CEDC interns displayed a large increase in their perceived “ability to lead people from various backgrounds” and “ability to change their local community.” More rigorous surveys are underway to determine if the other differences are significant, but this data suggests that the CEDC intern experience provides students with enhanced leadership outcomes as compared to a typical classroom experience, but that the classroom experience still contributes positively to leadership development.

The one survey question that classroom students exceeded interns involved “sense of responsibility for projects.” While more research and assessments will be performed to elucidate this potential concept further, there are several potential explanations for this particular outcome. CEDC interns work on a projects alongside communities in Haiti rather than a Clemson classroom. Consequently, there are many vagaries and circumstances that may diminish the actual responsibility that an intern feels when working on a project. Additionally, since CEDC interns work directly alongside communities on projects, the community itself is responsible for the successful execution of the project. In other words, a CEDC intern may feel less responsible for a project due to the responsibility being on the target community.

To what extent did your internship contribute to your...

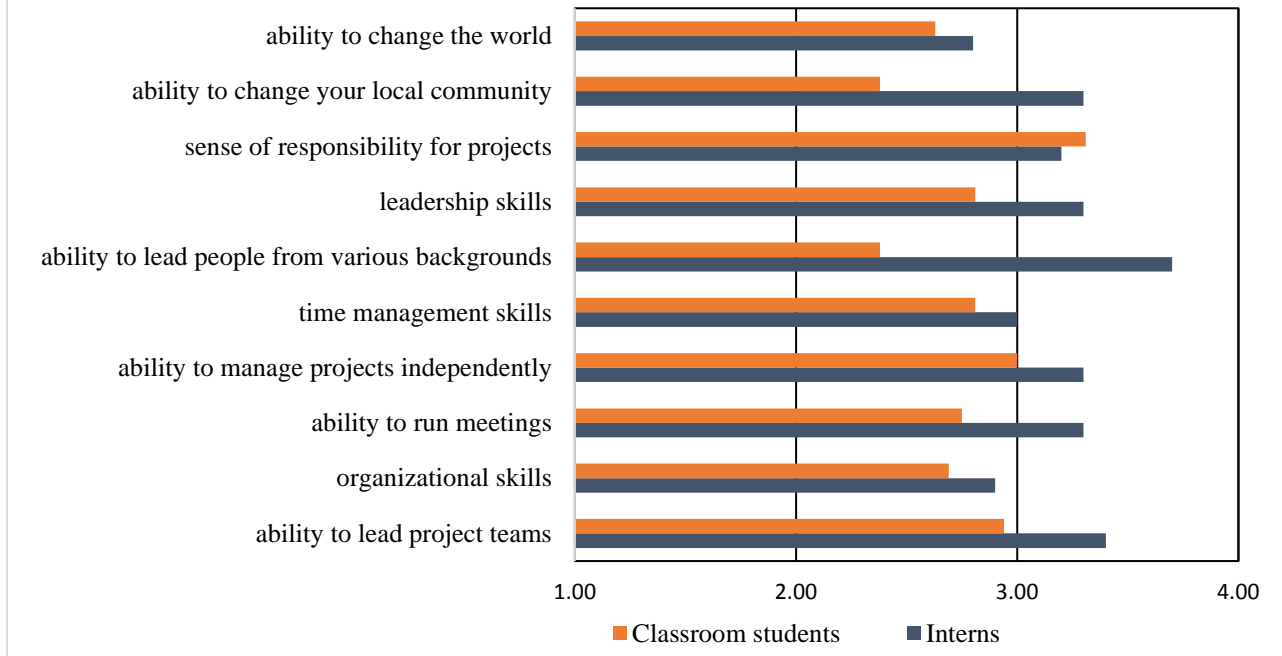


Figure 4. Leadership outcomes of CEDC interns and typical CEDC students

The open-ended questions of the CEDC intern survey also yielded noteworthy results. Many CEDC interns highlighted the confidence they felt after their internship concluded. One intern noted the acquisition of “a general attitude of confidence I can now carry with me in whatever professional setting I enter” and another intern noted feeling “more confident working with people from all professional backgrounds.”

Other interesting responses identified how the CEDC internship forced them to become leaders. This theme is highlighted in the following response:

I am a naturally introverted person and being a project manager both in the classroom and in Haiti as an intern forced me out of my comfort zone. Before I became involved in CEDC I would not have considered myself a leader at all. After my internship, I saw myself as a capable and empathetic leader and a more confident person overall. I still don't consider myself an excellent leader (and I know I have a lot of work left to do), but I do see myself in a much different light after my internship experience.

The experience of this particular student is echoed by another student who emphasized the heightened level of responsibility and accountability innate in the CEDC internship. These unique characteristics of the program enabled his/her advanced leadership development.

The internship forces you to make decisions, daily. These decisions include what supplies are needed, how to utilize resources, how to encourage a work crew digging through rock by hand, whether something not going [according] to plan is a problem that needs remedying, or just [a challenge] to work around. Having to make these decisions

developed my confidence in my own abilities, as well as my skills in communicating my opinions and decisions. Accountability is very real when someone will knock on your door at 5:30 am because the water [supplying the entire community] is not running.

CEDC classroom students also echoed the important role that CEDC played in their development as a leader and reiterated several themes. Several students highlighted their focus on communication, noting that “Through CEDC my communication skills have grown immensely” and “CEDC has taught me the importance of clear communication between members of a group and its leaders.”

Other CEDC students in the classroom underscored how their experience in CEDC is preparing them to be leaders in the professional world and industry. This theme is highlighted in the following responses:

CEDC has forced me to get out of my comfort zone and to take accountability for managing independent and group projects in a professional environment. I have seen these experiences pay off outside of CEDC, and I already know that the leadership skills I have acquired will continue to make a positive impact on my future.

Leadership in CEDC has been a huge contributor to my development as a leader. It forced me to take ownership of a project and be a driving force within it. This sense of ownership is key to taking on more responsibilities.

Discussion

Unlike typical students in the CEDC program, CEDC interns not only have an objectively higher level of responsibility for the ethical considerations and successful execution of projects but also develop the aptitude to lead a team of people from a much more diverse background than is found in a Clemson classroom. Interns must lead a group of people who do not speak English, much less share a common perspective on life and work. Student interns are tasked with integrating into a new community while maintaining the integrity of the program and diligently working to meet CEDC’s goals.

These high expectations preclude many students from seeking such a rigorous internship, but the students who successfully complete the CEDC internship program demonstrate enhanced leadership development outcomes and emphasize their higher levels of self-confidence. This CEDC leadership case study implies that the more trust and responsibility that service-learning programs, or any project-based program, places on the student, the more dividends for the student with regard to leadership development. The success that the interns witnessed during their internship and the impacts they saw as a result of their efforts may explain why they feel a greater ability to change their local community.

Even CEDC students who did not participate in the immersive internship program displayed major leadership development outcomes. There were small quantitative differences between CEDC students who stayed in the classroom and CEDC students who participated in the internship. CEDC’s unique corporate organizational structure and special focus on student leadership of projects enables students to have a much higher level of leadership development. Based on this data, future research efforts could explore the marginal costs (in student time away

from campus and program costs) compared to the marginal benefits of the intern program (increased field accountability, better connection of in-class projects to real-world, and intern development). Other future efforts will also involve controlling for past leadership experience in order to more accurately pinpoint the effects that CEDC has on the development of student leaders.

There are very few programs similar to CEDC. When pursuing humanitarian projects through organizations like Engineers Without Borders (EWB), many students will not have the ability to live and engage with a local community to the same extent or experience the same level of responsibility for projects. EWB projects entail trips that range from a few days to a few weeks and their programs focus on limited contracts with a community rather than a long-term relationship. The Peace Corps Master's Program provided a similar experience to CEDC's program but it was recently phased out, and it focused on graduate students rather than undergraduates (Peace Corps, 2016). Consequently, there are not many outlets for students to experience such an intense experience in the Global South. Yet, other immersive student programs, such as study abroad experiences, could also yield similar impacts to CEDC's internship experience.

The authors highly suggest that other service-based programs like CEDC investigate potential internships and study abroad opportunities for their students. The CEDC internship has not only galvanized the program but also strengthened the bond between the University and the Haitian community. Furthermore, returning student interns become respected advocates for the program and help educate and advise their peers about best practices when it comes to these engineering projects. The majority of CEDC program directors, the overall student leader, have been past interns. By utilizing a field-based internship, service-learning and project-based programs at other universities could improve their learning outcomes by giving students more responsibilities, fortify their relationship with their target community by maintaining a more constant presence, and reinforce their own program by generating more student leaders and advocates.

However, the ethical consideration of a program must be carefully evaluated so the host community is not seen solely as a tool for educational growth. CEDC's unique position, partnerships, and history with the community of Cange, Haiti lends itself to such an internship program. Yet, even CEDC's relationship with Cange has had its challenges and CEDC's community development efforts have been a work-in-progress as community members, CEDC professional advisors, and student leaders determine the most appropriate role for CEDC in the local community (Gordon, 2017). Though its relationships are ever-evolving, CEDC's long-term commitment to its host community in Haiti, compared to EWB's five year contracts with communities (EWB-USA, 2015), allows the internship program to continue to grow and develop to best meet the needs of the community, while still meeting the program's mission.

For the CEDC internship program to be replicated at other educational institutions, a similar long-term commitment and partnership must be established with a local non-governmental organization (NGO) and/or community. Without this critical relationship, the program would likely fail to provide long-term benefit to the community and students. The creation of these partnerships is beneficial for all parties but must be approached with mutual respect, attention to conflicts-of-interest, and a focus on the achievement of long-term goals over short-term victories.

The CEDC internship was not created as a learning tool but as a method to better serve the people of Cange. Even though the student intern is responsible for a project, they also work constantly with the community who ultimately owns the outcome.

Conclusion

While many other programs and student organizations provide leadership experience in a classroom context through capstone projects and extra-curricular activities, all CEDC students are tasked with leading a project in another country alongside people with varied backgrounds towards a common goal with tangible results. CEDC's project-oriented framework and commitment to a single community in Haiti's Central Plateau provides students real-world responsibility and accountability for their projects. This real world responsibility enables the development of tangible leadership skills by allowing students to control a project, work with a much more diverse team, and assimilate into an international community. In this manner, CEDC interns and students are better equipped to become successful and renowned engineers in the tumultuous 21st Century.

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