An Innovative Approach to Recruit and Retain Historically Underrepresented Students in Engineering

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Abstract

The Science, Technology, Engineering, and Math (STEM) fields do not usually attract first generation, low-income, and minority students (such as women, Hispanics, and African American, etc.). There are various ways to increase the number of minority students' participation in STEM careers, but one of the most frequently utilized means is implementing outreach programs in the community to introduce students in the K-12 system to STEM. This study describes the program developed in the Cal Poly Pomona College of Engineering (CPP CoE) to provide outreach to K-12 students while increasing the retention of the undergraduate engineering students. The program used service learning, along with outreach activities, to give CPP engineering students the opportunity to immerse themselves in the K-12 classroom.

CPP students became mentors and teachers of middle and high school students and led the development of STEM activities. The year-long mentorship experience culminated with an evening event at CPP, where CPP engineering students received the K-12 students, their parents, and their teachers for a night of fun STEM workshops and activities. CPP students' reflections and students' engagement in the activities for more than a single term suggested that undergraduate students were positively affected in their involvement with the program. K-12 parents and teachers were enthusiastic about the program and were excited to meet with CPP engineering students. The results will be used to expand the program to reach more K-12 students, and it will be the basis for a sustainable outreach program that will allow CPP engineering students to apply their technical knowledge while servicing the community. This paper describes the details of the service learning outreach-retention program designed for CPP engineering students.

Background on STEM education

Technological innovation and development to satisfy society's needs and commodities requires a large pool of diverse, creative and well-prepared professionals with backgrounds in Science, Technology, Engineering, and Math (STEM) fields[1]. The shortage of students from diverse populations interested in the STEM fields, and the severe academic deficiencies of many minority students entering four-year colleges (due to the K-12 programs' lack of access to core math and science courses, limited access to high-level math and sciences courses, opportunity gaps in gifted education, retention rates of students of color, among many others)[2] has caused a national movement for the creation of programs to support the K-12 education directly or indirectly in the academic preparation of students and teachers. According to Cohen and Deterding "outreach within institutions, across institutions and into curricular reform in K-12 (along with professional development of teachers) is needed to address what is, at its very core, a recruitment problem" (p. 223)[3]. In the last two decades it has been observed that US universities have been seriously impacted by the lagging behind in STEM education of the K-12 programs. Thus universities have creatively come up with novel ideas to be active participants in motivating and enhancing the K-12 learning experience[4].

The American Psychological Association fact sheet has reported that there is a correlation between socioeconomic status (SES) and academic development. SES is a measure of the income, occupation and education of the individuals and their families[5]. It has been reported that students from low-SES households are more likely to have learning challenges, such as disinterest, lack of attention or collaboration, and are more likely to drop out from school or college due to lack of interest or because they don't feel part of the community or due to financial and personal distress[6-8]. Universities have acknowledged their responsibility in science and engineering education at the K-12 level, and K-12 outreach activities have become bridges between the universities' academic programs and research activities and the K-12 community[9]. Outreach activities engage students and teachers that otherwise would not be engaged or would have a limited exposure to STEM fields. Moreover, outreach activities have been used as one solution to the current US shortage of professionals in engineering and science[10].

According to the Association of American Colleges and Universities (AACU), service learning has been identified as one of the high-impact teaching and learning practices[11]. Programs, like Engineering Projects in Community Service (EPICS), have been created to include service learning activities into the engineering curriculum. Service learning is a well-known and effective pedagogical method that engages learners of diverse backgrounds, especially those of underrepresented backgrounds[12-14].

The project described in this paper combined the service learning pedagogy with engineering outreach activities to enhance the learning experience of the students enrolled in an engineering course (EGR 299 S course). The objective was to improve the retention of underrepresented engineering students (majority at CPP) by providing them with opportunities to use their technical engineering skills and by providing them with opportunities to work in diverse and multidisciplinary teams (building confidence in their knowledge) in order to build relationships with K-12 students and to motivate the K-12 students to pursue STEM fields.

Introduction to CPP engineering programs

Cal Poly Pomona is a four-year institution well-known by the diversity of its student population (0.2, 23.6, 3.3, 38.9, 0.1, 19.7, 3.9, 4.4 and 5.7 % of American Indian/Alaskan Native, Asian, Black/African American, Hispanic/Latino, Native Hawaiian or Other Pacific, White, Two or More Races, Unknown, and International Students; respectively). Cal Poly Pomona is conveniently located in the intersection of I-10 and I-57 which confines the campus among little hills giving it the feeling of a semi-rural environment located in the middle of the Los Angeles urbanized area. Due to the historically high quality of the CPP Engineering and Science academic programs and due to the accessible tuition cost, the majority of the CPP students are commuters, and a large majority belong to a low income and/or first generation in college family. Hence, a large portion of the full-time students have full or partial financial aid. The large number of high school students with significant English and Math deficiencies entering CPP academic programs, especially majors in the STEM fields, created an unsustainable

resource investment to support the remedial courses. After the economic recession of 2008, many of the CPP academic engineering programs were affected by impaction which resulted in the reduction of number of students admitted. Program impaction increased the admission standards and reduced the number of remedial students admitted. While impaction increased the number of high quality incoming engineering students, the college preparedness of the 12-grade incoming students was not improved. Additionally, students enrolled in engineering programs before impaction that had started in remedial courses or that had math and/or science deficiencies were in disadvantaged positions compared to well-prepared students, which posed student retention challenges[15]. Students with deficiencies usually take more than 6 years to graduate, if they don't drop from the engineering major due to the lack of motivation, financial support, and/or self-confidence[16].

The CPP CoE has always conducted outreach activities to promote engineering majors among K-12 schools and community college students in the service area and in the state. Many of the outreach activities have served to engage and retain its own engineering students (i.e., open house, honor's college day, tours of the college facilities, Society of Hispanic Professional Engineers –SHPE- and Society of Women Engineers-SWE- outreach events, among others). However, after 2008 many new and novel efforts were undertaken in the CPP CoE to increase the college preparedness of the K-12 community, to increase the retention of the CPP engineering students, and to increase the student diversity, especially the number of female students enrolled in engineering programs. In 2013, the CPP CoE was supported by the Kellogg Foundation Endowment Program to launch the project titled: An Innovative Approach to Recruit and Retain Historically Underrepresented Students in Engineering. The project described here was one of the three different programs launched in the CPP CoE in Fall 2013 that had the overall objectives of recruiting high quality K-12 students and increasing retention of CPP underrepresented engineering students while enhancing the STEM education of the K-12 academic programs. This paper describes the work done for the program "Hispanics in Engineering" via a Service Learning Course and the E-Girl event.

"Hispanics in Engineering" program model

The "Hispanics in Engineering" program was developed with two different mutually supporting components. The program components were designed to sustain the overall objective of retaining underrepresented CPP engineering students and to enhance the K-12 student learning experience. However, an inherent and deep connection to the learners' community needs was infused to motivate, engage and increase self-confidence in both CPP engineering and K-12 students. Both program components are shown in Figure 1 and are described in detail below.

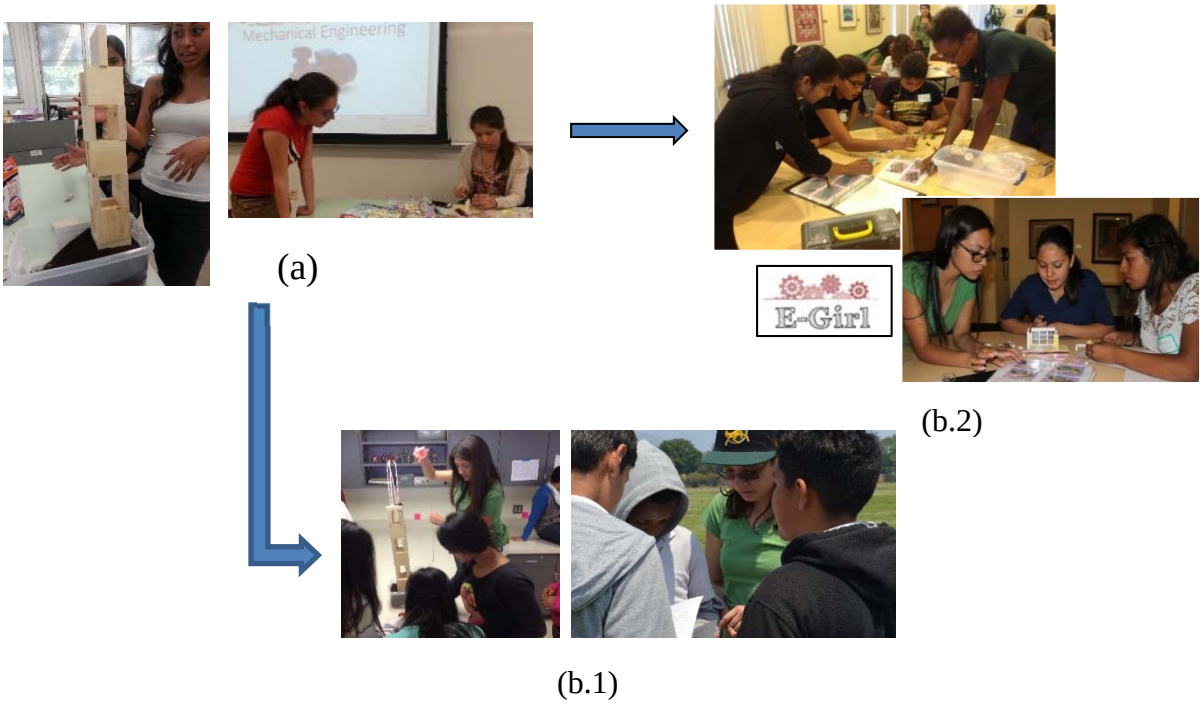

Figure 1. "Hispanics in Engineering" Program, (a) EGR 299 S Engineering Outreach students preparing hands-on activities, (b) EGR 299 S students building a relationship with K-12 partner schools, (b.1) Engineering students visiting K-12 schools, and (b.2) K-12 students' experiences culminating with the E-Girl event.

Service learning course

College teaching practices have been evolving to increase the quality of the learning experience and success of college students. Service learning incorporated into academic courses is one of the well-documented high impact pedagogical practices that has been adopted by many college professors[17, 18]. The objective of the service learning component of a course is the infusion of the mutual healthy interaction with a community partner, where college students can apply their technical knowledge in non-familiar contexts while solving an issue or challenge identified by the community members [19]. Besides enriching college students' technical skills, service learning courses teach or make college students aware of civic responsibility, which helps them to integrate themselves as valuable members in a non-engineering community. In addition, soft professional skills, like oral and written communication skills, can be significantly enhanced by the frequent interaction with the non-engineering community members. Incorporation of the service learning experience was achieved by the creation of a new lower level engineering course with the CPP Center for Community Engagement Service-Learning Designation. The course was entitled EGR 299 S- Engineering Outreach. It was offered every quarter (ten-weeks long). The course gave one unit of academic credit, and with no pre-requisites, was open to any student in the CPP campus (Figure 1.a). The curriculum of the course was built around the design of new or modifying existing hands-on activities that illustrate engineering principles, practicing oral

communication skills by preparing for the facilitation of activities (before and while visiting K-12 students), writing skills used when preparing an outreach activity proposal (to include specific instructions on how to adapt it to fit the needs of the community partners) and with written reflections of the experiences from the visits to the K-12 classrooms. The schedule of the course included four to six visits to the K-12 selected schools to nurture the development of a trusting learning environment. The EGR 299 S course was also a creative way to engage and improve retention of CPP engineering students.

E-Girl event

In 2013, when funding was obtained to develop the "Hispanics in Engineering" program, the E-Girl event was created by two CPP female engineering students (Hadasa Reyes, a Mechanical Engineering major; and Vanessa Davalos, a Civil Engineering major) to inspire students from disadvantaged communities (low income students not considering STEM careers or with lack of confidence or motivation to pursue STEM professions) to pursue STEM fields. The E-Girl event was planned to be the culmination of the academic year and the conclusion of the CPP- K-12 community development experience. The EGR 299 S course allowed CPP and K-12 students to get to know each other, and allowed the development of a pleasant working environment. E-Girl was scheduled in the spring quarter of the academic year, and after at least four visits to the K-12 classrooms by the EGR 299 S course students had taken placed. While the course was offered three times in the academic year, many students enrolling in fall quarter, re-enrolled in winter and spring quarters. The K-12 communities in the CPP neighboring areas fell within at least one of the required criteria: low income families, first generation students, large student minorities (like Latinos) and/or large female student body. Additionally, E-Girl promoted the development of relationships between the CPP engineering and the K-12 communities, and provided opportunities for K-12 students, parents and teachers to visit CPP.

Community service partners

The community partners, with at least one of the required criteria, were selected based on their commitment to work with the CPP engineering professor and students. Committed partners were selected to ensure that the experience of both CPP engineering and K-12 students was not interrupted or disturbed due to stakeholders' time constraints. Community partners were sites affiliated to the CPP Center for Community Engagement, and the communication among instructors was coordinated through the Engineering Outreach office at CPP CoE. Characteristics of the neighboring school districts provided the convenience of having community partners located within a 15-mile radius of CPP. The day of the activities at the K-12 school, EGR 299 S students and the CPP instructor traveled to the site. All the supplies for the activities were funded by the "Hispanics in Engineering" program funding.

Results and discussion

Growth of the EGR 299 S course

The EGR 299 S course was offered for the first time in winter quarter of 2014. Since then it has been offered every single quarter except summer quarters and spring quarter 2015. The class enrollment varied every quarter (Table 1). At least 30% of the students enrolling in a given quarter continue enrolling at least a second or a third time. Some students took breaks enrolling in the course due to scheduling conflicts with other courses, but re-enrolled in a later quarter. However, some of the students having scheduling conflicts with the course continued to be engaged with K-12 school visits or E-Girl activities. Only students enrolled are included in Table 1. The number of students enrolled at any time varied from 9 to 15. Students were required to attend four to six outreach events every quarter and at least 6 students were present in each of the K-12 visits. Depending on the size of the K-12 classroom, usually 5 to 10 K-12 students were partnered with each CPP engineering student. The K-12/CPP student ratio worked well for both groups to have productive and successful learning experiences.

Table 1. EGR 299 S course enrollment since its creation

Quarter	Total Enrollment
Winter 2014	15
Spring 2014	9
Fall 2014	9
Winter 2015	10
Fall 2015	13

CPP engineering student characteristics

With the objective of engaging engineering students in the hands-on engineering outreach activities, including freshmen at the early stages of their program or sophomores and juniors with lack of motivation, the EGR 299 S course did not have any pre-requisites. Thus, students from all academic levels had the opportunity to participate in the outreach course and associated activities. The CPP CoE Office of Outreach and the administrative assistants of each engineering department promoted the course among the ~5,000 undergraduate students enrolled in the CPP CoE. Mostly every quarter, senior students represented the majority of the students enrolled (20 to 60 %), followed by juniors (13 to 60%), sophomores (0 to 27%) and with freshmen being the group with no representation until Fall 2015 when 8% of the students enrolled were freshmen (Table 2).

Table 2. EGR 299 S academic levels

Quarter	Senior	Junior	Sophomore	Freshmen
Winter 2014	60%	13%	27%	0%
Spring 2014	33%	33%	33%	0%
Fall 2014	50%	30%	20%	0%
Winter 2015	20%	60%	20%	0%
Fall 2015	62%	30%	0%	8%

While no freshmen were enrolled in the class until Fall 2015, every quarter two to three freshmen students volunteered in EGR 299 S course outreach activities (visits to K-12 schools and E-Girl). Students were engaged because they gained service hours required by other programs CPP extracurricular or academic programs. Preliminary data from student reflections suggest that senior students felt more confident managing the technical theory behind engineering applications and felt that they could contribute more to the development of the hands-on activities, which explains the larger number of senior students enrolling in the course. One senior student reflected: *"I felt like I was using engineering training because part of engineering is examining effectiveness of designs and being able to troubleshoot any design flaws that may come up before the design is actually brought to life"*. Preliminary data (not shown or discussed in this paper) has been used to develop an in-depth study of the benefits and gains of students participating in the course experience.

In the CPP CoE, the percent of females enrolled in technical core or elective engineering courses is commonly less than 50%. However, when the EGR 299 S course was offered, female students represented the majority of the enrollment, ranging from 56 to 88% (Table 3).

Table 3. EGR 299 S student gender distribution

Quarter	Females %	Males %
Winter 2014	87	13
Spring 2014	88	13
Fall 2014	56	44
Winter 2015	60	40
Fall 2015	46	54

During the duration of the project, students from six of the CPP CoE majors were enrolled in the course. The distribution of the students enrolled in the course indicated that civil engineering had the largest enrollment (53 to 80%). The dominating civil engineering student enrollment is attributed to the course instructor being associated to the same department. However, as time progressed, the number of students enrolled in the EGR 299 S course from chemical and materials engineering, and mechanical engineering majors started to increase to reach approximately 20% of the total students enrolled.

Table 4. EGR 299 S student distribution by major

Quarter	Civil %	Chemical & Mat. %	Mechanical %	Electrical %	Construction %	Industrial %
Winter 2014	53	7	13	0	7	20
Spring 2014	75	0	13	0	0	13
Fall 2014	78	11	11	0	0	0
Winter 2015	80	10	10	0	0	0
Fall 2015	62	23	0	15	0	0

Program sustainability components

One of the main objectives of the development of K-12 outreach activities via service learning experiences was to provide a sustainable way to promote active CPP engineering student participation in the education and motivation of the K-12 community. The sustainability of the program was achieved developing the curriculum model shown in Figure 1.

Sustainability component 1-The service learning instructional model provided academic credit to students(this provided time in students' schedules to engage in the creation, modification and further implementation of the hands-on outreach activities while keeping in mind the characteristics of the K-12 partner). The course was officially designated as a service learning course, which added all the elements of a healthy and ethical relationship between the community partners and engineering students during the learning experience.

Sustainability component 2- Kits containing all the different items needed to conduct the hands-on activities were assembled and reused at different K-12 schools' visits. Once the kits were not in use, the CPP CoE Office of Outreach took custody of them and made them available to other CoE outreach programs, individual students clubs or faculty members that wanted to get involved with K-12 outreach. This is the legacy of the EGR 299 S students.

Sustainability component 3- Building relationships with committed and nearby K-12 community partners facilitated the multiple visits of CPP engineering students during each quarter and during the academic year.

Sustainability component 4- Continuous interaction through the academic year of CPP engineering students and K-12 students created a great learning environment that motivated K-12 community partners to participate in the CPP E-Girl event at the end of the academic year.

Sustainability component 5- One of the key elements of the sustainability of the model is the involvement, commitment and partnership of the CPP CoE administration, the Office of Outreach and their staff to support the creation and maintenance of the EGR 299 S course. CPP CoE collaboration supported the continuous contact with the K-12 partners, aided the communications with K-12 partners when needed, provided support with ordering of supplies

and with E-Girl logistics (food, reserving rooms, etc.), and provided funding to expand the program to include more K-12 students. All the components mentioned in this section were critical to the success of the model and to achieve the desired impact.

The sustainability components discussed above were all developed and integrated during the first year of the program, and they were improved in the subsequent years. The CPP CoE students, faculty member, administrators and staff engaged in the different symbiotic program components to meet the program goals. The success of the complex collaboration was an important outcome of the project. One of the recommendations for universities or colleges that would like to develop a successful and sustainable long-term outreach program is to extend this beyond outreach offices, or individual efforts (as done by student associations, faculty members or administrators) and merge existing and future efforts to amplified impact. In addition, Incorporating outreach activities as part of the student curriculum has demonstrated to be successful. This model engages faculty members and new engineering students every time the class is offered. This resulted in new and fresh ideas being frequently discussed by the students enrolled in the class.

The academic credit associated with the course provided the opportunity of having engineering students fully engaged in the design, modification and implementation of new activities (using their engineering knowledge). Instead of having students participating in outreach as an extracurricular activity, competing for their valuable time with academic activities, the course provided the time in students' schedule to think on how to apply their knowledge and how to convey it to K-12 students.

Student experiences

As part of the curriculum it was expected that students would complete the following assignments: 1) development of a new activity proposal (including description of activity, materials needed, physical demonstration developed, and facilitation worksheets), 2) participation in 4 to 6 of the K-12 visits scheduled the term, and 3) writing of a reflection after each of the outreach events. In addition, students had to read some literature related to service learning and outreach (e.g. *What We Don't Talk About When We Don't Talk About Service*, by Adam Davis, and *Understanding K–12 Engineering Outreach Programs* by Andrew, et al., [9]), they supported the preparation of the outreach kits and practiced before the visits took place. This paper limits its discussion to the program description and briefly discusses some of the observations made from students' work, behaviors and attitudes. Student performance suggested that it was important to take the time and evaluate the impact of the course in the CPP engineering student learning experience. The study is still in progress and results will be prepared for publication in the coming months.

Hands-on activity proposal

Via the hands-on activity proposal, students had the opportunity to apply their engineering knowledge to design/modify and implement hands-on activities to be used in the K-12 outreach

visits (Figure 2). Every time the course was offered, different activities were proposed by the engineering students enrolled. It was observed that while it was very easy for some students to come up with ideas for activities, it was a very challenging task for other students. Some students struggled more with the implementation or construction of the physical demonstrations. The collaboration among engineering students and the peer-to-peer feedback helped to improve individual proposals. Peer-to-peer feedback became a critical element for students that had a hard time coming up with ideas for hands-on activities, or that struggled building physical demonstrations. The multidisciplinary learning environment challenged all engineering students since they were only familiar with concepts from their own major. Practice in the engineering classroom also aided the confidence building, especially when students handled engineering concepts from other engineering majors when facilitating the activities at the K-12 visits. Examples of hands-on kits that were successful include turbines, wire motors, water boats, roller coasters and groundwater recharge demos, among others.

Figure 2. EGR 299 S classroom. Engineering students practicing activities proposed by their peers. Testing was done to provide feedback for improvement of the activity, and for the selection of the activity that was ready to be implemented in the K-12 classroom.

Site visits to K-12 schools

As part of the service learning requirement students worked with the community partner a minimum number of hours (hours that were associated with the course units). Each student enrolled in the EGR 299 S course was required to attend four to six visits to the K-12 schools. It was necessary that all engineering students participating in the K-12 visit attended the CPP in-classroom training to ensure that they were prepared to support the K-12 students. In the first stage of the project a couple of engineering students showed up to the outreach event without fully understanding the activity or without the in-class training. The unprepared engineering students struggled while attempting to support the K-12 students, thus the peer-to-peer feedback and the in-classroom training were set as a requirement for attending all K-12 visits. Overall, all of the engineering students were well prepared and supported the few that were not. All the activities achieved the objective of engaging the K-12 students developing their own engineering projects. The K-12 teachers were very excited about having engineering students working with

the K-12 students. At the conclusion of the three-year grant, the K-12 partners were still eager to continue their relationship with the developed CPP engineering academic program.

Figure 3. EGR 299 S engineering students visiting the K-12 classrooms

Engineering students' reflections

CPP CoE student reflections suggested that the majority of the students were positively impacted. Several students took the EGR 299 S course in two to three continuous quarters, and three students participated in the outreach activities during the three years when the project was funded (enrolling in the course every term except when there was a scheduling conflict with another course). Students' reflections indicated that engineering students saw value in developing relationships with K-12 students. Some reflections mentioned that sharing their passion for engineering with K-12 students was something enjoyable, and they wished they had a similar experience during their K-12 years. In some occasions engineering students had time to discuss with K-12 students the resources and the challenges faced while in college and how the challenges could be overcome.

Comments from the engineering students' reflections triggered the need of further investigation on the impact of student learning. Some comments are shown below:

"*I felt like I was doing something positive for the middle school girls because I feel like just being there and serving as a sort of role model impacts the girls and shows them that just because girls typically aren't encouraged as much as boys to pursue engineering, that it's not impossible.*"

"At first I was a little nervous because I didn't know how a middle schooler would act or whether they wanted my input."

"I could see we sparked an interest so I do believe we are doing something positive for the K-12 students."

"This event showed us how to work with others to design a project, how to present a successful project to the public, and more. For me, I think it helped me gain social skills with people of

higher authority. I didn't expect for the principal of the school to walk around and interact with us."

"I tried to pose questions about how things work and why things are the way they are because this is the type of thing that engineers need to understand, and this is the type of thing that can explain how math and science have improved all of our lives."

Figure 4. EGR 299 S engineering students sharing resources and challenges faced in college.

Skills practiced and gained through EGR 299 S course Experience

Engineering students' technical skills were enhanced by the experience of developing the hands-on proposal and physical model. All students enrolled in the course were part of the multidisciplinary team that worked on preparing for the facilitation of the activities at the K-12 sites, and some students got the opportunity to take on the leadership roles facilitating the activities during the K-12 visit. While working in a multidisciplinary environment, CPP engineering students had the need of using their major's knowledge to enhance the work of peers, majoring in different fields of engineering, thus acquiring and building up new engineering knowledge. Collaboration was critical to successfully organize outreach kits, and working together as a team ensured that the selected activities were effective illustrating engineering principles. A lot of planning was done (e.g. length of hands-on activities had to fit within the different allotted K-12 class periods) and it was the key for the success of the complete process, from hands-on activity conception to the facilitation at the K-12 site.

Moreover, engineering students had to learn how to explain principles to engineering peers from different majors, and to K-12 students with no engineering background. Simplicity and clarity of the written, graphical or verbal communication was key for the outreach activities to be successful. Engineering students became aware of the importance of building relationships as a first step to being able to support or participate in the solution of a community problem/issue. Principles of social justice and ethical behavior are critical in the core training of an engineer, and the key to a successful engineering career.

Conclusions

While the current study does not present data from student surveys or their opinions, the observations made by the instructor and the engineering Office of Outreach Director suggested a positive impact on students' learning experience through their participation in the described educational model. A current study is underway to actually capture students' opinions and gains using qualitative and some quantitative approaches.

The educational program developed included the collaboration of several partners and stakeholders (CPP CoE administrators, CPP CoE Office of Outreach staff, CPP engineering students and instructor, and K-12 community) and it was successful due to the commitment of each component. Currently the CPP CoE is funding the EGR 299 S course and is continuing the effort that has proven to be very successful. It is important to emphasize that the success of the program depended on 1) the commitment and key weight distribution among all stakeholders (university administrators, faculty and K-12 teachers), 2) the motivation and engagement of the engineering students, and 3) the continuous communications among all the participants. The biggest challenges faced were 1) the occasional disinterest, lack of confidence or lack of creativity of engineering students that resulted in the development of hands-on activities that were not ready to be used at the K-12 visits, 2) conflicts with the engineering students' class schedules, which hindered the learning experiences of some students, and 3) the high demand that a program like this creates for the university, instructors and engineering students when K-12 communities within and beyond the service area request more frequent visits and inquire for information on how to become a part of the program.

CPP engineering students' reflections suggested that academic and professional skills were strengthened via the conception, development and presentation of the hands-on demonstrations. In addition, student reflections indicated that engineering students valued the development of the relationships with the K-12 students, namely relationships that allowed engineering students to show K-12 students how fun the engineering world is, and that inspired engineering students to engage with their community and consider matters other than just technical relationships. This program contributes to engineering education by merging the students' engineering knowledge with the creation of hands-on outreach activities and linking the service to the community. The inclusion of the ethics and social justice component in the formation of future engineering professionals, and the multidisciplinary nature of the course are unique aspects that this educational program offered.

Future work

The EGR 299 S instructor will continue working with the engineering education collaborator to gather the data from engineering students' experiences. This will become a second manuscript. In addition, while the Kellogg Legacy Grant funding has ended, the instructor and the College of Engineering, via the Office of Outreach, are working on continuing the relationships and the

offering of the course twice a year. All the existing K-12 partners have commented on the value of the program and their willingness to continue working with the existing program. Many other K-12 communities have expressed interest of participating in the program. However because of the engineering students' busy schedules and the distance from the university campus, it has not been possible to include all interested K-12 schools. Inclusion of schools farther from the CPP campus is being serviced via other Engineering Outreach Office programs.

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