

# A Closer Look at Campus-Community Partnerships in Engineering Education

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**Abstract** — This Research Work in Progress paper looks at community-engaged learning, service learning, and similar pedagogies that extend project-based learning beyond the classroom into “real world” communities. Use of such pedagogies is increasingly common in engineering education, and evidence suggests that they are particularly effective at connecting engineering theory to practice, engaging engineering students motivated to “make an impact,” and preparing engineering students for an increasingly globalized world. Community-engaged learning and similar pedagogies typically involve creating a partnership between campus partners (e.g. students, faculty, or staff) and community partners (e.g. community members or organizations) to address an engineering challenge that, if successful, will contribute to student learning and provide value to the community partners. Building upon the existing frameworks of “do no harm” and “engineering to help,” this paper examines the relationships between academic and non-academic partners as a crucial yet relatively unstudied aspect of community-engaged learning. The partner relationship – the shared expectations, commitments, responsibilities, and trust (or lack thereof) between partners – appears to be vital. However, because it is not always the primary focus of those involved, and because partners’ interests, incentives, epistemologies, and worldviews do not always align, partnerships frequently fail, leaving dissatisfaction and disillusionment among campus and community partners alike. This study employs a comparative case study approach using sets of interviews with students, instructors, and community partners involved in different sides of the same engineering projects. Some projects are retrospective while others are current, and some had positive outcomes (as defined by stakeholders) while others were less than positive. We present qualitative findings that suggest a set of considerations for mutually beneficial partnerships in community-engaged engineering courses and programs. Ultimately, this paper aims to provide a current perspective and guidance for engineering educators, students, and community partners who wish to jointly build and nurture enduringly effective and equitable partnerships.

**Keywords** — *community-engaged learning, engineering service-learning, design for impact, campus-community partnerships, trust*

“Solidarity is not the same as support. To experience solidarity, we must have a community of interests, shared beliefs and goals around which to unite ... Support can be occasional. It can be given and just as easily withdrawn. Solidarity requires sustained, ongoing commitment.”

— bell hooks, 2014

## I. INTRODUCTION

Community-engaged learning, service-learning, and similar pedagogies have a long history in higher education [2-3] and, in recent decades, have become increasingly prevalent in engineering education [4-6]. Service learning is an active pedagogy that connects theory with practice, communities with classrooms, and analytical thought with context and values [2,7]. While evidence alarmingly suggests that engineering students disengage from public welfare concerns over the course of their educational careers [8], service learning can help to re-engage engineering students with a sense of purpose, ethics, and social and environmental responsibility, while also promoting prosocial reasoning, prosocial decision-making, and cognitive development [9-14]. With hundreds of published definitions, service-learning is not easily defined [15]. We use “community-engaged learning” as an umbrella term that encompasses service-learning and any pedagogy that involves a partnership between a campus partner (university students, faculty, or staff) and a community partner (a community member or organization that works to create mutual benefit in a community). Worldwide, there are many well-established community-engaged engineering courses [e.g. 5, 16-18]. Prior studies has shown that community-engaged learning is particularly effective at contextualizing engineering, connecting engineering theory to practice, engaging engineering students motivated to “make an impact,” increasing the persistence of women in engineering education, and preparing students for an increasingly globalized world [13, 19-24].

However, there are reasons to be wary of community-engaged engineering. Engineers and engineering students often over-attend to the technological aspects of complex situations and largely ignore, and thereby perpetuate, structural economic, political, and social forces and the power relations that maintain them [25]. In one study, a majority of community-engaged engineering student projects failed due to “lack of contextual knowledge” or “assuming the needs [of stakeholders] [26].” As Monsignor Ivan of Mexico warned U.S. college students in his address “To Hell with Good Intentions,” when engaging with communities, there are very real possibilities for well-intentioned students to do harm [14, 27-30].

This study is motivated by a wish to facilitate campus-community partnerships in engineering education that are increasingly effective and equitable, i.e. effective at achieving

the goals of both campus and community partners, and equitable by acknowledging and working to attenuate power imbalances, unequal risks of harm, and disparities in outcomes between campus and community partners. This paper explores characteristics of quality partnerships in an effort to highlight the campus-community partnership as a crucial yet understudied aspect of community-engaged learning in engineering.

## II. THEORETICAL FRAMEWORKS

As a basis for this work, we draw from the frameworks of “do no harm,” “engineering to help,” and established principles of community-engaged learning. “Do no harm” is a framework borrowed from peacebuilding and international aid that analyzes local capacities for peace and capacities for war [28]. It assumes an assets-based model of community development and is cognizant of the sometimes harmful history of technocratic engagement in many communities. Similarly, “engineering to help” offers incisive critiques of community-engaged learning in engineering – borrowing from fields such as development studies, cultural studies, and feminist critical theory – to question paradigms in which “helping” leaves root causes and systemic structures largely unexamined or in tact [31]. Finally, we build from established principles for community-engaged learning in higher education published by a variety of researchers and organizations, including university public service centers (U.C. Berkeley [32] and Stanford [33]), scholars [2, 34-37], and the U.S. Centers for Disease Control [38]. This cumulative set of principles may be summarized as follows: Respect and Humility; Reciprocity; Relevance; Clear Expectations and Commitment; Preparation; Reflection and Evaluation; Valuing Diversity; and Safety and Wellbeing. These frameworks and principles grounded the development of interview protocols as well as interviewing and analysis.

## III. RESEARCH QUESTIONS AND METHODOLOGY

This study aims to address the following research questions:

**RQ 1:** What considerations are important to the formation of effective and equitable campus-community partnerships in engineering education?

**RQ 2:** How might such campus and community partners limit possible harms and facilitate increasingly effective and equitable partnerships?

We employ a comparative case study approach. Because the study is intended to clarify or suggest new theory, and not to show the extent to which a theory is generalizable, a purposive sampling strategy was used. Interviewee identification began with a literature review to catalog engineering faculty who teach community-engaged courses, followed by exploratory interviews and snowball sampling to identify associated community partners, students, and other educators with significant experience with community-engaged learning in engineering. We focused on faculty with 10+ years of experience with community-engaged learning. Although they are largely from mechanical engineering departments, their community-engaged courses tended to be interdisciplinary (across engineering disciplines). The cases were chosen based on availability of partners (at least one community partner and one instructor or student) from each project for semi-structured interviews in English, in-person or by phone. We adhered to

IRB-approved protocols. This preliminary dataset includes five instructors, three community partners, and one student. A summary of the interview participants is shown in *Table I*.

TABLE I. INTERVIEW PARTICIPANTS

Summary Statistics	Number
<b>Partnerships<sup>a</sup></b>	
Total interviewees	9
Total cases (campus partner(s) + community partner set)	3
Female / male	3 / 6
<b>By Partner Type</b>	
<b>Community Partners</b>	
U.S.-based nonprofits	1
Southeast Asian NGOs	2
<b>Campus Partners</b>	
Universities or colleges	5
Community-engaged engineering course instructors	5
Tenured faculty	2
Teaching faculty, lecturers, or instructors	3
Students (engineering undergraduates)	1

<sup>a</sup> Each partnership is between one or more community partner and one or more campus partners. Partnerships center on an engineering project(s) in a community-engaged learning course.

Interviews lasted for an average of 61 mins and all but one (per interviewee request) were audio recorded and transcribed. A team of two authors collaboratively built a codebook with a mix of theoretical and emergent codes, and coded the transcripts. A sample of the transcripts were independently coded by both coders with an intercoder reliability score of 0.75. Thematic analysis was performed looking at the content of each code across the interviews and cases. Due to space limitations, only a subset of the emergent themes are presented below.

## IV. PRELIMINARY RESULTS AND DISCUSSION

The findings presented are preliminary and by no means comprehensive, however, the sample that follows demonstrates the potential to add clarity and nuance to existing theory and practice.

### A. A Typology of Campus and Community Partners

In the process of coding, a characterization of campus partner and community partner types emerged.

**Campus partner types** include: *students, instructors, advisors, and partnership liaisons*. The first three roles are as expected while the partnership liaison role is less obvious. As a faculty interviewee put it, “*a liaison person ... is in charge of: figuring out what the projects are; setting up the projects; running them through the class; doing the follow-up after the class ... and working with the client the whole time.*” They are a university-based person or entity responsible for caring for the relationship with a community partner and everything that this entails. In one model, the partnership liaison is a staff person from a campus center, e.g. public service center or humanitarian engineering center. In another model, partnership liaisons are one or more committed project advisors, who may or may not have engineering backgrounds but likely have significant experience in community-engaged learning and projects. Lastly, we found that partnership liaisons could be especially active and dedicated course instructors. Regardless of the model, campus-based partnership liaisons appear to be particularly important for facilitating strong and lasting campus-community partnerships.

Our findings also suggest a set of **community partner types**: *primary community partners, context translators, and implementation partners*. A primary community partner is the main and sometimes only community partner; their mission is to provide value for their primary stakeholders, e.g., persons with disabilities, an elder population, a population without reliable access to electricity. In some cases the primary community partner is the primary stakeholder, such as an individual in need of a novel wheelchair attachment. If the primary stakeholder is more than a single individual, it may be helpful to consider the following two additional partner types.

A context translator is someone who is trusted by primary stakeholders, has deep understanding of their history, cultural norms, and beliefs, and is often a recognized member of the primary stakeholder group. As one community partner put it:

A great partnership is where you have a rock star, local bridge person or cultural translator. ... [They] get what the expectations and hopes of the [primary community partner] are, understand the culture of the students in some capacity, and deeply understand the culture of the [primary stakeholders]. ... They can guide the [outsider] into understanding. ... They kind of feel what's right. ... That person can help guide an [outsider] that is open to such guidance into understanding how a collaboration will actually work better with local [people].

Finally, implementation partners are community partners who play a role in providing the long-term, intended value (e.g. product, service, or connections) for primary stakeholders. This role can be filled by primary community partners, established manufacturers and distributors, financial or government institutions, a dedicated organization founded by primary community partners, students, and/or instructors, or others. It appears critically important, for many reasons, that the full set of partners has the collective capacity to implement course projects. Sometimes this may require working with partners to purposefully recruit and engage new implementation partners.

B. 'Partners' vs. 'Clients'

Another theme in the data suggests different ways that campus and community partners orient to one another – such as a transactional approach between 'client' and 'consultant' or a

relational approach between 'partners' – as shown in *Table II*. The quotations in the table illustrate differences between a 'partner' orientation (relational approach) and 'client' orientation (transactional approach). Campus-community partnerships span these approaches in a variety of ways, and a case can be made for why different orientations are more effective or more equitable for a given partnership situation. We found that some partnerships began as transactional and transitioned to relational as trust and relationships were built. Other partnerships, such those involving implementation partners (e.g. manufacturers), called for a more transactional approach from the start. Finally, some partnerships were highly dedicated to a relational approach, as is also evident in the literature [31,39], focusing on building solidarity amongst long-term partners. In alignment with prior work [40], some partners worried about the use of terms like 'client,' as one instructor explains: "if we're thinking of communities as our clients, it's a very different kind of conversation. We do a very different kind of listening and evaluating of their priorities than we do if they are the users, stakeholders, citizens, [or] partners." Similarly, other instructors expressed concern about programs that support "that paternalistic nature of service," and a desire to "fight things like 'hero mentality.'" One instructor offered this guidance:

Be careful what you make transactional ... it's not just buying stuff, it's like, 'I need certain information,' or 'I need agreement,' ... 'What do I have to do to get it?' And you get in that kind of mentality. And it's the worst case if you're going at a different time rate, so you get impatient: 'Why haven't you given me this thing?' ... So you get at odds with your partners.

And, a community partner expressed similar concerns:

Are you coming in with the attitude that you have these amazing things to give to that community, and you're here to help them and solve problems, and they should be respecting you? Or, are you coming in thinking ... I have a set of skills that I can use to contribute to this, but I am not the expert here; I do not know how to operate in this environment, and this can only be something that works if we are partnering together?

While this distinction is both interesting and important, for the sake of consistency we use 'partner' throughout this paper.

TABLE II. ORIENTATIONS BETWEEN CAMPUS AND COMMUNITY PARTNERS: 'PARTNER' VS. 'CLIENT'/ RELATIONAL VS. TRANSACTIONAL

'Partner'	'Client'
<p>"They are not working on programs here... and going and providing those solutions to the community partners, they're working in solidarity with those community partners to work on solutions. ... [it is a] reciprocal kind of relationship with the community partner, where everybody are co-learners, co-educators, co-everything." – Assoc. Prof., M.E.</p>	<p>"I call it client-focused, project-based experiential learning. ... For students, it's important because they don't really understand what the relationship is until you tell them ... If I say, 'You are a consultant, and they are a client ... you are there to serve the client,' they understand that relationship. ... It also gives the client some power, to feel like: 'Look, this is your consultants; you can drive them.'" – Adjun. Prof., M.E.</p>
Relational	Transactional
<p>"'I see you and not just the project.' Relational will take time to understand each other and to build trust, ... [to] show up and be face-to-face, and be vulnerable in the relationship. A relationship requires vulnerability on both sides. ... When you're on the side that has more power, you can be non-vulnerable. You can put up your defenses ... and pretend you control the process, and ... at some point, the [community] partners will ... give up on it, and you lose your ability to do a project because you didn't build relationships and understanding and care and trust and empathy and enter with humility.'" – Prof., M.E.</p>	<p>"Transactional, is very much a kind of tit-for-tat. I give you this, you give me that ... and that's fine in a business sense. ... A good example, ... we really learned that manufacturers are very time-sensitive. They want a very clean engagement. [They] don't want you to show up early and talk to them a lot and kind of think about it and change your mind and adjust your designs. They're like ... 'the more I talk to you, the less money I make and the less viable I am, and the more distracted I get. ... Please be more transactional with us.'" – Prof., M.E.</p>

### C. Preparing Students

Instructors stress the need to prepare students for community engagement: “the students don’t really know what they’re doing,” “you shouldn’t deploy people who are not really ready,” and “we should be doing everything we possibly can to make sure that we’re not adding to the problem.” Several guiding themes emerged around preparing students.

#### 1) Affirming or Instilling Values

An instructor explains the importance and utility of affirming or instilling values with students:

One of the things we were clear on [in] our program is what our values are, to the point where we expound them to students on a regular basis. ... ‘Students ... whenever you’re in doubt or concerned, go back to the values, and they will tell you the right thing to do. If you get in conflict with your values, you’re probably doing the wrong thing.’

Values can help students to monitor and assess their own and their partners’ behavior while navigating a real world project, perhaps for the first time. For example, one instructor promotes values with their students that are similar to the principles of community-engaged learning described in section II, e.g. Respect, Reciprocity, and Humility.

#### 2) Expressing Humility and Agency

Many interviewees shared the importance of being humble and, at the same time, encouraging students to ask questions and express their agency— as explained by an instructor and student, respectively:

I’ve got a friend who knows a ton about pumps; it’s okay for him to go a community and go, ‘I know a lot about pumps. ... but it doesn’t mean I should be full of myself or think I’m better at something I’m not good at.

This was...my first time kind of heading an engineering team, if you will, so I was up in the forefront of almost every meeting, the communication, and the chain of emails. [If I could go back], I would ... tell myself to not be afraid to ask these questions.

#### 3) Understanding Equity and Self

Two community partners suggest directly addressing questions of ethics and equity early on with students:

I think it’s irresponsible to let students enter into [a community] without thinking through a lot of those considerations on their own, like should they even be doing this work?

That should maybe be the first course or the first lecture you get on just the ethics of this type of work, and just understanding how there’s a lot of other perspectives to take in mind, and that you’re dealing with people’s lives.

Instructors also suggest that students typically need prepared so that they do not to reinforce negative stereotypes when working with community partners. One instructor explains:

Our students are ... outsiders to these projects almost by definition, and they’re privileged essentially by definition, or at least seen as privileged in those contexts... [In terms of] training ... you can have ... inclusive processes, and a layer down you could have mindsets that are more equity-minded. ... And even below that is an understanding of yourself, and how you as an outsider relate to the insiders. So, we have the students do a cultural gap analysis.

Beyond merely encouraging a lens of openness, instructors can help students to reflect on their belief systems, assumptions, biases, and understanding of others, opening the door for

improved listening and learning when working with partners who may have quite different lived experiences than them.

#### 4) Setting and Monitoring Expectations

Students walk into a community-engaged course with expectations, some of which may be helpful or harmful to the project. Two expectations stood out as being particularly important for instructors to convey to students. The first is that real world projects are messy; things will change; and ‘reality’ can be difficult to know. It may be frustrating at times, but learning to adapt helps, as illustrated by one instructor:

Don’t even think to yourself, ‘oh, our project can’t work’ ... This is the nature of the business. You’re learning how it goes, and the sooner you learn how it goes, the better you’ll be at it.

The second expectation is that students will be viewed as responsible by their community partners, and while the weight of expectations from community partners may feel scary or overwhelming, the course has been designed to provide support throughout the process, as explained by two instructors:

Understand that the assumption [from community partners] is that because you’re there doing that job, you must be really good at it.

Students are seldom in a situation where they’re responsible to anyone, and that’s a failing of pedagogical systems. And so, it can be kind of threatening to students, where they’re like, ‘wow, if I screw this up, somebody’s life is going to be impacted.’ ... we don’t want anyone to get hurt, including students. So, we go slow, and going slow keeps people who don’t feel like they know how to do this work from feeling like they’re going to get hurt or hurt somebody.

### V. LIMITATIONS AND FUTURE WORK

This study makes no claims about generalizability of the findings due to the lack of representative sampling strategy and small sample. Also, because cases were chosen based on the availability of sets of partners, the sample may be biased towards the views of partners with greater accessibility than others. However, for the sample of partners who were interviewed, the internal validity of the meaning we have made from their experiences and beliefs should be high.

Due to limited space and the work-in-progress nature of this paper, three important themes are left out and merit further explication: *Beginning and Nurturing Partnerships*, *Ingredients of Well-Prepared Course Projects*, and *Monitoring for Possible Harms*. Future work also includes developing additional themes and increasing the number of interviewees. Once a theory of partnership is sufficiently developed, a survey may be created and administered to a more representative sample. Ultimately, we hope that this paper deepens the collective understanding of how engineering educators, students, community partners, and others may jointly build and nurture enduringly effective and equitable partnerships.

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