The LSU Community Playground Project: Reflections on 16 Years of an Engineering Service-Learning Program

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Abstract - This article presents a first-year, biological engineering design course in which a placement-project combination service-learning model is used to enable students to meet practice-based and civic-based learning objectives. In this course, college students (1) work individually with elementary school students to practice reading and math skills and to learn about play and the school community, and (2) work in teams to co-create playground designs with the child play experts. Lessons learned and best practices of engineering service-learning are discussed, including the shift in instructional role, the variability and “partially controlled” nature of community-university partnerships, and the importance of language. Outcomes of the program are briefly discussed, with more detail given to five years of alumni survey data regarding the service activities of participants in the service-learning course before and after graduation. Results showed that 68% of respondents participated in service before graduation and 45% participate after graduation. Most service activities performed by graduates are not engineering related. Ideas for encouraging service in the engineering profession are discussed.

Index terms – civic professionalism, community-based design, engineering service-learning, playground

INTRODUCTION

My journey in teaching a service-learning course started in 1998; I was an assistant professor and was tasked with teaching a first-year design course in biological engineering (BE), entitled BE 1252: Biology in Engineering. I wanted my students’ first experience with design to be something “real world” and something that everyone was familiar with (I had horrible experiences as an undergraduate when trying to design artifacts with which I was wholly unfamiliar). Additionally, biological engineering was home to students with a broad range of interests, from biomedical to biological to environmental to agricultural, and I wanted to choose a project which would be of consequence to everyone regardless of their interest area. I chose playgrounds based upon a combination of previous experiences, broad familiarity and appeal, and the fact that as outdoor environments with safety recommendations drawn from biomedical and environmental research, playgrounds were easily adaptable as an area of interest for students¹. My idea was to have college students work in teams to design playgrounds at local public schools.

LSU had an active university-wide office of service-learning and I met the director of this office during a professional development workshop in 1998. It was through the director and the office that I learned the basics of service-learning, including how to effectively adapt this pedagogy into a course, the importance of reflection, and how to form and sustain effective community-university partnerships. My course evolved over time as my proficiency with service-learning increased and my understanding of community increased^{2, 3}. My entry into service-learning involved thinking about educational goals for my students only. However, my course is now based on addressing critical community issues as well as the educational goals for students.

This two-credit hour course includes one hour of lecture per week and a 3-hour lab each week. College students work in teams of 3-4 students throughout the semester to co-design a playground at a local public school. Each lab section is assigned to a single public school and we co-design with school personnel, especially the children, who are the true experts at play. School teachers and administrators determine the types of playgrounds we will co-design, which are specific to the school. Typically we generate two types of playground designs at each school based on the age of students; usual configurations include playgrounds intended for younger children (pre-kindergarten only, pre-kindergarten and kindergarten, or kindergarten - grade 2) and those intended for older children (usually grades 1-5 or 3-5).

College students develop multiple iterations of their designs during the semester and do most of their design work during the laboratory period. Multiple meetings with the elementary school facilitate this process. College students are paired with children at the elementary school who are reading or performing math below grade level. College students meet one-on-one with the same child a minimum of eight times during the semester in an effort to improve the elementary school student's achievement in math or reading. College students undergo training to be effective volunteer tutors. This training, and the placement process, is provided by Volunteers in Public Schools, a non-profit organization that supports local public schools through numerous programs, including Reading and Math Friends tutoring. (see <http://vips.ebrschools.org/>)

In terms of service-learning pedagogy, this course is a combination placement/project-based model. In a placement model, students perform direct service in the community to meet their learning goals—the service is an end in itself. In a project-based model of service-learning, students perform service to provide a tangible deliverable. A combination model requires a service placement as well as a deliverable.

The placement portion of this service-learning course (the tutoring) is critically important to provide college students with an understanding of and feel for the school community with whom they are completing a playground design. The entire class makes a visit to the school at the beginning of the semester to “talk play” with the children—the initial playground design concept each group creates is from the kids’ descriptions, drawings, ideas, and conversations from this initial meeting. On-going tutoring provides each college student the opportunity to continue the design/play discussion with a single child over the course of the semester, which informs each group’s design as the semester progresses and the group’s design evolves. Additionally, as the college students visit the school regularly to tutor, they come to know and understand the school community—it is this process, which I call “finding the soul of the community,” that is at the crux of successful community-based design. Each group has to come to an understanding of what the soul of the school community is, in terms of what makes it special and unique, so that each team can include design elements that effectively express the soul of the community⁴. Teachers often have a lot of input in this part of the design process. The placement portion of the

course leads to a more successful project-based deliverable (the playground design that each group creates).

Near the end of the semester, the entire class travels to the school once again so that each college student group presents their co-designed playground concept in poster format to the children, teachers, and administration. The format of this presentation is determined by the school, and typically involves college students delivering short presentations to the children in a gathering area in which elementary student teams rotate through the various posters. After each presentation, college students get feedback from the elementary schools students about the effectiveness of the design concepts—elementary school student and teacher feedback on the designs are included as a section in the detailed technical report that each team submits to the instructor at the end of the semester.

There are several features that make this service-learning program unique. First, the program has focused on a single issue year after year: ensuring that children enrolled in the public school system have access to safe, fun, state-of-the art playgrounds¹. Second, the service-learning model is a combination placement and project (deliverable) model⁵. Most engineering service-learning courses tend to use a project model, in which students work with a community partner to provide a deliverable (a design or a device). While it makes sense to use this model in engineering, the placement model more typically used in liberal arts courses is also useful because it provides students with enhanced exposure to the community. The learning goals I have for college students on their way to becoming humanitarian engineers and citizens¹¹ are difficult for students to achieve unless they spend significant time engaged with the community. Finally, the program has a mechanism for going from the design phase to the implementation phase. The playground designs created through this course are not of the professional quality necessary to actually build them. I hire selected college students who have completed the service-learning course to join the LSU Community Playground Project Research and Design Team. This team is responsible for taking the multiple designs created at a school, and working with the elementary school to consolidate these designs into a single design. The Research and Design Team then works with the school to write proposals and fundraise to obtain the funds to build the playground. This team also helps to organize and execute volunteer builds of the playgrounds.

This service-learning program requires substantive logistical effort and support. The ultimate goal of the LSU Community Playground Project is to ensure that every one of the 47 elementary school playgrounds in public school system is modern, safe, fun, and accessible. Both LSU and the public school system provide resources to support this goal. I have worked on a long-term basis with the Chief Information Officer of the school system and the Director of school grounds and maintenance to establish a ranked list of school playgrounds in need of upgrade and to plan and execute projects accordingly. The school budget does not include funding for playground equipment but does for playground maintenance—additionally, the grounds and maintenance department pledges multiple employees for every volunteer build. The construction skills of these employees add substantially to our abilities (grounds and maintenance employees have taught many an engineering student to effectively “swing a hammer”). Employees of ground and maintenance also support in other ways, including meeting playground equipment delivery trucks at the school location, unloading equipment, storing it safely, checking to make sure that all parts were properly shipped, and bringing tools to each build site.

LSU has also supported the efforts of this project. Liability is a significant concern given the accident rate on public playgrounds. I worked with the LSU Office of Risk Management to establish a “chain of liability” to ensure that the university, its employees, and its students are not

liable. The playground designs use pre-fabricated components created by national playground manufacturing companies whose components are in compliance with the latest safety standards and guidelines. The custom designs we create with these components are checked by the company's design headquarters to ensure compliance with all safety standards. The person hired to oversee volunteers as they build the playground is a certified playground installer. Playground build volunteers must sign a waiver of liability, get a safety orientation before they begin working, and we have "safety officers" (also volunteers) working each build site to maximize site safety (for example, to make sure that volunteers stay hydrated, to keep shovels/rakes face down, to keep holes well marked, etc.). Using this model, the playground manufacturing company is liable for equipment and/or design flaws, the certified installer is liable for errors in installation, and the school system is liable for playground maintenance once the playground is built.

The service-learning course also complies with the requirements of LSU's service-learning office with regard to liability. Logistically, when we travel as a class, we use university vehicles to visit the school site, as well as for field trips to area playgrounds so that the students can learn about playground design, safety, and layout experientially. For the placement portion of the course, students are responsible for arranging their own transportation to the school site to tutor—this responsibility is usually not an issue because most students have cars, many carpool, and the schools are within 10 miles of the campus. Students are required to secure field trip insurance (free to them) through LSU's service-learning office before they leave campus (<https://sites01.lsu.edu/wp/riskmgmt/triptravelservice>).

LSU has created a memorandum of understanding with the school system to formalize the collaboration and has created a mechanism through which if play equipment is purchased by the university (through a grant), the equipment becomes the property of the school system. LSU employees assist with the submission of grant proposals to fund playgrounds, have created a foundation account for fundraising purposes, and help execute fundraising campaigns for the playground project. The elementary schools are also involved in fundraising for their respective playgrounds.

Many of the students employed on the Playground Research and Design Team are funded by work study or by LSU Chancellor's Aide scholarships—both programs provide a source of funding from which students are paid as they work on the playground project. Although my teaching load is not reduced in terms of teaching a course using service-learning pedagogy, the products of scholarship created from the playground project (including the completed playgrounds, grant funding received to build the playgrounds, and especially refereed journal articles and books) are recognized in annual evaluations and were recognized for promotion to full professor.

LESSONS LEARNED

Although the structure of the course is well established, I am constantly experimenting and changing aspects of the course. Some of this change involves external forces, such as the ASTM playground safety guidelines, recommendations, and standards being updated and changed. The standards around this topic are dynamic, with major changes occurring in response to data collected on playground accidentsⁱⁱⁱ. Other changes include improvements made as a result of assessment. I have learned many lessons over the course of my service-learning career^{6, 7}. The following are three lessons learned that I consider most important.

Control is an illusion

We engineers love control. We like order in our classrooms, we invoke assumptions to control problem-solving, and we want a controlled, orderly situation which lends itself to straightforward, successful solutions. Service-learning is a pedagogy in which you do not have control of everything. Sometimes this lack of control translates to your students as well. Engineering professors who are interested in doing service-learning have often confided that they are afraid to “lose control.”

In response, I tell the following true story: The first time I taught a service-learning course, I told my students on the first day of class that we were going to design a playground that semester. I went on to say that I didn’t know how to design one myself, but that we were going to learn together. After end of the semester, when I got my student evaluations back, the highest score I received on any of the 20 metrics was, “Instructor thoroughly understood the subject matter.” After having a good laugh, I thought about it and came to the conclusion that my students thought that I understood the subject matter because I modeled “how to learn how to design a playground” instead of “how to design a playground.” Service-learning courses “without controls” force engineering faculty to model “how to learn how to design”—and it is this “how to learn” knowledge that is just as important (I’d argue more important) than simply the “how to design” knowledge.

Service-learning classes are more reflective of the engineering profession, where engineers are NOT in control of everything. I assert that it’s better for students to learn the importance of context in engineering design and to get experience with not having control of many aspects of the situation for which they are designing and/or problem-solving while they are training to become engineers. Students tend to be more interested in this experience as well, because it is “real” and their projects can have impact on the community.

Although you may not have control of every aspect of a service-learning course, you have full control over your classroom and how you respond to any situation. Your students can learn a great deal from you about communication, conflict resolution, ethical behavior, and professional skills in these scenarios.

You do not need to know everything!

Just as the environment in a service-learning classroom is not completely controlled, your role as an instructor will also change. Most of us were educated in the “professor is omniscient” model and, as instructors, we tend to feel comfortable being the all-knowing “sage on the stage.” Service-learning changes the instructor’s role to a facilitator of learning. You are an expert source of information, but not THE expert source of information.

Getting used to this transition can be hard, but remember that your students already believe that you’re omniscient—you are definitely the expert in engineering—but not all the knowledge that you need to work in an engaged environment is engineering knowledge. Your community partner is also an expert. I strongly suggest that you make an effort to present your community partner as an expert, and even a co-instructor if they’re heavily involved in the course.

Even though you are a facilitator of learning, there are still things that you want your students to master. You have to focus on learning objectives and how the students will achieve them. Some of mine are easy and straightforward (mastering the design process, learning how safety standards impact design). Others are less straightforward because they tend to be more civically

oriented and outside my area of expertise. For example, I want my students to get to the point that they can “see” the uselessness of blame⁷. I also want them to examine and overcome race and class stereotypes. Sometimes, students will say things in class that are so uninformed that I cringe inwardly—I used to wish that I had a greater understanding of critical race theory⁸ or that I had a degree in sociology to be better prepared to address such comments. I’ve realized that I don’t need either of those things. I just need to calmly ask the probing questions that lead students to further articulate their ideas and to consider them, and to let other voices join the conversation. If you use discussion techniques in class and someone says something worth thinking about and discussing, you can place students in small groups to talk about responses and then have them prepare such responses that you can put on the board, share with the entire group, etc., without calling anyone out or making them feel bad. For more information on classroom management techniques that actively engage everyone, see <http://www.liberatingstructures.com/>.

As professors, we’re usually pretty good about assembling teams with complementary expertise areas for research projects, but we often don’t do the same thing for teaching. If you are not sure of how to handle something, make use of the expertise that’s available to you—your community partner is a fount of wisdom—avail yourself of their wisdom. Your service-learning office has probably already dealt with the issue you’re having and can offer perspective. Your college of education is full of faculty members who are experts at college teaching. Invite them for a cup of coffee and pick their brains about teaching. I was interested in looking at the structure of my service-learning class and how well it met ABET objectives. I didn’t know how to go about conducting such research, so I enlisted the expertise of a faculty member in the college of education. She and her graduate student worked with me to design and execute a study that we published on this subject⁹.

Not all partnerships are created equal

I teach two to three sections of the course each year, and each section partners with a single public school. These 2-3 simultaneous partnerships are never the same. One is usually easier than the other(s), which doesn’t necessarily mean it is better than the other(s). Difference is what makes the course a unique experience each time. Despite my best efforts, some partnerships will go smoothly and some won’t. Sometimes it’s lack of communication; other times, it might be the situation. For example, if a school is dealing with low academic achievement, building a new playground might not be as much of a priority as with a school in which academic achievement is not an issue. Sometimes, issues are beyond the control of the partnership. Twice, the school board has voted to close a school while we’re collaborating, so likely, those playgrounds will never be built.

For partnerships that are difficult, regardless of the reason, I do not assume that service-learning is a failure if things don’t go the way I intended. Sometimes the tougher partnerships present better teachable moments for students. My philosophy with service-learning partnerships is to never stop trying¹⁰ and to do everything I can to transcend a difficult partnership.

BEST PRACTICES

With regard to best practices in service-learning in engineering, I have four major suggestions.

Use best practices in service-learning.

Service-learning is a well-established pedagogy, but most of the original work was done outside the engineering profession. I encourage anyone undertaking service-learning in an engineering course to familiarize themselves with “the canon” of service-learning. The following references are recommended as a starting point:

- Boyer, E. 1996. The scholarship of Engagement. *Journal of Public Outreach*. 1(1): 11-20.
- Howard, J. 2001. Principles of good practice for service-learning pedagogy. *Michigan Journal of Community Service Learning*, Summer 2001, pp. 16-19.
- Campus Compact. 2003. Introduction to Service-Learning Toolkit: Readings and Resources for Faculty. 2nd Edition. Providence, RI: Campus Compact. ISBN 0972939415.
- Eyler and Giles. 1999. Where’s the Learning in Service-Learning? Jossey-Bass: San Francisco, CA. ISBN 978-0470907467

Your university’s service-learning office may have these publications in their library and may have additional references for you to read.

Carefully plan logistics

A well-planned service-learning course is important so that you, the students, and the community have a productive experience. Logistics also provide structure to the service-learning partnership that can ameliorate the “uncontrolled” aspect of service-learning. Advice for logistics is as follows:

- Start with a small service-learning project and increase its scope over time. The first time one teaches a service-learning course, a small project with specific objectives and an achievable goal is recommended. All parties will increase their confidence over time and as an instructor, you will become familiar with the service-learning process. Your experiences can be the basis for forming partnerships with a larger focus over time, either with the same community partner or with different community partners. Many service-learning practitioners recommend forming an on-going partnership with the same community partner; advantages of this approach include trust-building over time, efficiency (you don’t have to “learn” a new community partner or develop a new partnership each year), and impact (impacts tend to be bigger with on-going work and relationships).
- Choose the model of your service-learning course. As discussed above, instructors can choose a service-learning project model (a deliverable), a placement model (regular visits to a site to perform service), or a combination of both. To learn more about these types of models, instructors are encouraged to consult pertinent literature^{11, 12}.

- Choose the format of your course. Service-learning courses lend themselves well to a laboratory (rather than lecture or recitation) format. Continuous chunks of time are useful for students if they are working in groups in a service-learning project model. Laboratories lend themselves well to research, design, discussions with the community partner, partner visits (off and on-campus), group work, team meetings, prototype building, etc. If you have control of the course format, I highly recommend that the course contain a laboratory component.

Remember the importance of language

In service-learning, the language we use is extremely important. We convey a lot with our words, and I believe that one has to be precise with language to ensure that all constituents in the service-learning process are respected. Patti Clayton has defined “the power of little words” to refer to this phenomenon¹³. The following choices of words are the ones I encounter most in engineering service-learning.

Community partners, not clients. Engineers often use the word “client” when discussing people for whom they are doing engineering work. The word client is defined as “a person or organization using the services of a lawyer or other professional person or company.” This term works well in the engineering profession because the engineer is providing expertise to a paying entity. This model does not translate well in service-learning. In service-learning, the term “community partner” is used instead of client. The community partner is not purchasing the services of the student as a client would (and the student is not yet a professional). A community partner is a person or organization working to address a critical community need. The students work with the community partner in the capacity of addressing this critical community need, in a way that also enables the students to meet their learning objectives. The community partner is an expert in his/her/their own right. In the best partnerships, the community partner is a co-educator with the engineering instructor—not a client. When we call our community partners clients, we reduce their roles to passive entities to whom we are providing our expertise. We thus reduce the respect we show them as well. For these reasons, it is important to use the term community partner.

Serve, not help. The difference between these terms is best described by Rachel Naomi Remen¹⁴: “Helping, fixing and serving represent three different ways of seeing life. When you help, you see life as weak. When you fix, you see life as broken. When you serve, you see life as whole. Fixing and helping may be the work of the ego, and service the work of the soul.”

The word “help” suggests that the community partner needs the help of the professors and the students. In actuality, the students perform service-learning for two functions: to serve and to learn. It is important that the students realize that they are not helping—they are serving to address a critical community need, and in so doing, they are learning from the professor and from the community partner, and are learning in the classroom and in the community. Using the word “serve” or “service” instead of “help” or “helping” reinforces the students’ role and respects the knowledge base of the community partner.

Design with, not design for. Because the university (your class) and community (your specific community partner) have a mutual, reciprocal partnership in service-learning, these entities accomplish goals together. They work with each other to address critical community issues—and in engineering service-learning, they design artifacts or solutions to problems with each other. The university does not design for the community, nor does the community design

for the university—the two entities design together. The “with” language (as well as referring to each other as co-designers) reinforces the expertise of each constituency.

If you use a project model, establish a mechanism for ensuring that the deliverable at the end of the project period is good enough for actual deployment.

If you really want the project to be appropriate for use within the community instead of foisted upon the community, make sure that a mechanism is in place to ensure that the use, maintenance, and retirement/redesign/recycle portions of overall process are clear and assigned.

Service-learning programs have handled this issue in various ways¹⁵. For example, the Engineering Projects in Community Service (EPICS) model uses vertically integrated teams to partner with the same community partner over an extended period in order to collaborate throughout the life cycle of a deliverable (see <https://engineering.purdue.edu/EPICS>). Sometimes the professor who teaches the service-learning course is the point person for questions and concerns about service-learning projects after they have been deployed within the community. Having a point person is critically important for an on-going partnership—in our case, issues like drastically increasing enrollment in schools have led to additional collaborations to create bigger play spaces.

OUTCOMES

Outcomes data for the playground project with regard to students and the community was recently detailed¹⁶; briefly, outcomes include:

More than 60% of the students who took BE 1252 graduated with a B.S. in Biological Engineering from LSU. This graduation rate is difficult to put into context because there is no control group. The course was taught once before I taught it (it was not a service-learning course) and the six-year graduation rate that year was 26%. However, it is difficult to draw conclusions with one year of six-year graduation rate data vs. 11 years of such data. Also, university admission standards have increased between 1996 and 2007 (the last year that six-year retention data was measured).

The quality of students’ reflection went up after the course model was changed from project-based only to project plus placement. For the placement portion of the course, approximately 250 college students have each provided an average of 8 hours of reading or math tutoring during the semester.

From 1999-2014, 29 playgrounds were co-designed by college and elementary school students. Of these playgrounds, 20 have been built. Several designs were not built due to external factors such as the closing of schools. The other designs cannot be built until funding is complete (currently, funding is 95% complete for one design and approximately 25% complete for two others). Collectively, these playgrounds serve about 8000 children each school day and additional children from the neighborhood year round. The playground research and design team has undertaken additional projects that have resulted in an additional 9 playgrounds being built (and another 2000+ children served on a daily basis).

Several other project activities have been undertaken in response to on-going assessment and conversations with community partners as follows:

- Twice, I have run a semester-long workshop for elementary school advocates (usually teachers, but also pre-service teachers, PTO (Parent Teacher Organization) members, and parents) to teach proposal writing and fundraising strategies. Each individual or team

representing a school is given a specific foundation to apply to for funding for their playground. This workshop series resulted in funding for three playgrounds. Some of the participants used their proposal writing skills to successfully garner additional resources for their schools that were not playground related.

- The playground research and design team has worked with the school system to develop and execute a playground assessment tool so that school playgrounds are occasionally assessed and ranked in order of need of upgrade. This ranking is used to select partner schools for the course.
- I was recently asked to produce a training video for public school employees to teach the basics of playground safety, so that routine maintenance issues can be recognized and reported quickly.

The outcomes detailed in this paper involve survey data collected from our alumni who were surveyed 3-5 years after graduation. These students graduated from our program between May 2006 and December 2010 ($n = 78$, including 35 in the 2009 survey and 43 in the 2013 survey, representing a 50% overall response rate) and were asked several questions about service-learning and service.

The first question was, “Were you more likely to participate in service as an undergraduate as a result of having taken BE 1252?” Answers are included in Figure 1.

FIGURE 1
PERCEIVED RELATIONSHIP BETWEEN TAKING SERVICE-LEARNING COURSE AND
SUBSEQUENT PARTICIPATION IN SERVICE

Data in Figure 1 indicate that participating in service-learning made an overall 39% of students more likely to get involved in service as an undergraduate; a substantial percentage of students felt that taking a service-learning course might have made them more likely to participate in service. If one pools the “yes” and “maybe” data, 72% of students provided such answers. These results are encouraging if educators want engineering students to be involved in serving their communities and bodes well for offering service-learning courses, as well as offering them early, to give students time to participate and develop via service.

Alumni were asked if they participated in service as undergraduates, and if they participated in service today, as graduates. The responses are shown in Figure 2.

FIGURE 2. PERCENTAGE OF RESPONDENTS WHO PARTICIPATED IN SERVICE AS UNDERGRADUATES AND AS GRADUATES

Examination of Figure 2 shows that overall, 68% of students surveyed participated in extracurricular service as undergraduates. This percentage compares well with data from the National Survey of Student Engagement (NSSE), as 50-65%^{iv} of respondents nationally indicated that they had participated in service at least once during the academic year¹⁷. After graduation, 45% of alumni overall report being involved in community service; although this data represents a substantial decrease compared to participation while in college, it is higher than national data on volunteerism, which shows that 39.8% of college graduates participate in community service¹⁸. While the number of students participating in service as undergraduates was relatively stable for the two survey periods, the percentage of graduates involved in service increased substantially between the 2009 and 2013 survey periods. The reason for this increase is unknown and hard to interpret without a bigger and more sophisticated data set.

Participants in the 2013 survey were asked to identify the type of service in which they were involved as undergraduates, and then as graduates. The 17 answers to this question were classified as to whether or not the service activity was associated with engineering, and this data is presented in Figure 3.

FIGURE 3
 TYPE OF SERVICE ENGAGED IN BEFORE AND AFTER GRADUATION

As undergraduates, 33% indicated that they participated only in service activities affiliated with engineering, while almost a quarter of students participated in engineering and non-engineering service activities. Overall, 57% of students participated in some service activity connected to engineering. As graduates, 35% of respondents participated in some service activity connected to engineering. While the percentage of people participating in only engineering service remained close (33% as undergraduates and 29% of graduates), the percentage of respondents participating in both engineering and non-engineering service activities decreased substantially, from 24% of undergraduates to 6% of graduates.

It is impossible to draw sweeping conclusions from this data set due to its size, focus on one discipline within the engineering profession, graduates from one university, and its geographic focus (the south generally has higher volunteer rates compared with the rest of the country and much of this service is done through faith-based groups. Of the 11 respondents who listed non-engineering service activities as graduates, four specifically mentioned that the activities were facilitated through their church). However, the data offer a “small snapshot” that is thought-provoking.

FINAL REFLECTIONS

As I reflect on service-learning in engineering, I realize that it has become the driving force in my career. What made me enter this area was my interest in ensuring that my students were not educated to be ‘highly-skilled barbarians’—this interest has taken me on a career-long journey in which I have learned about the immense wisdom in my community, about how to find the soul of the community, and about the necessity for the engineering profession to develop civic engagement as a core value.

There are many ways in which the service-learning course described in this paper could be improved. Further involving elementary school children in the playground design process, in terms of teaching elementary students the principles of engineering design and having them practice those skills with the playground design, would enhance the elementary school students’ education and their impact on the design process. This approach would have to be undertaken carefully—public school teachers are the experts in their classrooms, in content, and in pedagogy—I believe that an elementary school engineering curriculum should be delivered by these teachers and would have to fit into the elementary school’s pedagogical model (currently for most states, the Common Core State Standards Initiative).

There is plenty of room for enhancing the playground designs created through the partnership. I sometimes feel like the co-created designs lag “the state of the art” in playground design for multiple reasons, including liability (pre-fabricated components tend to look similar even if they are put together in a unique way), limited budget, and maintenance issues (minimal maintenance is critical, which limits innovative designs that require maintenance). I believe that finding ways to address the aforementioned issues would lead to better designs.

Another improvement would involve expanding the scope of the playground project. The elementary school teachers, who offer so much wisdom in identifying the soul of their school’s community and providing “in the trench” information necessary for playground safety and layout, often ask for “a room of their own,” an outdoor area where they can relax and regenerate. In practice, it’s been so difficult to get funds just to build the playgrounds that to this point, I have not added the design and construction of these “rooms” to the scope of the playground project, even though I think doing so is supremely important. Teacher turnover is a national crisis, with 46% of teachers leaving the profession within five years¹⁹. I have thought about the “rooms of their own” being the continuation of the playground project. I have also hoped that others would join this effort.

Finally, I believe that just as the course can be improved, both engineering education and the engineering profession can be improved to ensure that civic engagement and service are core values. As educators interested in providing civically engaged activities to our students, we might ask ourselves several questions that could lead us to better informed and developed programs for engineering students, engineering graduates, and the engineering profession. For example,

- Do we want our students to be involved in their communities before and after graduation?
- In what ways do we want them involved?
- What sort of curricular and/or co-curricular activities and programs do we need to provide students in order to “get them where we want them?”
- What do we want the trajectories of our graduates’ lives to look like as professionals and as engaged citizens?

- What does civic professionalism look like in engineering?
- In what ways do we build capacity toward civic professionalism in engineering?

The alumni survey results presented in this paper show that most of the service activities that graduates are currently performing are not connected to engineering. While this fact is not necessarily objectionable, it also makes one realize that there are few service options available for practicing engineers. There are organizations such as Habitat for Humanity, professional chapters of Engineers Without Borders, and Code for America (especially for computer and electrical engineers), but generally, there is not a multitude of service organizations in which an engineer can contribute to community by practicing their profession.

Additionally, there is no professional mandate to perform service within the engineering profession. Law has such a mandate, and expects all members of the American Bar Association to perform 50 hours of pro bono (for the public good) service, for which they do not charge, each year. There is professional infrastructure in place to support pro bono work through the American Bar Association (see http://www.americanbar.org/groups/probono_public_service.html).

I believe that we should move toward a professional mandate of service in engineering. Part of this mandate will involve developing an infrastructure in engineering to support pro bono service, and another part would be to provide opportunities for engineering service beyond the aforementioned organizations.

One easy practice would involve those of us running engaged engineering programs to open venues for service to our engineering alumni. Anecdotally, I have noticed that playground builds attract my alumni as well as my current students. The conversations, connections, networking, and mentoring that occur while these constituencies work together side-by-side during a build are amazing to observe. These conversations are not the primary purpose of getting together, they're just a positive, unintended consequence of opening spaces in which current and former students can serve together in an engineering capacity. Service-learning pioneer Julie Hatcher spent much of her career on developing structured reflection models in service-learning that most practitioners use today^{20, 21}. She recently said that current research is showing that unstructured reflections, such as the playground conversations, have even more impact on building a service orientation than structured reflection²².

Other ideas for building toward a professional mandate of service in engineering include:

- Working with discipline-specific and general engineering professional societies to find local, regional, national, or international pro bono engineering service opportunities.
- That the National Society for Professional Engineers make completing community service hours in engineering an expectation for continuation of the PE license, similar to continuing education hours.
- That liability issues involved with doing pro bono engineering work are addressed in such a way as to make it easy for engineers to be covered. The legal profession already has an outstanding mechanism in place for providing malpractice insurance for lawyers doing pro bono work (see http://www.americanbar.org/content/dam/aba/administrative/lawyers_professional_liability/lpl_pro_bono_work_and_malpractice_coverage.authcheckdam.pdf).
- That groups with a focus on engaged work in engineering, for example, the ASEE Community Engagement Division, EPICS, Engineers Without Borders, and others, collaborate together to build the engineering profession toward an ethos of service.

Activities could include development of engineering service toolkits with best practices and recommendations, a “how to get involved” portal to connect with communities, liability information, and the sharing of successful projects, as well as opportunities to get involved with ongoing projects.

What do we want the trajectories of our students to be as professionals and as people? Our archetypes have generally included professional engineering careers and engineering management careers, but we tend not to include civic or personal narratives that are also critically important for life. I think it’s imperative that we build toward engineering service careers and an expectation of service for all engineers. In so doing, we build the future of our profession to a place in which service is a core value.

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NOTES:

ⁱ Lack of access to playgrounds is a national issue. Although our community has a strong park system, due to geographic and safety issues, many of the children enrolled in public school have access only to their school playgrounds.

ⁱⁱ Civic learning goals are that (1) students can work effectively with a community to design an artifact that reflects the soul of the community, (2) students can listen contextually, withhold judgment and problem-solve with the community in a transparent way, without hiding behind the profession. I want my students to be design facilitators, not “THE DESIGNERS.”

ⁱⁱⁱ Hospitals are required to report playground accidents to the National Electronic Injury Surveillance System (NEISS); the committees responsible for playground related ASTM standards analyze NEISS data and use this analysis to make appropriate changes to the standards.

^{iv} This range was based on data reported from Doctoral Research Universities (50%), Research Universities with high activity (58%), and Research Universities with very high activity (65%). Data is from the 2012 annual report, the most recent year from which data involving community service was found.