

**BUT WHAT DOES IT MEAN TO THE PEOPLE WHO MATTER?:
COMMUNITY PARTNER MEANING MAKING
IN ENGINEERING ENGAGEMENT PROGRAMS**

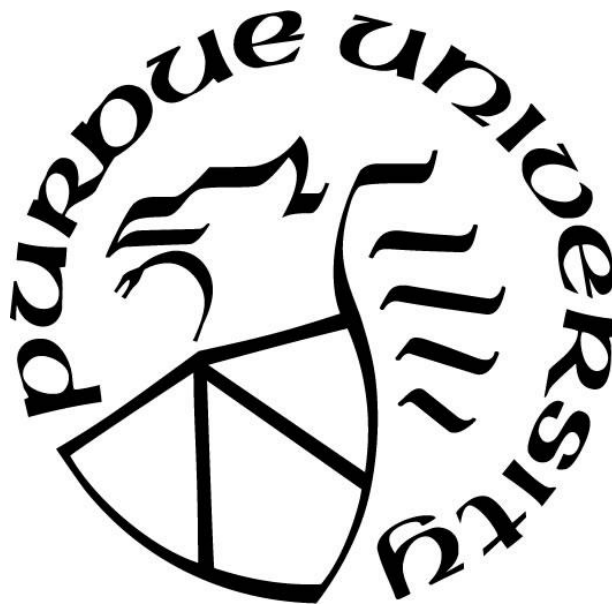
by
Chanel Beebe

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THE PURDUE UNIVERSITY GRADUATE SCHOOL
STATEMENT OF COMMITTEE APPROVAL

Dr. Brent K. Jesiek, Co-Chair

School of Engineering Education

Dr. Monical E. Cardella, Co-Chair

School of Engineering Education

Dr. Ruth Streveler

School of Engineering Education

Dr. Stephanie M. Zywicki

School of Curriculum Studies

Dr. Darryl A. Dickerson

School of Mechanical and Materials Engineering

Approved by:

Dr. Allison F. Godwin

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ABSTRACT

Engineering engagement programs use service learning and community engagement pedagogies that require a real-world situated problem in which the community partners who experience those problems are integral to those spaces. Despite community partners being integral to engineering engagement programs, research on community partner perspectives is vastly unrepresented in literature. Therefore, the goal of this work is to investigate engineering engagement programs from the perspective of the community partners by answering the research question: what meaning do community partners make of their experience in engineering engagement programs? This study describes a qualitative research inquiry in which interviews with three community partners from three different engineering engagement programs were conducted and analyzed for community partner meaning. Using a framework developed by Zittoun and Brinkmann for meaning making, this study presented several themes associated with pragmatic, semantic, and existential meanings made by community partners within this study (2012).

Findings from this study suggest implications for expansions of existing frameworks of constituents and components of engineering engagement programs, as well as potential opportunities to more deeply engaging community partners the assessment of student contributions and trajectories as a function of participation in EEPs. Additionally, findings from this study suggest an opportunity to investigate communication and thinking between students and community partners to better support the experience of the community partner (and potentially, the learning of the students). Lastly, findings from this study suggest that participation in EEPs presents the opportunity for community partners to learn by doing which can be more deeply investigated to begin addressing the gap in the literature associated with community partners in research on engineering engagement spaces.

1. INTRODUCTION

1.1 Introduction and Problem

Engineering engagement programs are an integral part of engineering curricula across the world due to the importance of giving developing engineers the opportunity to practice and hone their skills. These programs include a wide range of community engagement practices in which undergraduate students are paired with local stakeholders or community partners as a part or extension of course work. Though student learning is an articulated goal of such spaces, an additional objective of these spaces is to serve the local community by helping them to meet their needs and create change. (Bringle & Hatcher, 1995) Within Engineering Education, research on these programs focuses on student learning and motivation with some focus on the nature of relationships and with community partners and tangible impacts of the work. Though this research allows to investigate student experiences and developments as a function of these spaces, current research in community engagement in engineering neglects community partner experiences and perspectives of these spaces. (Natarajarathinam, Qui & Lu, 2021) The lack of research on community partner perspectives within Engineering Education poses tensions for ensuring mutuality of benefit of these spaces, and confounds the ability of these space to speak clearly to the value and benefit of engagement programs within engineering for community partners. Thus, this study outlines an investigation of the research question: “what meanings do community partners make of their experiences in engineering engagement programs (EEPs)?” Investigation into engineering engagement programs from the perspective of community partners may potentially provide insights into their experiences of these spaces and ways in which programs can be better designed to meet their needs. The goal of this work is to contribute to the development of a more holistic understanding of community engagement in engineering education.

1.2 Developing Engineers: Educational Logistics of Changing the World

According to the Engineer’s Council for Professional Development, “Engineering is the application of scientific principles to design or develop structures, mechanisms, and other apparatuses to advance the human condition and thus serve society” (1947). As a marginalized

person from a low income, urban cultural background, my motivation for becoming an engineer was based around the idea that the profession would both bring me financial stability and allow me to “change the world” and address problems I saw the people around me facing. As I matriculated through engineering undergraduate curriculum, it became clear that an being an engineer involved connecting with problems and the people facing those problems in order to address complex problems.

As I neared graduation, I noticed that my peers also seemed to be developing conceptions of what being an engineer meant, but their conceptions did not always align with mine. Though that initial observation didn’t arise as problematic, as I finished my fourth summer of internships and prepared for my final year as an undergraduate engineering student, I became fascinated with aspects of engineering more closely aligned with the development of engineers, and human centered variations of the design process I was already familiar with from my coursework. After taking a course on design thinking and learning new ways to describe how engineers use design solutions for stakeholders facing those problems, I reflected again on the fact that not all of my peers in my engineering classes had the conception of what engineering was for and who it could be used to help. Though the diversity of motivations for being an engineer seemed healthy, I became interested in how our extra-curricular activities informed the way we used our degrees once we graduated. This curiosity sparked an interest in how engineers were and have been historically educated, and what the objective of that education was regarding providing opportunities to engage with real stakeholders inside and outside of the classroom.

As I began exploring research in engineering education, I noticed that scholars and thought leaders in the field were also calling for better understandings of the social implications of how engineers were educated. In 2008, a Special Report of the Journal of Engineering Education entitled “The Research Agenda for the New Discipline of Engineering Education” cited an “increase interest in engineering and awareness of the social impact pact of the engineering profession” as a key objective of research in engineering education. In 2019, the Accreditation Board for Engineering and Technology (ABET) revised its accreditation standards to ask engineers to “produce solutions that meet specified needs with consideration of public health, safety, and welfare” and to “consider the impact of engineering solutions in global, economic, environmental and societal contexts (ABET, 2019).” Though the National Academy of Engineering has outlined 14 Grand Challenges for Engineering in the 21st Century that give more detail to which humans

and conditions our energies should be focused on, the approach by which engineers are able to effectively address those particular humans and conditions is not as easily outlined. Luckily for engineers, design is a widely considered distinguishing activity of the engineering professions in which engineers employ design thinking, which is a systematic and intelligent process in which solutions are generated and evaluated to achieve clients' objectives or users' needs while satisfying a specified set of constraints (Dym et al, 2005). Unfortunately, teaching and learning design thinking in engineering is not a simple endeavor due to the iterative nature of the design process and the evolving nature of socially situated problem spaces.

1.3 Engagement with Stakeholders

The evolving nature of socially situated problem spaces reflects the complexity of the problems to be solved within the human condition. As engineers attempt to address problems that are more and more social, the task of scoping and defining the problem becomes a function of much research and engagement with stakeholders closer to the problem. A stakeholder has been defined as anyone who might be affected by: “the eventual designed artifact (e.g., end-users, customers, clients), the process of its creation (e.g., manufacturers, designers, investors), or its distribution and end of life (e.g., purchasers, retailers, distributors.)” (Mohedas et al., 2020) For engineers then, the extent to which stakeholders are involved, including how often and how deeply becomes a function of the way the problem-solving activity began and the resources associated with supporting it. Within engineering education, stakeholder engagement is often housed within programming and coursework in which students are paired with members of their local community who serve as stakeholders for collaborative efforts toward addressing a problem.

Within the engineering educational contexts, stakeholders serve a crucial role of grounding the pedagogical efforts of the educators into a real-world context by which students can demonstrate engineering skills. More deeply, stakeholder engagement during the training and education of engineers can serve as a model by which developing engineers build the foundation of their ability to identify and address problems for the rest of their career. As such, engineering educators deploy a host of pedagogical approaches to facilitating student engagement with stakeholders. The following sections describe these approaches in more detail.

1.4 Service Learning

Community engagement is considered one form of experiential education in which students engage in activities that address community and promote student learning and development (Jacoby, 2003). Community engagement is a form of service learning, which has been around since the 1960's and involves students engaging with their communities as a part of their learning curricula (Lima & Oakes, 2006). A formalized definition of service learning was put forth by Andrew Furco in 1996. In his article, Furco established service learning as a type of experiential learning distinguished by its intention to “equally benefit the provider and the recipient of the service” and to “ensure equal focus on both the service being provided and the learning that is occurring” (Furco, 1996). Furco goes on to elaborate on a service and learning topology from 1994 by making distinctions among service programs. Citing Sigmon (1996), Furco presents service and learning according to its primary and secondary foci broken down by emphasis on either “service” or learning”. Sigmon differentiates between service LEARNING where the learning goals are the primary focus and SERVICE learning where the service outcomes are primary. Sigmon also describes service learning as settings in which the learning and service outcomes are completely separated and SERVICE LEARNING as settings in which both are prioritized equally. This topology is reflected in Table 1.1.

Table 1.1 Service Learning Topology (Sigmond Via Furco, 1996)

Topology	Focus
Service-LEARNING	Learning goals = primary, service outcomes secondary
SERVICE-Learning	Service outcomes = primary, learning goals secondary
Service-Learning	Service and learning goals separate
SERVICE-LEARNING	Service and learning goals of equal weight and each enhances the other for all participants.

More recently, Service learning has been defined by Bringle et al. (2004) as: ‘course-based, credit-bearing educational experience in which students:

1. participate in an organized service activity that meets identified community needs and
2. reflect on the service activity in such a way as to gain further understanding of course content, a broader appreciation of the discipline, and an enhanced sense of civic responsibility.’ (Bringle et. al, 2004)

In this definition, Bringle et al. extend upon the idea that the service learning activity addresses community needs by adding the idea of reflection and translation to course content, appreciation for one’s discipline, and enhanced sense of civic responsibility.

Within engineering education, service Learning is generally conducted using project-based learning, where the learning and activities are driven by the goals of the project. This is often referred to as project-based service learning and is typically integrated into credit-bearing courses for engineers, and other times the service experiences exist between student curricular and extracurricular activities. (Bielefeldt et. al, 2010) Within engineering, extracurricular examples of project-based service-learning include Engineers Without Borders (EWB; www.ewb-usa.org) and Engineers for a Sustainable World (ESW; www.esustainableworld.org/) which help facilitate community service opportunities for more than 6000 student members combined. Within curricula, examples of project-based service learning in engineering include programs like Engineering Projects in Community Service (EPICS), and Service Learning Integrated throughout the College of Engineering (SLICE) in which students are connected with community partners to solve problems associated with the community partner (Lind, n.d, Zoltowski and Oakes, 2014). Other curricula examples of project-based service learning also exist within engineering capstone and design in the real world classes. (Cannon et. Al, 2014; Dwweolka & Hayden 2021; Kilmartin, & McCarrick, E. 2010). Though described here as PBSL, these examples could also be described as community engagement programs, as described in the next section.

1.5 Community Engagement

Project-based service learning can be thought of as a pedagogical approach to community engagement in which student learning goals are combined with service to the community to enhance student development and the common good. However, community engagement exists beyond settings in which student learning is prioritized. Taken broadly, community engagement

can be described as a “process of working collaboratively with and through groups of people affiliated by geographic proximity, special interest, or similar situations to address issues affecting the wellbeing of those people.” (Principles of community engagement, 2011). As such, many forms of EEP’s can be considered community engagement programs because they involve collaborative work associated with addressing issues for partner communities and groups. Within engineering, community engagement is “a form of active, experiential learning where students, instructors, and the community partners work collaboratively on projects that benefit a real community need and provide a rich learning experience for all participants” (Swan, Paterson & Bielefeldt, 2014). In this sense, community engagement is an umbrella term under which many service-based engagements could fall. Given the fact that engineering engagement programs use service learning and community engagement pedagogies that require a real-world situated problem, the community partners who experience those problems are integral to those spaces.

1.6 Purpose of This Study

Despite the community partners being integral to these spaces, research into these spaces prioritizes investigations of student learning and outcomes vastly underrepresents the community partner experiences of engineering engagement programs. Therefore, the goal of this work is to investigate engineering engagement programs from the perspective of the community partners by answering the research question: what meanings do community partners make of their experience in engineering engagement programs? To investigate this question, this study presents a qualitative research inquiry in which semi-structured interviews with community partners from three different engineering engagement programs are used to generate findings and insights into community partner perspectives. The results of this work may yield insights regarding how community partners experience engineering engagement programs, and how they make meaning of those experiences. These insights can contribute to the design of engineering engagement programs that are more considerate of the perspectives and vulnerability of community partners.

1.7 Study Overview

Chapter 2 outlines literature associated with community partner experiences in engineering engagement programs and establishes a gap in the literature related to their experience. Next,

Chapter 2 problematizes that gap for engineering education and proposes a theoretical framework for investigating what meanings community partners make of their experiences in engineering engagement programs. Chapter 3 discusses methods for addressing the research question, including data collection and analysis methods. Chapter 4 presents the findings of this study and Chapter 5 discusses how those findings connect to and inform existing literature related to community partner experiences of engineering engagement programs and closes this study with a discussion of conclusions from this work and implications for community partners and designers of engineering engagement programs.

2. LITERATURE REVIEW

The goal of this work is to investigate engineering engagement programs from the perspective of the community partners. This chapter discusses existing literature associated with community partner perspectives in engagement programs (beyond and within engineering) and establishes a gap in the literature as it related to community partner perspectives. Next, this chapter problematizes that gap for engineering education and discusses a recent conceptual framework with potential implications for reflecting on community-engaged endeavors. Finally, the chapter proposes a theoretical framework for investigating what meanings community partners make of their experiences in engineering engagement programs.

2.1 Existing Literature

Research on Engineering Engagement programs is heavily focused on the student outcomes and learning (Brown, 2019; Natarajarathinam, Qui & Lu, 2021). For example, Sevier et al. conducted a study of the effectiveness of service-learning on influencing ABET program outcomes and reported service-learning as more likely than non-service learning methods to positively influence students' self-assessment of their engineering abilities (Sevier, et. Al., 2012). Studies beyond the context of engineering education, like that of Malinin in 2017, have looked at the impacts of service-learning experience on “non-academic skill development” and found that service learning positively impacts: empathy, relationship building, flexibility, systems thinking and professional goals (Malinin, 2018). Other research on engineering engagement programs has looked at the effects of these programs on retention of students from demographics underrepresented in engineering such as women (Manning-Ouellette et al., 2018) and racial minorities (Mungo, 2017; Ellertin, Carmona & Tsimounis, 2016.; Lucy-Bouler, T, 2012).

While these studies provide useful insights for assessment and improvement of engagement programs toward the goal of improving the learning value of these programs for students, community partner perspectives of engineering engagement programs are vastly underrepresented within research. Thus, the goal of this chapter is to draw on related bodies of research to situate this study's focus on the perspectives of community partners in engineering engagement programs in literature. The existing literature related to community partners'

experience of engagement programs within and beyond engineering explores community partner motivations, benefits, outcomes and partnerships. The following sections describe this existing literature.

2.1.1 Community Partner Motivations

There has been a wealth of literature unpacking the motivation of community partners in engagement programs like service-learning. Addressing a growing concern among many people both inside and outside the service-learning movement since the 1990s, Bell and Carson attempt to highlight the voices of community partners in service-learning programs in their book *The Unheard Voices: Community organizations and service learning* (Bell & Carson, 2009). Attempting to answer the question “who is served by service-learning,” Bell and Carson explore existing literature related to community partners in service-learning programs and explore the “extent to which the development of service-learning programs to primarily serve student and institutional interests may undermine community interests, which may negatively impact the community and undermine community support for the service-learning program” (p. 10). With the goal of understanding the impact for the community organizations participating in the service-learning program they hosted, Bell and Carson examine the complexities of community partner motives to work with service learners through a discussion of four different types of motives that their respondents expressed:

1. The Altruistic Motive to Educate the Service Learner: Agencies sometimes believe that part of their mission includes a responsibility to help students understand the issues facing their clients.
2. Long-Term Motives for the Sector and the Organization: Some community organizations worry about the long-term support for their work. Who will be working at and donating to agencies and organizations like theirs?
3. The Capacity- Building Motive: Organizations sometimes engage service learners to expand their organizational capacity.

4. The Higher Education Relationship Motive: Some organizations take on service learners to build, strengthen, or preserve connections to colleges and universities. (p. 20)

Basinger and Bartholomew conducted a similar study of community partners from service-learning programs to uncover their motivations and found that organizations engaged in service-learning are motivated both by altruistic and self-serving factors (Basinger & Bartholomew, 2006). Community partner organizations are motivated to:

- Help students learn
- Foster positive relationship with university
- Get free labor from students
- Enhance their community image
- Cultivate good citizens and future volunteers/donors
- Fulfill service-learning related mission objectives (p. 20)

Though these provide a comprehensive set of motives, they don't address the nuance for motivation to engage in a short-term project vs engage in a longer-term partnership. In "Asking the Community: A Case Study of Community Partner Perspectives," Worrall describes that the motivation to join a service-learning program differs from the motivation to continue a longer-term partnership (Worrall, 2007). Partners in Worrall's study of 40 service-learning programs initially became involved because they perceived engagement as an opportunity to access a new resource to expand the reach of their organization's programs and potentially have some economic benefit. However, their motivations for continuing involvement appeared to evolve over time and included fulfilling organization missions, gaining a symbiotic partner, and having the opportunity to hear fresh perspectives about the organizations' work (p. 10).

Though the motivations of community partners has been studied more broadly in the fields of service-learning and community engagement in general, studies investigating motivation in engineering engagement programs has focused more so on the motivations of engineering students

either to engage in service-learning type courses and activities or to persist in their professional development as a function of having participated. One notable exception is the 2014 work of Thompson and Jesiek that looks at the motivation of community partners that were involved with an engineering service learning project at a large midwestern university (Thompson & Jesiek, 2014). Building upon findings from studies of other non-engineering service-learning partnerships, this study of 11 community partners found that community partners were motivated by:

- learning objectives and educational purposes related to the students,
- personal benefits including personal enjoyment and professional enhancement, and
- organizational benefits including products and partnerships (p. 11).

Thompson and Jesiek's paper concludes by arguing that by considering community partners' perspectives on their motivations and outcomes of the program, designers of engagement programs become able to better include more of the people who are directly impacted by engineering service-learning.

As it relates to community partner motivations, existing studies suggest that partners are motivated by access to resources and expertise that allow them to increase their capacity and extend the reach of their existing work. The following section discusses existing research on community partner conceptions of outcomes and benefits.

2.1.2 Community Partner Benefits and Outcomes

Understanding benefits and outcomes for community partners involved with these programs is important to ensuring that participation in such programs is worthwhile and beneficial for all involved. In an investigation aimed at identifying best practices in community engagement, Sherry McGee (2009) outlines benefits to community engagement in terms of individuals/communities and municipalities. For Individuals, McGee shows benefits to people engaged in their communities, including: "networking opportunities; access to information and resources; skill enhancement; and a sense of contribution and helpfulness in solving community problems" (Bracht, Kingsbury, & Rissel, 1999). For Municipalities, McGhee asserts that community engagement can produce benefits including:

- “enhanced understanding of community needs and strengths;
- stronger services;
- greater innovation in problem solving;
- improved accountability; and
- more democratic methods [of engagement across stakeholder groups]” (McGee, 2009).

And because community engagement involves multiple community stakeholders, it has been argued that diversified input provides for more critical reflection which in turn increases the opportunity for innovative problem solving (Kagan, 2005).

Looking more closely at engagement programs within the university context, Lloyd et al. describe benefits to community partners based on analysis of data collected between 2011 and 2015 in association with Macquarie University’s PACE (Professional and Community Engagement) program showing how it developed and fostered a culture of learning (Baker et. Al, 2016). In describing benefits to all stakeholders of the PACE program, the authors describe the following benefits for community patterns:

- Completion of projects/additional human resources
- New perspectives and energy
- Capacity development (individual and organizational)
- Networking with other partners
- Enhanced organizational profile
- Community benefit
- Improved productivity
- Personal satisfaction in contribution to student learning

The following benefits for community partners were identified in relation to staff and the university:

- Breaking down barriers between university and community
- Research projects and curriculum collaborations

Finally, the following benefits for community partners were identified in relation to students:

- Talent identification, recruitment, and enhanced workforce development
- Exposure of students to social issues (p. 249).

While these benefits may have been surfaced for researchers looking at those particular partnerships, benefits for community partners can vary depending on the context of the engagement. While reflecting on the success of service-learning projects in software engineering, Brian Nejme asserts that “genuine” success has rarely been achieved in software engineering service-learning projects (Vollmar & Sanderson, 2012). Common failures of these projects were typically due to overlooking some fundamental flaw within the design of the project or a misalignment between the course project and course goals. Nejme suggests that successful service-learning projects in software engineering are those in which:

“The community partner representative is engaged and meets consistently with developers and the project is either relatively simple or a representative of the community partner had the talent to maintain the system.” (p.16)

This suggests that outcomes of service-learning projects in engineering may be deeply affected by community partner perspectives of the project and the engineers they are working with.

Nora Pillars Reynolds also looked at community partner perspectives of outcomes in her 2014 study of partnerships between a college of engineering and a rural municipality in Nicaragua (Reynolds, 2014.) Though the intended community outcomes described by university participants corresponded with tangible project outcomes, the community participants also described outcomes related to trust/confidence, pride, and awareness. Within this partnership, trust and confidence of community partners was discussed in terms of the students and university they were working with

and “ensured that resources go where they are intended, and that the partnership will be sustained.” (p. 83)

As it relates to community partner benefits and outcomes, existing studies suggest that partners can benefit from engagement programs in a number of ways. Within engineering education, however, research on community partner perspectives of those benefits is scarce most deeply explored in terms of the nature of the partnerships in engineering engagement programs.

2.1.3 Community Partner Partnerships within Engineering Engagement Programs

Within engineering, partnerships in engagement programs have been categorized by Julia Thompson and Brent Jesiek as Transactional, Cooperative, and Communal. (Thompson & Jesiek, 2017). Thompson and Jesiek explain that transactional relationships are often unilateral and can become exploitive. Cooperative relationships involve activities where ownership is shared, and boundaries are intentionally blurred. These sorts of relationships are less likely to be exploitive because of the bidirectional nature of decisions and power. Lastly, communal relationships involve deeper, more fluid relationships centered around shared values and often are more connected to society as a whole. Communal relationships often involve projects and experiences that are transformative and generative.

This framework of relationships was used to examine structural features of engagement programs which allowed the researchers to identify six themes that influence the nature of interactions within the partnerships: (a) program purposes, (b) partnership structures, (c) modes of interaction, (d) organizational partners, (e) individual partners and advisors, and (f) projects. (p. 92 Thompson & Jesiek 2017) By exploring the presence of these themes in interviews with community partners who were involved in engineering engagement programs, two important elements of the engineering education context were surfaced: project-based approaches and the engineering mindset.

According to this study, the project-based approach to service-learning (commonly found in engineering engagement programs) creates a dynamic that situated the engineering students as outsiders. Nonetheless, this outsider dynamic was seen as beneficial to many of the partners as they were personally curious and did not usually work with engineers, and saw the potential of drawing on the students’ engineering skills/expertise. Here we see an example of the social

distance experienced within engineering engagement programs as a potential benefit to the community partner. In addition to the outsider dynamic created by the project-based approach, the prevalence of the engineering mindset – often characterized in the literature as the “Engineering Problem Solving” (EPS) approach (Downey & Lucena, 2006) – is an important characteristic of engineering engagement programs. As the source states, “Engineering students often attempt to replicate this approach while working on service-learning projects, seeking a single solution without adequate community input” (p. 94). Within the programs Thompson and Jesiek studied, training and support designed to help students learn how to bring community voices into the design process was used to mitigate the prevalence of the engineering mindset.

In an attempt to better investigate partnerships in service learning and civic engagement, Bringle, Clayton and Price established a structural framework for relationships associated with service learning and civic engagement: Students, Organizations in the community, Faculty, Administrators on the campus, Residents in the community (Bringle et al., 2012). This framework, abbreviated as SOFAR and illustrated in Figure 2.1, established ten dyadic relationships across these five constituents and was intended to be used to assess the types and qualities of relationships between all constituents in service-learning programs.

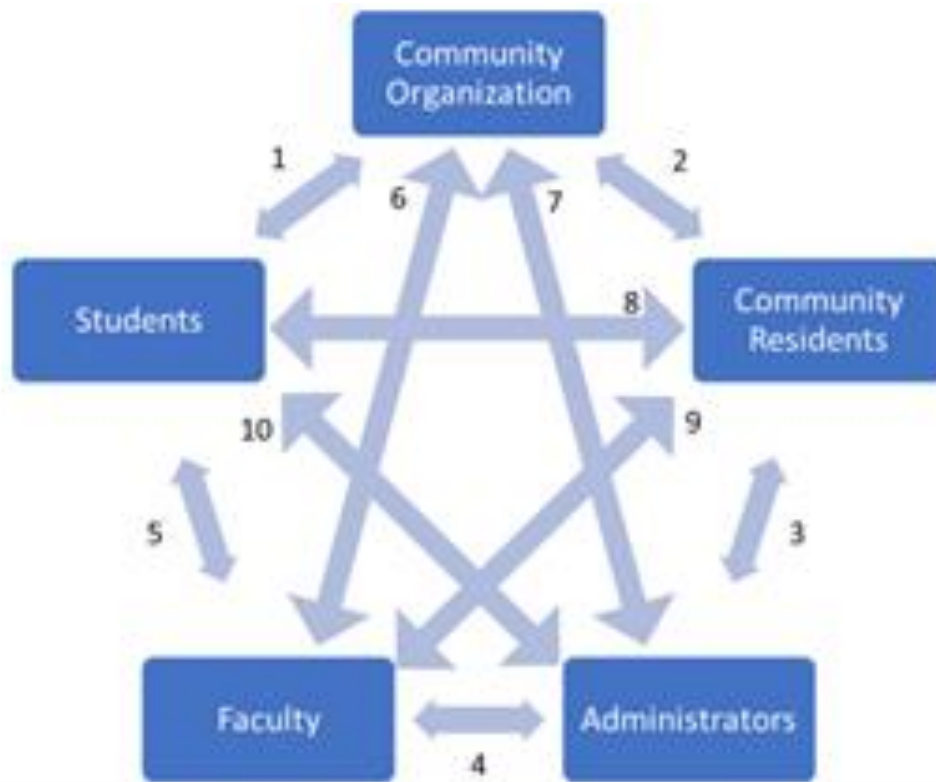


Figure 2.1 SOFAR Model of Constituents in Engagement Programs (Bringle et al., 2012)

Though the SOFAR Model is one of many attempts at relating structural factors to the nature of relationships and partnerships in engineering engagement programs, research on EEPs has tended to follow the path established by the broader literature on service-learning and community engagement in higher education, focusing mainly on student outcomes and with minimal attention to partnerships or the perspective of partner communities” (Thompson & Jesiek 2017).

2.2 The Gap

While the frameworks for partnerships have provided more insight into community partner perspectives of engineering engagement programs, community partner’s perspectives of these spaces continue to be underrepresented in the literature. As established in the above discussions, community partner perspectives of the benefits, motivations and outcomes within engineering education are also sparse. Despite the rising focus on community engagement within engineering education, a systemic review of studies focused on community engagement programs in

engineering education from 1980 to 2019 was published in 2021 indicating that the community partner remains a less-studied subject of researchers (Natarajarathinam, Qui & Lu, 2021). Natarajarathinam et al describe this “enduring neglect” by stating:

“Most articles [in their systemic review] emphasized students’ learning outcomes, personal development (Keshwani & Adams, 2017; Wallen & Pandit, 2009), course/project experience, and delivery of solutions or products (Marsolek et al., 2012; J. Seay & Lumkes, 2014), but the community perspective was largely ignored.

In addition to the underrepresentation of community partner perspectives in engineering education research, the frameworks for understanding components of that partnership are relatively new and have yet to be applied to the development of engineering engagement spaces explicitly (Thompson & Jesiek, 2017). More recently, even nascent frameworks for engineering engagement spaces have been calling for “use of the model as a conceptual framework to address opportunities through contemplating how to improve project-based community engagement endeavor, reviewing case studies on specific programs, and identifying potential gaps in the existing literature is also called for” (Leidig & Oakes, 2021).

Though this model, presented in Figure 2.2, provides a useful conceptual framework for investigating the process, stakeholders, and resources associated with a deliverable, this model has yet to be applied to the development of engineering engagement spaces explicitly and leaves it up to the users of that framework to “define their own goals and utilize the insights gained from the model in an appropriate manner.” The model also provides the potential for better understanding the overall experience but is not intended to directly address the community partner experience of these settings.

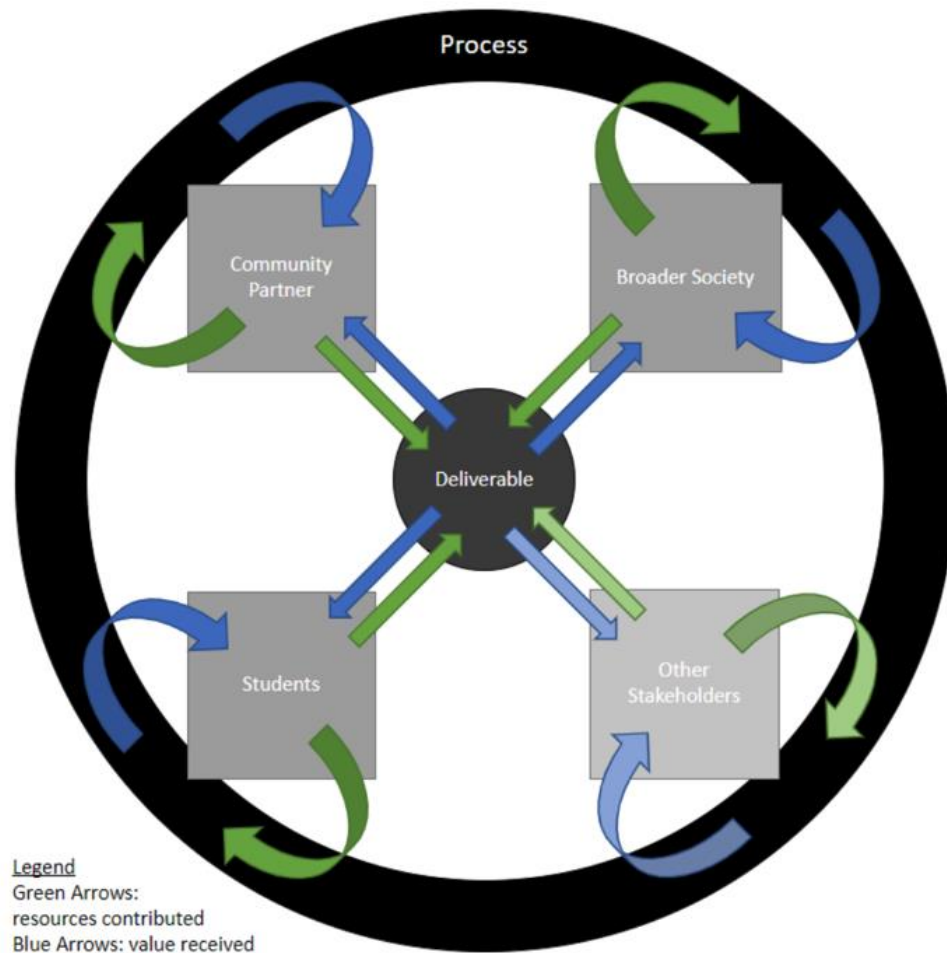


Figure 2.2 Model for Project-Based Community Engagement

2.3 The Problem

As stated in Chapter 1 and further illustrated within existing literature, engineering engagement programs use service learning and community engagement pedagogies that require a real-world situated problem to enhance student development. Despite the significance of community partners in those programs, research within engineering education on these underrepresents community partner perspectives of these spaces. Given the importance of community partners in these spaces, more research would need to be done to investigate engineering engagement programs from the perspective of the community partners. Thus, the goal of this study is to address the research question: “what meaning do community partners make of their experiences of engineering engagement programs?”

2.4 Theoretical Framework: Meaning Making

Theoretical frameworks are “any empirical or quasi- empirical theory of social and/or psychological processes, at a variety of levels, that can be applied to understanding the phenomena of a study” (Anfara & Metz, 2014). Using literature on community partner perspectives presented above and filling in gaps with literature from engagement programs in general, the following sections propose a theoretical framework for meaning making of community partners in engineering engagement programs.

2.4.1 Meaning Making and Learning

Many scholars accredit the concept of meaning making to the origin of pragmatic theory in which “the individual is active in the construction of his or her world, and that the meaning we derive in our lives is the outcome of a complex relationship between received ideas and present experience” (Anfara & Metz, 2014). While this presents an epistemological framing of meaning making, the development of a theoretical framework for meaning making to address the research question of this study would need to be informed by existing theories on the types of meaning making. Though learning is typically assessed in terms of students within research on engineering engagement programs, learning has been addressed as a form of meaning making which may have useful implications for what meaning community partners may make of their experiences in these settings. In fact, perspectives from several disciplines (including educational, psychological, and philosophical) have supported the claim that learning in these settings is best understood in terms of meaning making (Zittoun & Brinkmann, 2012). Though the “learning” of community partners in engineering engagement programs is seldom an articulated goal of these programs, literature associated with learning may provide useful insights into meaning making in general – which can be used to understand what meaning community partners make in these settings. Building on the work of prominent learning theorist such as Dewey and Bruner, Zittoun and Brinkmann distinguish three levels of meaning (semantic, pragmatic and existential) (2012). The following sections explore each type of meaning established by Zittoun and Brinkmann and associated theories that will contribute to the development of a theoretical framework for meaning making.

2.4.2 Semantic Meaning

Semantic meaning is related to the meaning of language, signs and symbols and involves the development of conceptual relations to the world that predominantly take place in social settings. In this sense, semantic meaning involves “the process by which socially given and shared words organize thinking and how thinking gives life to words” (Zittoun & Brinkmann, 2012 , p. 1810) Semantic meaning builds on the work of another prominent learning theorist, Vygotsky, who reflected on the relationship between language and thinking as a part of a process of socialization into “cultural-discursive systems of meaning” (Liu and Matthews, 2012.) This suggests that semantic meaning occurs in relation to a social context in which meaning is filtered through interactions with others. For community partners in engineering engagement programs, semantic meaning may be made through terminologies and ways of thinking that are developed and negotiated across the five didactic interactions associated with community partners in the conceptual framework presented in Figure 2.3.

2.4.3 Pragmatic Meaning

Moving beyond symbols and conceptual relationships associated with semantic meaning, pragmatic meaning is associated with the process of learning and negotiating social practices of a given setting. Often connected with the idea of situated learning, pragmatic meaning involves acquiring and negotiating identity in a given community of practice (Zittoun & Brinkmann, 2012). “Communities of practice are groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly” (Wegner 201; Wegner & Synder 2000.) Within this “regular interaction,” pragmatic meaning is made through shared practice and participation with others that inform what it means to “be” a part of a particular community. In this sense, pragmatic meaning-making involves the connection between behaviors and identity. For community partners in engineering engagement programs, pragmatic meaning may be made through techniques and ways of being that are developed and negotiated across the 5 didactic interactions associated with community partners in the conceptual framework presented in Figure 2.3.

2.4.4 Existential Meaning

Existential meaning is associated with a person's life trajectory and how a given experience might "question or reshape his or her whole perspective on her past and future possibilities" (Zittoun & Brinkmann, 2012). Moving beyond semantic meaning associated with symbols and conceptions and pragmatic meaning associated with behaviors and identity within a particular community, existential meaning is associated with attempts to understand how events in life fit into a larger context (Reker, 2000). In this sense, existential meaning making involves a person making connections between the activities of a given experience and their conceptions of their life journey beyond the confines of the given community of practice. For community partners in engineering engagement programs, existential meaning may be made through insights that connect the five didactic interactions associated with community partners in the conceptual framework presented in Figure 2.3 to the social trajectory and journey of the community partner beyond the engagement program.

2.4.5 Summary

Meaning Making has been established as having three theoretical components: semantic, pragmatic and existential. Though the establishment of these components are based on theories of learning – which is typically not associated with community partners in engagement programs, they provide a useful theoretical framework for answering the research question "what meanings do community partners make of their experience in engineering engagement programs" by establishing theoretical typologies of the types of meaning that can be made. Summarized in Figure 2.3, meaning making for community partners in engagement programs may arise as semantic, pragmatic, existential or some combination of the three. The following chapter describes a research study designed to investigate what meaning community partners make in engineering engagement programs that will further illuminate the potential relationships between the types of meaning in this theoretical framework.

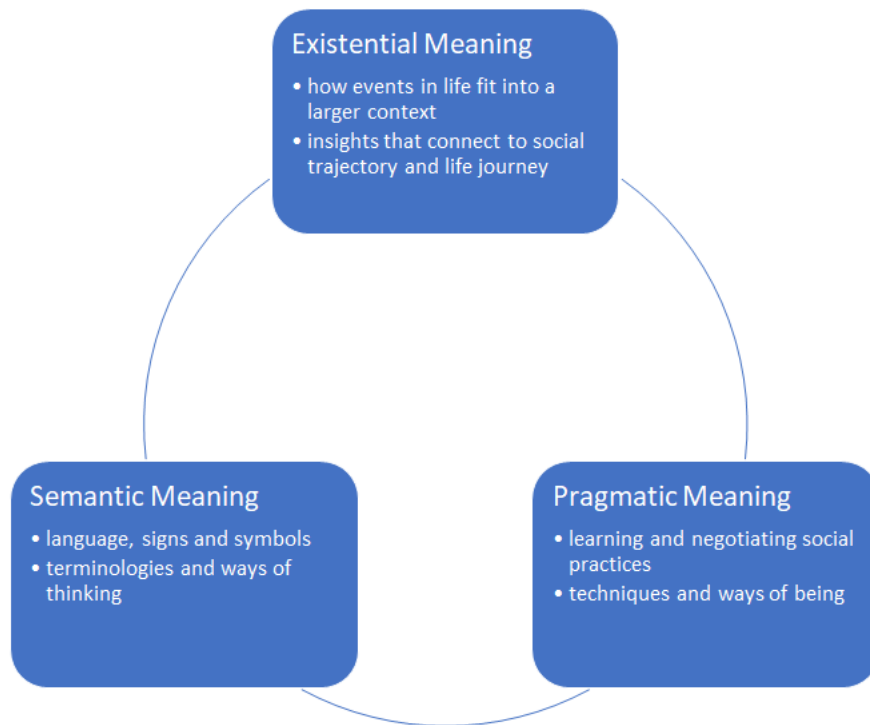


Figure 2.3 Theoretical Framework for Meaning Making

3. METHODOLOGY

This chapter presents the research design, including data collection and data analysis procedures, associated with this study of community partners in engineering engagement programs. This chapter presents the qualitative research design and methodological steps used. To accomplish this, the following aspects are addressed: (1) research questions, (2) research design, (3) role of the researcher, (4) setting and participants, (5) data sources, (6) data collection, (7) data analysis and (8) data validation.

3.1 Research Question

The question driving this study and research decisions is “what meaning do community partners make of their experience in engineering engagement programs?”

3.2 Research Design

Given that the goal of this study is to understand how community partners make meaning of their experience, a basic qualitative research study was designed to surface the voice and perspectives of community partners involved in engineering engagement programs. Qualitative research, also known as qualitative inquiry, was developed in the fields of anthropology and sociology “answering questions about people’s lives, the social and cultural context in which they lived, the ways in which they understood their worlds and so on.” (p. 13, Merriam & Tisdell, 2015) Though Merriam and Tisdell discuss six common types of qualitative research (case study, ethnography, grounded theory, narrative analysis, phenomenography, and basic qualitative research), this study chose a basic qualitative research design because of its focus on meaning and propensity to generate results that may give direction to a more involved inquiry into the experiences of community partners in engineering engagement programs.

Basic qualitative research inquiries have the primary goal of investigating how people make sense of their reality and are the most common form of qualitative inquiry (p.24 Merriam & Tisdell, 2015.) Within education, basic qualitative studies typically employ interviews, observations and/or surveys where data analysis is based on a theoretical underpinnings

appropriate to the context of the study. The following sections unpack the research design and decisions made in this study. Because of the interpretive nature of qualitative studies, the researcher shapes the outcomes of the research by the selection of the interviewees, having the ability to recognize patterns in the interviews and, eventually, controlling how the findings are reported (Sandala, 2016). As such, it is important within interpretive research to understand and document the role of the researcher, which is discussed in the next section.

3.3 Role of Researcher

Before unpacking what decisions were made in order to select participants, I must first unpack the positionality of the researcher making these decisions (Secules et. al, 2021 Kincheloe & McLaren, 2011; Maher & Tetreault, 1998)). As a graduate researcher conducting this study, I shared negotiated control of this study with my advisor and committee members. Additionally, as a person from a combination of disenfranchised communities (people of color, women of color, low socioeconomic status) my approach to this study was based in a desire to advocate for and surface the perspectives of community partners who can be seen as the most marginalized participants of these design settings. Thus, it was important to me to choose settings in which I had a pre-existing or organic connection to in order to be able to identify and connect with those who may be most marginalized. My positionality, reflected in the final column of Table 3.1, most impacted the chosen sampling method for this study, discussed in the next section.

3.4 Sampling Method and Participant Selection

In qualitative research, the process of deciding who, where and when to interview is called “sampling” (Merriam & Tisdell 2016). The most common form of sampling in qualitative research is purposeful, non probabilistic sampling in which investigators are seeking to learn from those who may have the most to contribute around a topic – as opposed to probability sampling in which random sampling is done with the goal of generalizing results (Merriam & Tisdell 2016). Given this study’s goal of understanding how community partners make meaning of their experiences in engineering engagement settings, purposeful sampling was decided to be the best route to ensure results are informed by people who have had relevant experience with the settings.

Once community partners of engineering engagement programs were selected as a purposeful sample for this research question, convenience sampling was used to identify potential participants. Convenience sampling is an approach to sampling in qualitative research in which participants are selected based on their accessibility to the researcher (Etikan, 2016). Though considered the least rigorous form of sampling in qualitative research, convenience sampling was particularly appropriate to this study as an effort to increase familiarity and comfort with speaking candidly. The participants selected for this study were associated with me in some informal way. In some cases, this association was direct (i.e. being a grader or assistant in the course that housed the project), in other cases it was indirect (i.e. being loosely affiliated with the program that coordinates the project). These associations and proximity served a dual purpose. First, the sense of familiarity allowed conversations to start from a place of commonality. Having seen me associated with the project or program loosely, the participants were able to gauge my investment in the program. Secondly, this proximity allowed me to be familiar with the details of the program which allowed for an increased ability to probe into the nuance of the participant responses.

In addition to convenience sampling, criteria-based selection is used to determine which participants to invite to participate. Criteria-based selection involves determining what attributes of your sample are crucial to your study and selecting participants that meet that criteria (Merriam & Tisdell 2016). Given the myriad of project formations and partnership configurations within engineering engagement programs, participants within this study were selected according to the type of interactions they had within their respective programs. In particular, all participants in this study were addressing issues related and connected to their role and function within their organization. Participants in this study also had their own relationships with additional stakeholders the eco-system surrounding the problem. This element was important because it meant that the community partners were genuinely invested in problem-solving and were not simply supervisors of the work being done by the students. Participants were not compensated for their participation in this study. The following section describes the participants associated with this study and the engineering engagement programs they were a part of.

3.5 Setting and Participants

Though several participants and sites were initially identified for participation (full list of sites and descriptions in Appendix A), three participants were chosen to investigate in this study. Unselected programs were not included based on unavailability of community partners to be involved in full data collection.

Programs selected for this study are described in Table 3.1. The following sections describe each participant and the associated program setting. Participants and programs were given pseudonyms to protect their identity. The following descriptions are based on course syllabi associated with the engagement experiences presented in Appendix B.

Table 3.1 Summary of Participant Program Descriptions

Participant Pseudonym	Class Focus	Length of Class	Length of Project	Project Focus	Group Size	Interaction pattern	My Role
Toni VanWeiser	Academic & Professional Excellence & Skill Building	Semester	Semester	Design Process + Partner Problem	4	Weekly	Coordinator + Researcher
Yasmine Gavarti	Community Service & the Design Process	Semester	Semester+	Design Process + Partner Problem	4	Monthly	Researcher
Tiffany Smitherman	Systems Thinking	Semester	3 weeks	Systems Thinking + Partner Problem	5-6	Bi-weekly	Grader + Researcher

Toni VanWeiser and Program 1. Toni VanWeiser's work focuses on the health and safety of rural communities. Toni's involvement with the engineering engagement program was centered around developing a walkway for residents of the particular area her work serves. Though Toni VanWeiser did not live in the area herself, her work focused on that area and she had her own experience and investment in the area. Toni was involved in Program 1 which was a semester-long program in which engineering students were paired with local community partners to solve problems that mattered to the community partners. Students were expected to meet with their community partners weekly to discuss the problem at hand and co-design solutions to the problem.

Though the focus of the class was academic and professional skills development, the focus of the project was to give the students practice using and working through the design process. As such, students were supposed to learn diligence and collaborative problem-solving. Within Program 1, Community partners were expected to communicate and interact with their students often. This communication was primarily focused on the problem at hand, though more collegial bonds were often built. Within the space of the engineering engagement program, Toni VanWeiser worked with the same four students, communicating weekly and co-developing a pathway that would meet the constraints of the students.

Yasmine Gavarti and Program 2. Yasmine Gavarti's work focuses on the education and experiences of the hearing-impaired community. As such, the problem her students were working on was to design a technology to help deaf people experience music via haptic sensors. Though she had worked with different students in prior semesters, Yasmine Gavarti insisted that her work during the investigated semester was "unique yet supportive" to prior semester projects. Yasmine Gavarti was both professionally and personally invested in this project as one of her family members was deaf. Program 2 was a program in which engineering students were paired with local community partners to solve problems that mattered to the community partners. Community partners are given the options to work with students for as many semesters as they would like, though the group of students changes per semester. Students were expected to meet with their community partners monthly to discuss their progress with the problem at hand. Though community partners are asked to give directions and feedback to the students, the project is to be primarily completed by the students. Though the focus of the class was community development and design process skills development, the focus of the project is determined by the community partner, in this case Yasmine Gavarti. Within the space of the project, Yasmine Gavarti worked with the same four students, communicating monthly and providing feedback to the students during their project.

Tiffany Smitherman and Program 3. Tiffany Smitherman's work outside of the project focused on advising university students who may be struggling academically. As such, the problem she presented to the students within Program 3 involved the issue of communicating services to students who need them. Program 3 was a month-long program in which engineering students were paired with local community partners to solve problems that mattered to the community partners. This program was situated within a semester-long class in which students learned about

systems thinking in preparation for their work with the community partner. Students were expected to meet with their community partners bi-weekly to discuss the problem at hand and their selected solutions to the problem. Though the focus of the class was systems thinking, the focus of the project was selected by the community partner. Within Program 3, community partners were expected to communicate and interact with their students at specified points of check in. This communication was primarily focused on the problem at hand.

3.6 Data Sources

Within qualitative research, data collection methods typically include observations, interviews, documents and audio-visual materials (Esterberg, 2001). Each of these data collection methods involves different data types and purposes. Though observations and document collection could provide a picture of the context of the community partners, a substantial amount of interpretation would need to be done in order to understand how the community partners are making sense of their experience in a socially engaged design setting. Thus, this study is centered on semi-structured interviews with community partners before, during, and after their participation in engineering engagement programs. In addition to interviews, course syllabi associated with the engineering engagement programs were collected and used by the researcher to provide more context for interview questions and data analysis.

Interviews were chosen as the major data source for this study primarily due to their propensity to allow community partners to make meaning of their experiences in their own words (Creswell, 2002). There are three types of interviews on the continuum of qualitative research:

- Highly Structured Interviews in which the interview is the oral form of a survey having question wording and order pre-determined,
- Semi-structured Interviews in which an interview guide is used and questions are posed with flexibility according to the flow of participant responses,
- And Unstructured/informal interviews in which all questions are open-ended and exploratory (p. 110, Merriam & Tisdell, 2015.)

Because the goal of the study is to surface community partner voices associated with their conception of and experiences in an engineering engagement program, semi-structured interviews were selected to allow the researcher flexibility in asking questions related to their experience without forcing a pre-determined flow to the conversation.

3.7 Data Collection

The following section describes the data collection decisions made as part of this study. This includes the interview timelines and logistical decisions, as well as the development of the interview protocols.

Interview Timelines and Logistics. In qualitative research, multiple interviews “may foster a stronger relationship between researcher and participant, such that the latter may feel more comfortable deeply describing difficult or emotionally laden experiences to someone with whom he or she has had prior contact and established at least some level of trust” (Knox & Burkard, 2009). Therefore, in order to capture community partner perspectives in a way that builds rapport with participants, semi-structured interviews were held early in their involvement, toward the middle of their involvement, and near the end of their involvement with a single semester cycle of the associated engineering engagement programs. The timing of the interviews was based on the timeline of their engagement with pre-interviews being held within the first quarter of their engagement, mid-interviews as close as possible to half-way through their engagement post interviews within a week of their engagements ending. Interviews held before their engagement took approximately 20 minutes to complete. Interview held during their engagement took about 40 minutes and interviews after their engagement took about 30 minutes. The variation in interview times across interviews was due to the variation in interview protocol questions, discussed in the next section. Because the community partners were not compensated for their time, interviews were conducted primarily over the phone and in person when schedules allowed. Additionally, only audio recordings of interviews were collected, and audio transcriptions of interviews were then transcribed into words using an automated transcription service, temi.com. Transcripts were then reviewed and cleaned for accuracy and participant names were given pseudonyms to protect their identities.

Across all three participants, data collection resulted in about 270 minutes of audio recordings from community partners. For the scope of this study, community partners were selected to represent three variations of community partner experience to provide a starting point for an investigation into the experiences of community partners in engineering engagement programs. While this sample size is small in comparison to the true range of potential community partner experience, the sample is sufficient as a starting point for inquiry within this field due to the existing dearth of research representing these perspectives.

Interview Protocol. Given our established conceptual framework for community partners in engineering engagement programs (see Figure 2.X), the interview protocols for this study were designed to investigate community partner perspectives regarding the potential ecosystem in which community partners can make meaning. Interviews began with focusing on the participants' work before arriving at the project, then focused on their work within the project. Next the interview protocol asked about what they were expecting or were excited about, and what their concerns were. Sequential interviews built on prior interviews and allowed participants to make deviations based on what had arisen as relevant or important to them. The full interview protocol can be found in Appendix C.

3.8 Data Analysis

Analyzing data in qualitative studies is a complex process of making sense of data by consolidating, reducing, and interpreting what participants have said (p. 202, Merriam & Tisdell, 2016.) For interviews conducted as a part of basic qualitative inquiry, data analysis is conducted by systemically reviewing interview transcripts and assigning shorthand designations to various aspects of participant responses – called “coding” (p. 199 Merriam & Tisdell, 2016.) In 2019, Linneberg and Korsgaard described coding methods for qualitative data in their paper in the *Qualitative Research Journal* “Coding qualitative data: a synthesis guiding the novice” (Linneberg & Korsgaard, 2019). Linneberg and Korsgaard describe two approaches to coding qualitative data: inductive and deductive coding. Inductive coding involves researchers developing codes directly from language in the data, rather than using theoretical language to describe the data. Inductive coding is best for exploratory studies and is often the first step in a cycle of coding in which higher level categories are developed from original codes (Gioia et al., 2013). While inductive coding has

the advantage of being loyal to the data, there exist a risk of findings that lack focus and are more difficult to associate with the research question (Linneberg & Korsgaard, 2019). Deductive coding addresses this by using a predetermined list of codes as a “coding frame” to code data (Merriam & Tisdale 2016). Here, theoretical language from literature can be used to create or bolster existing coding themes (Linneberg & Korsgaard, 2019).

Though all qualitative research involves interpretation of data, basic qualitative research studies rely heavily on the epistemic idea of constructivism or interpretivism (often used interchangeably). Constructivism differs from positivism (often used to frame quantitative studies) in that its purpose is to describe, understand and interpret meaning in the data as opposed to predicting, controlling or generalizing data as is often the case in quantitative studies (p. 12, Merriam & Tisdale 2016). Within this study, constructivism is the lens through which data analysis was conducted based on the idea that community partners make meaning through multiple, context dependent realities.

For the purposes of this study, both inductive and deductive coding was conducted using NVIVO computer software to assist with organizing the codes. Inductive coding, also referred to as “open-coding” was first used to surface descriptive codes of aspects of community partners’ experiences of their respective engineering engagement settings (Burnard, 1991). Inductive/open coding was chosen as the first step of data analysis in this study in order to allow the voices of participants, rather than existing theories, to frame the way the data is understood. This process was used to develop a preliminary glossary of codes and their meanings referred to in qualitative research as a “codebook “ (Saldaña, 2016). Once this preliminary codebook was developed, deductive coding (using this code book) was conducted to generate larger categories under which multiple smaller codes could fall. Next, these larger categories were compared to the theoretical framework for meaning-making in engineering engagement programs. The following sections describe this process in detail.

3.8.1 Round One: Descriptive Open Coding

The first round of coding investigated transcripts for the voice of the community partners. Descriptive coding involves identifying what is being discussed or described by the community partners. Within this process, quotes were segmented and given descriptive codes that summarized

the discussion/responses made by community partners. For example, Toni's discussion of how she came to be involved in her engineering engagement program was coded descriptively as "collaborating with co-worker to develop project idea" because of the following statement in her interview data: "And I went to my colleague and said, you know, do you think we could come up with a project that would work for this? And the sidewalk project was one and the niches that we worked on last year, were kind of our two ideas."

Once descriptive coding was completed for all community partners pre, mid and post interviews, the quotes associated with descriptive codes were re-investigated to elucidate the meaning community partners were making in each quote. The following section describes this second round of investigation.

3.8.2 Round Two: Thematic Coding

The second round of coding investigated participant quotes for the meaning that community partners made. In this round of coding, quotes were reviewed against the following questions:

- What meaning are community partners making?
- Is that meaning related to the Engineering Engagement Program?
- Within the theoretical framework, how could that meaning be classified?

In investigating each of the quotes against these questions, the goal was to elucidate the answer to the research question "what meaning do community partners make of their experiences in engineering engagement programs?" Following the example of Toni's response related to collaborating with a co-worker to develop a project idea the following meanings were coded in association with her description:

- In order to engage, I need to check with my colleague
- This EEP requires projects that are already in the works

These meanings are the researcher's interpretations of the meaning Toni made within her descriptions. Once interpretations were made, the second question ("Is that meaning related to the Engineering Engagement Program?") was used to ensure the meanings surfaced address the scope of the research question. Third, the meanings associated with the original quote's codes were compared to the theoretical framework to understand how those meanings could be classified. Toni's meanings were coded as pragmatic because her meanings described a shared practice and participation with others. Within the scope of this study, the theoretical framework set out by Zitton and Brinkman was used to interpret the type of meaning community partners made in their description of their experience of the engineering engagement programs. While some quotes were coded as singular components of the framework, other quotes (discussed more in chapter four) were coded as overlapping types of meanings within the framework.

Once quotes and descriptive codes had been analyzed for interpreted meanings and associated to the theoretical framework, those meanings were investigated for patterns and categories of meaning. Those categories were grouped into themes of meanings that were then used to create insights and findings in response to the research question. Table 3.2 summarizes both rounds of coding for this example quote and two others to further demonstrate this coding approach.

Table 3.2 Examples of Participant Quotes and Coding Process

Participant	Quote	1 st Round	2 nd Round	Theoretical Framework
Toni	“And I went to my colleague and said, you know, do you think we could come up with a project that would work for this? And the sidewalk project was one and the niches that we worked on last year, were kind of our two ideas.”	collaborating with co-worker to develop project idea	In order to engage, I need to check with my colleague This EEP requires projects that are already in the works	Pragmatic
Tiffany	“I would say questioning or, but maybe context providing. So trying to, okay, what about this or how would that scale? I tried to avoid saying like, no or that’s not an option, but instead like asking a question around or providing information around or maybe reframe it just to see if that would get them to think of something new”	I tried to ask generative questions and reframe constraints to get students to think of something new	partner role: question asking	Semantic
Yasmine	“the students have definitely worked very hard and they’ve gained a lot of insight in to topics, set perspectives that otherwise I don’t think the probability in their life would have ever led them to thinking about”	The students have taken away valuable experience and perspective from their work in the EEP I don’t believe the students would have received this insight otherwise	partner conception of student growth: new perspectives	Existential

Analyzing the data this way created groups of meanings and community partner voice that can be used to illustrate answers to the research question “What meanings do community partners make of their experiences in engineering engagement programs?” The following chapter discusses the findings associated with each step of this data analysis and provides more insight into how those findings answer the research question.

4. FINDINGS

The purpose of this study is to answer the research question “what meanings do community partners make of their experience in engineering engagement programs?” The goal of this study is to more deeply explore the way community partners describe their experiences in these settings in order to inform the way they are included in the design, implementation, and research of engineering engagement programs. This chapter presents key findings gathered from 9 semi-structured interviews with 3 different community partners who represent 3 different engineering engagement programs. These findings are organized according to the theoretical framework for meaning making established by Zittoun and Brinkman (2012) and expanded with the voice of community partners from this study:

1. **Pragmatic Meaning:** For community partners in this study, pragmatic meaning involved descriptions of that was done within the context of the engineering engagement program. This included things like the evolution of the project, student performance and behavior as well as the roles of the people involved in the engineering engagement program.
2. **Semantic Meaning:** In the context of this study, semantic meaning involved descriptions of and commentary about ways of thinking and communication within the context of the engineering engagement program. This included shared words across people involved in the engineering engagement program, as well commentary about the clarity and quantity of those words from the perspective of the community partner.
3. **Existential Meaning:** Community partners in this study described and commented on existential meaning as they discussed the value or impact of components of their experience in the engineering engagement program on a larger social context or as a part of a larger journey. This included their connection to the broader context of stakeholders, and their belief in the larger social implication of the work done in the engineering engagement program.

4. **Overlapping Meaning:** Though some aspects of the community partner experience fit neatly within the Zittoun and Brinkman (2012) framework, other aspects represented two or more components of the framework into one larger meaning for the community partner. Within the context of this study, overlapping meaning occurred most frequently between pragmatic and semantic meanings made by community partner.

The following sections outline findings associated with each of the above components of the framework and its overlap. These sections represent overall themes associated with each component as well as some representative quotes from participants. These quotes were selected for how they elucidate meaning within the code but are not an exhaustive list of all participants quotes that were associated with each code.

4.1 Pragmatic Meaning

Analysis of community partner voice in this study generated pragmatic meanings around seven themes, each with one or more codes associated with them (count of associated codes included in parenthesis):

- Community partners' role within the EEP (3)
- Student contributions within EEP (4)
- Organizational influence on the EEP (1)
- Functions and benefits for the students within EEP (3)
- Participation in EEP related to role in organization (4)
- Community partner conceptions of the internal stakeholders to the problem the EEP is addressing (3)
- Community partners' benefits and outputs associated with participation in the EEP (7)

The following sections unpack meaning community partners made within each of these themes.

4.1.1 Community partners' role within the EEP

Community partners in this study articulate both the practices associated with the roles they negotiate with their students as well as concerns about what that role may be. Yasmine, for example describes: “[My role] is usually directly related to the development process at hand or any stumbling blocks or just wanting to review with me and getting some assurance.” Here, Yasmine indicates that her role for the students was to provide reassurance and to assist the students in navigating the obstacles that arise throughout their work in the EEP. Toni has a similar, yet different conception as she describes that her role changed: “I think I kind of started out as more of a facilitator and then I think I changed to being a resource.” Though both partners describe a function related to helping students to navigate the work or process of the EEP there is a variation in the way community partners describe their role within the EEP. Toni goes on to describe her role with the students as “pointing them in the direction of folks to talk to” which extends upon the conception of her role as a resource but differs slightly from Yasmine’s description of providing reassurance and being supportive for the students.

Wille Yasmine and Toni describe varying conceptions of what their role is, Tiffany describes her concerns about her role within the EEP saying “One concern I have... sometimes in my role I feel like I’m the Naysayer of like, oh, we can’t do that and we can’t do that” and “I’m hoping I can do enough providing that historical context and constraints so that I don’t feel like I’m just shooting down every idea or so that they don’t feel like every idea was shot down.” Here, Tiffany indicates that she struggles with having to play the role that says no and plans to use her knowledge of the context to validate instances where she needs to say no.

Though Tiffany’s concerns about her role present an alternative conception of role than Toni and Yasmine describe, these descriptions were interpreted as pragmatic meanings their descriptions spoke to their understandings or concerns around of what they would be doing within their experiences. Tiffany describes her struggles with executing the pragmatic function of the role of “naysayer” - which varies from both Yasmine and Toni’s characterization of their role in helping to navigate the work.

4.1.2 Student contributions within EEP

In addition to making meaning around their role in the EEP, Community Partners in this study also describe the student contributions to the work and their experience of the EEP. Toni, for example, in her pre-interview comments on the expertise of the students she was working with, stating that the engineering students may be able to contribute skills that have previously been missing on this project: “we need someone to sit down and look at the numbers and maps and figure out what is possible... I am hoping these students can provide that.” Speaking generally at the onset of her mid interview, Toni describes the problem the students are contributing to as “providing a safer route for people to walk to our local grocery store in our town.” Later, Toni describes a more specific task she’d given the students: “We’ve had them researching funding opportunities. I was hoping that maybe they could take it, you know, and provide us with some that looked like good possibilities. But it’s tough because the funding is governmental and hard to find.” Here Toni describes her expectations of the students’ function (find viable funding options) and her understanding of how difficult the nature of the task was.

Yasmine also described student contributions, but in greater detail. In her pre-interview Yasmine describes: “the students are developing a digital dashboard that will help my institution better organize learning and be a part of a toolkit that will help them make American sign language more accessible.” Here Yasmine is describing the pragmatic contributions of the students in the EEP and the function of those contributions to her organization. Later, in her mid-interview, Yasmine comments that the “dashboard project is well underway” and goes on to describe that the students’ role in the process is to “implement and test ideas we discussed.” Here, Yasmine describes the contributions of the students as executing the ideas they have discussed. While the nature of their communication will be later addressed as a semantic form of meaning, there are clear pragmatic elements of the student contributions to Yasmine in terms of progressing the project from the idea stage to reality. Community partner descriptions of student contributions to the EEP were identified as pragmatic meanings because they described the community partner’s understanding of student practices and ways of being.

4.1.3 Organizational influence on student work in the EEP

For one community partner in particular, the influence of the organization that they worked for had particular impact on the work the partner did with the students in the EEP. In her pre interview, Tiffany, whose students were working on addressing awareness of tutoring resources for undergraduate students, describes: “The university hasn’t centralized tutoring resources so there’s about 15 to 16 different help rooms across campus, and that complicates the work the students will have to do.” Here Tiffany makes meaning of how the functions and practices of her organization (the university) impedes the work her students can do. The meaning Tiffany made around her organization’s influence was coded as pragmatic because it directly informed the actions and practices within the EEP.

4.1.4 Functions and benefits for the students within EEP

Because Tiffany’s project within the EEP considered the students she was working with as stakeholders themselves for the problem they were addressing, she comments, “So if we’re not doing something that works for them, what’s the point? If they can provide potential solutions that would help us improve awareness around tutoring, that would be great for them as well.” Here, Tiffany makes meaning of the benefit to the students she is working with of the intended outcome of their work in the EEP. This recognition of potential benefits and functions of the EEP for the students they worked with were coded as pragmatic meanings because they described practical benefits of participation for students.

Though Yasmine’s students were not direct stakeholders of the problem they were addressing in the EEP, Yasmine describes how she perceives having participated in the EEP at all to be a benefit to the students: “These students get experience, you know, solving a real-world problem... and those sorts of experiences can stick with you.” Here, Yasmine makes meaning around the existence and transferability of the skillset students develop as a function of having participated in the real-world problem space presented in the EEP. This meaning is coded as a pragmatic meaning because Yasmine is speculating about the function of student work in the EEP towards their future practices.

4.1.5 Participation in EEP related to role in organization

Community Partners in this study saw their participation in the EEP as an extension of their role in their organization. For Tiffany, for example, she describes her role within her organization as slightly related to the problems she is addressing in the EEP but goes on to describe how her role links the two: “I’m the director of the academic success center and we provide a lot of different supports and resources, but tutoring is not one of them. However, it’s my role to get buy-in as we move forward with the centralized communication related to all academic resources, so this is technically my area.” Tiffany goes on to describe that her role within her organization has “an audience of advisors and faculty that often refer students to resources. So helping them be aware helps the student, which is good.” Here Tiffany makes meaning of the connections between her role and function within her organization and the work she is doing in the EEP. This is coded as pragmatic because Tiffany speaks to how things she does within her role in her organization connects to the things that are intended outcomes of the works she is doing with the students of the EEP.

Toni also described a connection between the work she did in the EEP and her role at her organization. In her pre interview, Toni says: “but we, you know, my role at [organization] is to try to help meet the needs of the people in the community and keep them safe (...) and we’re seeing pathways the students are designing as a major need in the community because, you know, we *see* people walking unsafely.” Here Toni makes meaning of the connection between her role in the organization to keep people safe and the problem the students are addressing. More deeply, Toni makes the connection between things she’s observed in the community and the work the students are doing. These meanings were described as pragmatic because Toni describes how the function and practices within the EEP translate to the functions and practices of her role within her organization.

4.1.6 Community partner conceptions of the internal stakeholders to the problem the EEP is addressing

Community partners in this study also described having made meaning around their relationships to stakeholders related to the EEP. As Toni, who works for a state-funded social services organization, describes: “we would be considered more of a community partner to the

problem, to the problem because we're, we're not on the town council, are not part of the county government, so we're kind of a periphery." Here Toni makes meaning around the fact that she does not have a direct impact on the problem but instead considers *herself* a community partner to the problem because she is not a part of the town government. Toni goes on to describe the numerous parties that need to be involved to realize the EEP students' solutions, and reasons solutions might not be adopted: "It could be the commissioners aren't on board, or the council and that would stop the projects in its tracks." Here Toni makes meaning around the functions and influence of whom she considers to be the real stakeholders of the problem. These meanings were coded as pragmatic because Toni describes the practices and functions of the internal stakeholders in relation to the work being done in the EEP.

4.1.7 Community partners' benefits and outputs associated with participation in the EEP

Community partners describe their expectations and recollections of benefits and output associated with EEPs. For example, in her pre-interview Yasmine described the EEP as an opportunity to expand her capacity: "Well, early on in founding my organization I realized that having connections with more folks helps expand my bandwidth so, you know, I make time [to be engaged in the EEP]." Here, Yasmine describes pragmatic benefits associated with being involved in the EEP including expanding her network and bandwidth. She goes on to say "you make those connections that you otherwise wouldn't have. I don't know how I would've crossed paths with these students in any other way." Here, Yasmine describes the benefit of meeting students she would not have otherwise encountered. These meanings were coded as pragmatic because they relate to how the participation in the EEP translates to practical benefits for Yasmine.

Toni also describes her expectations of the outputs associated with being involved in the EEP. In her pre interview, Toni says: "If we could at least get a process going as to how we could lay out the pathway, and maybe some of the statistics to support what could be done I think we would be in good shape." Here Toni describes that she hopes to get a process started with the students related to the problem she is working on in the EEP. Toni goes on to describe outputs by saying "There is an opportunity for us to investigate the topography of the area or other location options" further illustrating her expectation for the work in the EEP to provide some insights into the geographic specifics of the area. These meanings were coded as pragmatic because Toni

describes actions and activities she expects to occur within the EEP as well as their function towards the problem they are addressing.

4.1.8 Summary of Pragmatic Meanings

Community Partners in this study made pragmatic meaning associated with their experiences in their respective EEPs. Pragmatic meanings were associated with community partner roles within the EEP, their organization's influence on the problems space, the connection between their role in the organization and participation in the EEP, their conceptions of the functions of the internal stakeholders, the contributions of student contributions, as well as the functions and benefits of the EEP for the students and the community partners. These meanings represented community partner perspectives on ways of being and doing within the context of the EEP.

4.2 Semantic Meaning

Within the context of this study, semantic meanings related to descriptions of ways of thinking and communicating within EEPs. Community partners in this study made semantic meaning centered on three themes:

- Community partners communicate with the students within the EEP in a variety of modes (3)
- Community partner perspective of student thinking (3)
- Community partner ways of thinking through solutions (3)

The following sections unpack meaning community partners made within each of these themes.

4.2.1 Community partners communicate with the students within the EEP in a variety of modes

Community Partners described the need to communicate with students within the EEP in a variety of modes. Each mode held different meaning for the community partner. For example, Yasmine describes in her mid-interview: "We meet sporadically and communicate through email

mostly. In our actual meetings I can give a little more detail, but most of our communications are emails, so I have to be really clear about my feedback to ensure students aren't confused." Here Yasmine describes the approaches she takes to communicating with students in meetings or via email. This meaning was coded as semantic because she describes having to different ways of thinking and communicating with students within the EEP.

Toni also discussed using a variety of modes of communication with students in the EEP. Toni explains:

"It seems like showing them the video of the site worked better than all the describing I had been doing (...) after I showed them the videos I could just say the landmarks or describe the space with things they'd already seen. I feel like I should have started our discussions there."

Here Toni describes how a video of the area near the setting of their project served as an easier way of communicating with the students. She describes that sharing the videos with the students allowed her to communicate in terms of shared visuals and considers that her earlier discussions with the students may have benefited from the videos. These meanings are coded as semantic because community partners describe how ways and means of communicating impact their experience of the EEPs.

4.2.2 Community partner perspective of student thinking

Community partners in this study made meaning around the students' ability to think about the problem being addressed in the EEP. In her pre interview, Tiffany expressed concern about the students' perspective of the problem saying:

"I guess one concern that I know normally comes up is when we're talking with students that are upper-class men and women... is that they don't have as many tutoring resources available for them [as compared to lower classmen]. Most of [the tutoring resources] focus on 100 and 200 level and its hard to explain the limits of budget and class size and how that all factors in. So, I'm concerned with student awareness of those things"

Here, Tiffany describes her concerns about whether the upper division students she is working with in the EEP will be able to relate to the problem they are working on because of the potential disconnect between the problem and their current perspective within the problem space. Here, Tiffany articulates concerns about the students' ways of thinking about academic resources

on the level of the project because of their academic standing and the academic resources available to them at that level. These concerns were coded as semantic because the community partner is making meaning around the students' way of thinking in relation to the problem they are addressing in the EEP. Additionally, Tiffany's concerns around explaining the differences between the context of offering academic resources for these levels reflect a semantic meaning related to how to best communicate within the EEP to sufficiently guide student thinking.

Community partners in this study also made meaning related to the need for more innovative ways of thinking among students. In her post-interview, Tiffany comments "I guess I was just hoping that the students would be or think more inventively, you know? Like I was really hoping they would think of something we haven't done or thought about before." Here Tiffany describes having wanted the students to think more innovatively during the EEP. Yasmine echoes these sentiments in her post interview when she says: "I mean they are, they were very thoughtful and they were doing a lot of deductive reasoning, you know, but I think that, um, they, they still need to push the boundaries of thinking out of the box." Here, Yasmine describes the students' thinking as deductive and suggests that students still need to think more beyond their boundaries. These meanings were coded as semantic because they reflect community partner conceptions of student ways of thinking within the EEP.

4.2.3 Community partner ways of thinking through solutions

One community partner described her ways of thinking within the EEP. In her post interview, Tiffany comments:

"I think there's also a difference in attacking a problem when you're a consultant versus when you're the person that would then have to own this forever, right? So, my job is to think through if that idea would be good or would mean me and all of my staff spending several days and evenings to make it work. So like, thinking through the idea, about what it would be like to scale it out and weigh out the pros and cons and then communicating that back to the students."

Here, Tiffany describes the types of thinking she did during the EEP. She describes thinking about the solutions as a person who would have to live with the details of the solution. Her role, she describes, is to think through implementation and scaling and make estimates about the potential benefits versus costs. These comments were coded as semantic because Tiffany makes meaning of her ways of thinking within the EEP.

4.2.4 Summary of Semantic Meanings

Community Partners in this study made semantic meaning associated with the form and modes of their communications with the students, community partner perspectives on student thinking and communication. These meanings speak to ways of thinking or communicating within the context of the EEP by the community partner.

4.3 Existential Meaning

Within the context of this study, existential meanings are related to speculations and insights related to how experiences within the EEP contribute to a larger context or social journey. Community partners in this study made existential meaning centered on two themes: community partners' views about value of the EEP to the larger context of stakeholders (associated with 5 codes), and community partners' speculation about how this EEP contributes to larger student trajectories (associated with 4 codes). The following sections unpack meaning community partners made within each of these themes.

4.3.1 Community partners' speculation about value of EEP to the larger context of stakeholders

Across both her pre and mid interview, Yasmine describes implications of the student work in the EEP for the larger context of stakeholders – in the case of her EEP project: the deaf community in general. In her pre interview, Yasmine comments “Anything I can get involved in that moves the needle for the deaf community is worth my time, so helping the students think through this metronome is definitely a good investment of my time.” Here Yasmine describes how the work within the EEP contributes to “moving the needle” for the deaf community in general. Here, she moves beyond the immediate stakeholders within her organization and makes meaning of the EEP work in terms of a larger social journey of deaf people. In her mid interview, Yasmine comments that “[the work the students have done] will make it easier for this project to actually reach the world of deaf people, and not just stay within their class project.” Here, Yasmine comments on the prospect of the student work in the EEP to move beyond the context of their class project into the larger context of the deaf experience. These meanings are coded as existential

because they illustrate community partner connections between the EEP and the larger context and journey of stakeholders.

4.3.2 Community partners' speculation about how this EEP contributes to larger student trajectory

Community partners in this study also speculate about how participating in the EEP may contribute to the larger trajectory of the students' lives. In her pre interview, for example, Toni describes:

"I think one of the funniest things for me was when we were ... trying to think of somebody on campus we could talk to about the different kinds of services you could use on the sidewalks, and possibility of someone talking to a professional civil engineer in the area came up and [Student Name]'s eyes lit up (laughs). I could tell she didn't think she could talk to him about anything serious... but we talked through how the conversation would go and I could tell she, by the end she could probably see herself more as an engineer."

Here, Toni describes a situation in which a student seemed insecure about her ability to speak with a practicing engineer within the EEP until Toni and the student made a plan for how to approach the conversation. After talking through how the conversation would go, Toni speculates that the student could probably see herself more as an engineer as a function of their discussion. Here, Toni interprets the student's shift in discomfort with tasks associated with EEP to have implications on student's life journey and trajectory.

Yasmine similarly speculates about the potential impact of the EEP on the students' future selves by commenting in her post interview: "I think this is great experience for students to have... after this they will know that they can tackle any problem that matters to them, and that's powerful." Here, Yasmine describes how she believes having been involved in the EEP may translate to student ease in approaching problems in the future. These meanings are coded as existential because community partners are translating their experiences within the EEP to the larger social contexts and journeys of those involved.

4.3.3 Summary of Existential Meanings

Community Partners in this study made existential meaning associated with their experiences in their respective EEPs. Existential meanings were associated with community

partners' speculation about value of EEP to larger context of stakeholders, and community partners' speculation about how this EEP contributes to larger student trajectory. These existential meanings indicate community partner conceptions of how their experiences within the EEP extend into the larger social contexts of those involved.

4.4 Intersections within Theoretical Framework

In addition to meanings associated with individual components of the theoretical framework, Community Partners in this study also made meanings that aligned with more than one component of the framework. Though there is a natural rhetorical overlap between pragmatic themes and semantic themes - in that talking, thinking, and being are all actions that one does, overlaps described in the following sections reflect more nuanced examples of connections between the pragmatic and semantic elements of the meanings from participant voice in this study. Meanings within this overlap were associated with the following themes: Communication that Initiates Action (associated with 4 codes) and Learning by Doing + Doing for Thinking (associated with 9 codes). The following sections unpack community partner meaning related to those themes.

4.4.1 Communication that Initiates Action

Community Partners in this study made meanings around communications within the EEP that lead to work being done in the EEP. For example, in her post interview, Toni describes: "I'm thinking we will share the student's presentation with our internal team... they've communicated things in a way that would make work with some stakeholders easier." Here Toni describes that she intends to use student communications within the EEP to further work with the project stakeholders. This meaning was coded as semantic and pragmatic because she describes that student communication (semantic) will be used to further action (pragmatic) with the stakeholders.

Yasmine also makes meaning around the practical nature of her communications with the students: "It's really like a dialogue (...) asking questions back and forth until we get to a place where we have a new direction or something that clearly needs to be addressed." Here, Yasmine describes how the communication she had with the students within the EEP motivated and directed the work done on the project. This was coded as both pragmatic and semantic because Yasmine

describes the function of communication (semantic) within the EEP towards generating direction and action (pragmatic).

Community partners in this study made meanings that overlapped as semantic and pragmatic by describing communications with or from the students as connected to work done within the EEP.

4.4.2 Learning by Doing + Doing for Thinking

Community Partners in this study explained actions that needed to be taken in order to expand student learning as well as instances in which they themselves learned by doing something within the EEP.

For example, during her mid interview Yasmine describes her conception of where the project is going next by saying: “I’m just exploring and getting to know, um, you know, the stakeholder needs and problem and, and all of that in real time with the students.” Here, Yasmine makes meaning around learning about the problem and the needs of the stakeholders by participating within the EEP with the students. This meaning was coded as semantic and pragmatic because she describes that the practice of engaging with the EEP (pragmatic) allows her and the students to explore and expand their ways of thinking related to the stakeholders (semantic).

Similarly, Toni comments on having learned about the stakeholders as a function of having been involved in the EEP. In her Post interview, she explains:

“I never really thought we could put a pathway through somebody’s yard. I was taught not to cut through yards. I mean it’s deeply ingrained in me and, and so, you know, having a solution like that and then hearing the community person who owns that property say ‘yeah, that would actually be great because people cross through all the time, so a pathway would save my grass’ was just pretty mind boggling to me. That wouldn’t have been something I would’ve come up with (laughs), but that’s what we are doing!”

Here, Toni makes meaning about how the work done on her project expanded her thinking about what solutions the community would be open to. This meaning was coded as both semantic and pragmatic because Tiffany describes, like Yasmine, learning something (semantic) about their stakeholders by doing the project with the students (pragmatic).

For Tiffany, since the students she worked with were the stakeholders of the project she worked on in the EEP, she makes meaning around how the students' way of thinking impacts the implementation of the project. She explains:

“Well, the fact that the student's solution was something we've done before (...) but that they had never heard of it confirmed for me that [my organization] is going in the right direction with focusing on student awareness.”

Here Tiffany describes that the students' suggested solution confirmed for her that the work that really needed to be done was around student awareness. This meaning was coded as both semantic and pragmatic because Tiffany describes how the student's awareness (semantic) as suggested by their solution (pragmatic) informs what should be the future work of her organization (pragmatic).

Yasmine, also made meaning around student thinking when she explains “I think that, you know, I mean they are, they are very thoughtful and they were doing a lot of deductive reasoning, you know, but I think that, um, I still needed do stuff to get them to think out of the box.” In this case, Yasmine goes on to describe needing to create or suggest activities and additional resources activities to “help them know it was okay to suggest crazy things.” Here, Yasmine suggests an intersection between her own actions and the student ways of thinking which was coded as both semantic and pragmatic because Yasmine makes meaning around what she did (pragmatic) as a function of how the students were thinking (semantic).

Community partners in this study made meanings that overlapped as semantic and pragmatic by describing elements of themselves learning (semantic) by engaging in the EEP (pragmatic) as well as by describing connections between student ways of thinking (semantic) and how they were then able to engage with the work of the EEP (pragmatic).

4.5 Summary of Findings

Community partners in this study made pragmatic, semantic and existential meaning of various components of their experience within their respective EEPs. These meanings represented community partner conceptions of their role within both the EEP and their organization, student communications and benefits, and larger implications to their stakeholders' groups and the trajectories of their experience. Additionally, community partners made meanings associated with overlap between the semantic and pragmatic aspects of their experiences in their explanations of

connections between communication and the work that is done with the students in the EEPs. The following Chapter further discusses these findings, their connections to the literature and the implications of these findings for designing and implementing EEPs.

Beyond the quotes and codes represented here, there were several quotes that were identified as beyond the context of the research question. This included quotes and codes related to participant descriptions of their experiences that were not related to the engineering engagement program. Quotes associated with meanings beyond the engineering engagement programs were excluded from this analysis and are not represented in the synthesis of this study.

5. DISCUSSION, IMPLICATIONS, CONCLUSIONS AND FUTURE WORK

The purpose of this study was to investigate what meaning is made by community partners in Engineering Engagement Programs. Having previously outlined findings from interviews with three community partners at various engineering engagement programs, this chapter discusses researcher interpretation of these findings and their connection to existing literature presented in Chapter 2. The chapter continues by discussing conclusion and implications from these interpretations and concludes by addressing limitations and future work related to this study.

5.1 Discussion

Findings in this study were broken down according to a theoretical framework for meaning making created by Zittoun and Brinkman (2012) in which meaning and expanded with the voice of community partners from this study:

1. **Pragmatic Meaning:** For community partners in this study, pragmatic meaning involved descriptions of that was done within the context of the engineering engagement program. This included things like the evolution of the project, student performance and behavior as well as the roles of the people involved in the engineering engagement program.
2. **Semantic Meaning:** In the context of this study, semantic meaning involved descriptions of and commentary about ways of thinking and communication within the context of the engineering engagement program. This included shared words across people involved in the engineering engagement program, as well commentary about the clarity and quantity of those words from the perspective of the community partner.
3. **Existential Meaning:** Community partners in this study described and commented on existential meaning as they discussed the value or impact of components of their experience in the engineering engagement program on a larger social context or as a part of a larger journey. This included their connection to the broader context of stakeholders, and their belief in the larger social implication of the work done in the engineering engagement program.

4. **Overlapping Meaning:** Though some aspects of the community partner experience fit neatly within the Zittoun and Brinkman (2012) framework, other aspects represented two or more components of the framework into one larger meaning for the community partner. Within the context of this study, overlapping meaning occurred most frequently between pragmatic and semantic meanings made by community partner

The following sections explore researcher interpretations of meanings associated with each of these as well as connections to existing literature on community partners and engineering engagement spaces.

5.2 Pragmatic Meanings

Community partners in this study made pragmatic meaning around descriptions of that was done within the context of the engineering engagement program. This included things like the community partners' role within the EEP (Engineering Engagement Programs), student contributions to the EEP and their organizational influence on the work done in the EEP.

5.2.1 Pragmatic Finding 1: Community partners role within the EEP

Community Partners in this study made meanings around their role within the EEP that we coded as pragmatic because partners describe things they do in relation to the students they work with – namely proving reassurance, being a resource, and providing context and constraints as a naysayer. While the range in meanings around community partner roles within this study reflects these partners' experiences in their particular EEPs, this finding suggests a more nuanced experience and contribution of EEP space than existing literature on engineering engagement programs addresses. Existing literature focuses on the community partner organization's motivations and benefits, but there is a prevailing lack of literature on community partner conceptions of their roles within these spaces. The range in meanings made by community partners in this study coupled with the lack of literature associated with these meanings suggests a need for increased investigation into their roles within these spaces. Within the SOFAR Model presented in Chapter 2, these meanings suggest that the community partner intermediates the relationship between the community organization and the community partner (Bringle et al. 2012).

5.2.2 Pragmatic Finding 2: Student contributions within EEP

Partners also described student contributions including contributing skills that have previously been missing from the work being done in the EEP and progressing the project from idea phase to reality. Findings around student contributions within the EEP echoes existing literature on the motivation of community organizations for joining service-learning programs that states that getting free labor from students related to the problem space is a major motivating factor for organizations (Basinger & Bartholomew). However, community partners in this study from this study made meaning around student contributions in relation to the particular problem space within the EEP suggesting that partners may carry a deeper and more specific understanding of how student labor manifest and what that labor means for the progression of the work. Toni, for example, describes the students a specific need related to the problem space that her organization has been trying to address in saying: “we need someone to sit down and look at the numbers and maps and figure out what is possible.” Here, Toni articulates a specific need that has been lacking in her organization’s previous attempts at addressing the problem space suggesting that Toni has a nuanced perspective of the “student labor” that motivated organizational participation in the EEP.

5.2.3 Pragmatic Finding 3: Organizational influence on student work in the EEP

Tiffany makes meaning around how the practices of her organization impedes the work her students can do within the EEP by describing the decentralized nature of the academic resources associated with her work with the students in her EEP. She comments that the decentralization of those resources “complicates the work the students will have to do.” This finding suggests this community partner made meaning around what must be done (pragmatic) in relation to the first of the ten relationships outlined by Bringle, Clayton and Price (2012): between student and community organizations. This finding also suggests that the community organization are an additional stakeholder by which community partners make meaning in the model for project-based community engagement developed by Leidig & Oakes (2021).

5.2.4 Pragmatic Finding 4: Functions and benefits for the students within EEP

Community Partners in this study made meaning around the immediate and longer-term benefits for students who participated in the EEP. Though one partner's description of those was a function of her students also serving as stakeholders to the deliverable associated with the EEP, meanings made by both Tiffany and Yasmine suggests that partners were aware of the work students did in the EEP contributed to their developmental journeys.

5.2.5 Pragmatic Finding 5: Participation in EEP related to role in organization

Community Partners in this study described their participation in EEP as an extension of their role within their organization. Tiffany, for example, described the work done in the EEP related to student awareness of tutoring resources as addressing a gap in her organization's current offerings. Tiffany describes that her role within her organization has "an audience of advisors and faculty that often refer students to resources" and makes meaning around the connection between her role and the work the students are doing. These meanings suggest that Tiffany made meaning of the potential for Tiffany to provide stronger services from her role in her organization echoing McGhee's second of the five benefits for municipalities described in Chapter 2. Though Tiffany's organization is not an official municipality, this meaning suggests the project deliverable of the EEP may offer benefits between the community partner's organization and their stakeholders, which illustrates and arrows between the community partner, the deliverable and their other stakeholders within the Leidig & Oakes model for project-based engagement (2021).

Toni, describes a similar dynamic when she makes meaning of the connection between her role in the organization to keep people safe and the problem the students are addressing to create a safe walkway to a local store. Toni makes meaning of her work in the EEP as an extension of her role within her organization, suggesting what Bell and Carson describe as a capacitive building motive, in which organizations see participation in programs as a means of expanding their capacity (2009). Toni's meaning around capacity expansion is similar to the meaning Tiffany made meaning around addressing gaps in services by her organization.

5.2.6 Pragmatic Finding 6: Community partner conceptions of the internal stakeholders to the problem the EEP is addressing

Toni also made meaning around her relationship to stakeholders and the functions and influence of whom she considers to be the real stakeholders of the problem. In describing “we’re not on the town council or county government, so we’re kind of a periphery,” Toni makes meaning around the other players who have an influence on the problem she is working on in the EEP. This corresponds to a relationship between the project deliverable and the other stakeholders illustrated in the model for project-based engagement and suggests an additional stakeholder constituent on the SOFAR Model (Bringle et al., 2012): local governments. While this finding is a function of the nature of this state-funded partnering organization and the problem being addressed within the EEP, this finding illustrates that the community partner made meaning around the partnerships and interactions between those partners represented by the outer circle of the model for project-based community engagement developed by Leidig & Oakes (2021).

5.2.7 Pragmatic Finding 7: Community partners’ benefits and outputs associated with participation in the EEP

Community partners in this study described pragmatic benefits associated with their participation within the EEP including networking with students to expand their bandwidth and accomplishing tasks associated with progression with the project. In describing that having connections expanded her capacity, Yasmine suggests another example of the capacitive building motive, in which organizations see participation in programs as a means of expanding their capacity (Bell & Carson. 2009). Further, Toni’s meaning around the work toward the project deliverable as a benefit in and of itself suggests that the process may add value to the stakeholders or problem space and further extend the connections between the process and the project deliverable centered in within the Leidig & Oakes model for project-based engagement (2021).

5.3 Semantic Meaning

Community partners in this study made semantic meaning in their descriptions of thinking and communication within the context of the engineering engagement program. This included things like the variety of modes of communication used by community partners to communicate

with students, the community partners' perspective on student thinking as well as the community partners' ways of thinking through solutions within the EEP.

5.3.1 Semantic Finding 1: Community partners communicate with the students within the EEP in a variety of modes

Both Yasmine and Toni make meaning around ways of communicating with in the EEP. Yasmine describes how the level of detail she communicates with is affected by the type of interaction she is having with the student: "In our actual meetings I can give a little more detail, but most of our communications are emails, so I have to be really clear about my feedback to ensure students aren't confused." Toni, on the other hand, describes how using a video of the site location served as a form of communication:

"It seems like showing them the video of the site worked better than all the describing I had been doing (...) after I showed them the videos (...) I feel like I should have started our discussions there."

Both Toni and Yasmine's meaning around modes of communicating suggest a relationship between language and communication a part of a process of engaging in the EEP that echoes the Vygostian roots of semantic meaning within Zittoun and Brinkman's framework for meaning-making (2012).

5.3.2 Semantic Finding 2: Community partner perspective of student thinking

Both Tiffany and Yasmine made meaning around the the student's ways of thinking. Tiffany made meaning around the limitations of student thinking within the EEP in both her pre and post interview. In her pre interview, Tiffany made meaning related to the student's ability to engage with the reality of the context they were addressing in the EEP because it fell outside of their experience as upper-class students. Tiffany's comments echo the "outsider dynamic" described by Thompson and Jesik in which can result from project-based approaches in which the students are removed from the everyday reality of the project they are working on. In her post interview, Tiffany makes meaning around the lack of innovation in student solutions when she comments "I guess I was just hoping that the students would be or think more inventively, you know? Like I was really hoping they would think of something we haven't done or thought about

before.” These comments suggest that Tiffany was looking for new perspectives and energy as outlined as a benefit for community partners in Macquarie University’s PACE Program study (Lloyd et al. 2011) and are echoed by Yasmine who also comments in her post interview that the students she worked with needed to: “push the boundaries of thinking out of the box.” Though these comments differ from Tiffany’s comments in the pre interview related to the outsider dynamic of student thinking, all of these meanings suggest that student thinking can pose a barrier for student work within the EEP.

5.3.3 Semantic Finding 3: Community partner ways of thinking through solutions

In her post-interview, Tiffany provides a possible explanation for the difference between student thinking within the EEP and hers. She describes: “(...) My job is to think through if that idea would be good or would mean me and all of my staff spending several days and evenings to make it work. So like, thinking through the idea, about what it would be like to scale it out and weigh out the pros and cons and then communicating that back to the students.” Here, Tiffany describes considering the implementation of student ideas over time and suggests that a part of her experience within the EEP involves the communication of those considerations within the context of the deliverables. This finding echoes Long-Term Motives for the Sector and the Organization outlined by Bell and Carson in which community organizations worry about presence or absence of long-term support for their initiatives.

5.4 Existential Meaning

Community partners in this study made Existential meaning in their descriptions of how participation in the EEP contributed to the larger context of stakeholders and the larger trajectory of student development.

5.4.1 Existential Finding 1: Community partners’ speculation about value of EEP to the larger context of stakeholders

Yasmine describes the implications of student work on the deaf community in general (her stakeholder group) when she comments: “Anything I can get involved in that moves the needle for the deaf community is worth my time.” Here, Yasmine describes her motivation to participate in

the EEP in terms of fulfilling the mission objectives of her organization to “ actually reach the world of deaf people” which echoes a motivation Basinger and Bartholomew describe as “Fulfill service-learning related mission objectives” (2006). This suggests that Yasmine has made meaning of the connection between her experience of the EEP and the larger mission of her organization.

5.4.2 Existential Finding 2: Community partners’ speculation about how this EEP contributes to larger student trajectory

Both Yasmine and Toni made meaning around the impact of participation on the larger journey of the student’s development. Toni recalled an instance in which a student went from being shocked to potentially empowered as a function of getting to meet with a engineering professor for the project they worked on in the EEP. More abstractly, Yasmine makes similar describes the “power” having participated in the EEP and comments: “I think this is great experience for students to have... after this they will know that they can tackle any problem that matters to them.” Here, Yasmine speculates around the transferability of the student experience in the EEP to their future problems solving. Thee meaning on behalf of Yasmine and Tiffany suggests that community partners are aware of and potentially interested in the ways this EEP contributes to student development.

5.5 Intersections within Theoretical Framework

The following sections reflect more nuanced examples of connections between the pragmatic and semantic elements of the meanings from participant voice in this study. Meanings within this overlap were associated with the following themes: Communication that Initiates Action and Learning by Doing + Doing for Thinking. The following sections unpack community partner meaning related to those themes.

5.5.1 Intersections within Theoretical Framework Finding 1: Communication that Initiates Action

Community partners in this study made meaning of student communication (semantic) being used to further action (pragmatic) around the function of communication (semantic) within the EEP towards generating direction and action (pragmatic).

These meanings suggest that communication itself has a direct impact on the deliverables within engineering engagement programs and may suggest an additional node between the constituents of the program and the project deliverable that represents how communication may mediate or initiate action toward project deliverables as outlined in the model for project-based community engagement developed by Leidig & Oakes (2021). Additionally, this intersecting finding suggests potential expansion of the theoretical framework used to unpack meaning made by community partners within this study. Though communication was interpreted as a semantic endeavor within the context of this study, findings indicate the pragmatic nature of communication as something that potentially results in action. Within the context of engineering engagement programs, this intersection reflects the larger role communication plays in mitigating direction of work and thinking.

5.5.2 Intersections within Theoretical Framework Finding 2: Learning by Doing + Doing for Thinking

Community partners in this study made meanings that overlapped as semantic and pragmatic by describing elements of themselves learning (semantic) by engaging in the EEP (pragmatic) as well as by describing connections between student ways of thinking (semantic) and how they were then able to engage with the work of the EEP (pragmatic). These meanings suggest that community partners learn as a function of engagement in the EEP which echoes Thompson and Jesiek's findings which states that community partners were motivated by student learning objectives and personal benefits including personal enjoyment and professional enhancement (2014). This suggests that the semantic and pragmatic experience of the EEP generated a learning experience for community partners in this study. Though experiential learning is a well-founded tenant of engineering engagement programs for student participants, the results of this study suggest community partners also undergo a process of situated learning as a result of participation in their respective programs. Though scholars have studied the application of John Dewey's theories of experiential learning and Kolb's models for how this learning happens, these theories have thus far been explored in relation to student learning and development (Ord, 2012). While there typically do not exist learning objectives for community partners of engineering engagement programs, the intersections between pragmatic and semantic meanings made by community

partners within this study suggests a potential to more deeply investigate the learning of community partners, including what the potential benefits associated with that learning are for the partners, their work within their organization or even the engagement program itself.

5.6 Implications

From the interpretations above, conclusions and implications can be drawn toward answering the research “what meanings do community partners make of their experiences in engineering engagement programs.” The following sections unpack the conclusions and implications to be drawn from findings and interpretations associated with each component of the theoretical framework and its overlaps.

5.6.1 From Pragmatic Meanings

Pragmatic meaning made by community partners in this study suggest a need for a more nuanced investigation into the role’s community partners play in engineering engagement settings. From this study, pragmatic meanings made by community partners suggest that they mitigate engagement between their organizations and the students they work with and implies a need for augmentation of the existing SOFAR framework (Bringle et al., 2012) suggests that the community partner experience within engagement spaces exist as an extension of the community organization. Figure 5.1 presents an edited augmented SOFAR framework established by Bringle et. al (2012) by centering the community partner at the core of the relationships between the five constituents in the SOFAR Model. Overlayed atop the 10 dyadic relationships established in the original SOFAR Model are five additional relationships community partners may need to navigate within engagement settings. First, while community partners may believe in and align with the mission and functionality of the organization they represent, partners in this study often communicated and negotiated between the community organization and the engagement program. Second, though the community organizations and university constituents may have their relationships with the community residents, community partners in this study had their conceptions and relationships with those stakeholders. As it relates to additional relationships 3-5, Community partners also described pre-existing relationships with administrators, faculty or students that motivate or catalyze their participation in the engagement program (source). These relationships

continue to evolve and are negotiated by the community partner throughout the engagement program.

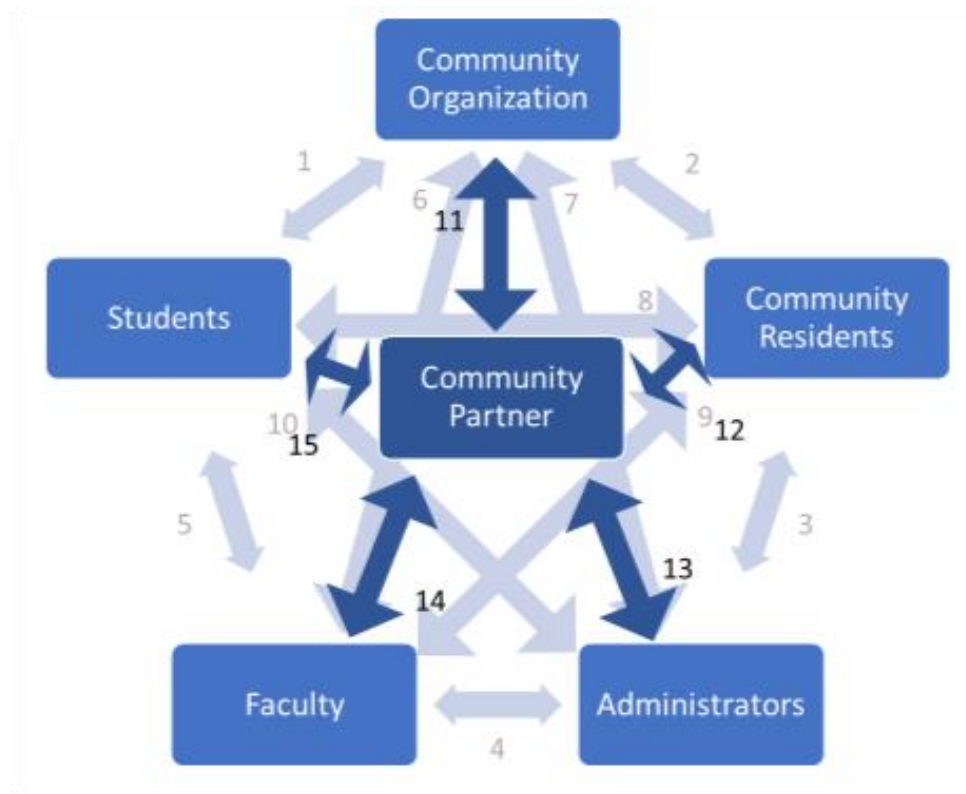


Figure 5.1 Conceptual framework for Community Partners in Engagement Programs

While the framework presented in Figure 5.1 is based on the investigation of relationships, this framework may have useful implications for investigating meaning making of community partners in engagement programs as it defines a potential ecosystem in which community partners can construct that meaning.

Community partners in this study also made pragmatic meaning associated with the student contributions to EEPs as well as the role their organization played in complicated those contributions. This suggests a potential need to evaluate and align organizational needs with the skillsets of the students and a potential to expand the model for project-based engagement established by Leidig & Oakes to include the community partner's organization as a potential stakeholder group (2021). Additionally, this suggests the potential to explore relationships between

community partners if these settings and the students and partnering organization – as visualized by relationships 11 and 15 on Figure 5.X.

Additionally, community partners in this study made pragmatic meaning around the benefits and outputs of participation in the EEP for the students. Though existing literature places responsibility to assess student contributions on faculty associated with these spaces, community partners in this study made meaning around the pragmatic benefits of student engagement in the EEP, which may have implications for a fostering space for community partners to offer deeper levels of feedback as it relates to student learning.

Lastly, pragmatic meaning made by community partners in this study has implications for the addition of local stakeholders into the model for project-based engagement established by Leidig & Oakes as well as investigation into the role the process associated with the EEP has on mitigating the project deliverables to those involved.

5.6.2 From Semantic Meanings

Semantic meanings made by community partners in this study implicate that communication is a means of learning for the community partner and a means of facilitating learning for the students involved in the EEP. Furthermore, semantic meanings made by community partners suggests that community partners consider a long-term perspective on their work in the EEP which creates problems when students' thinking not innovative relative to the work that has already been done. Semantic meanings made by community partners in this study implicate a potential need to investigate communication and thinking between students and community partners in to better support the experience of the community partner (and potentially, the learning of the students).

5.6.3 From Existential Meanings

Extending upon the component of the SOFAR Model (Bringle et al., 2012) representing community residents, community partners in this study made existential meaning around the connection between the work done in the EEP and the larger mission/stakeholder group served by their organizations. Furthermore, community partners in this study made connections between participation in the EEP and larger student journeys of development. This suggests that community

partners may be motivated by mission-focused work and potentially student development which implies an opportunity to investigate community conceptions of larger social impacts of their work more deeply and their conceptions of students' larger trajectories.

5.6.4 From Overlaps

Meaning made by community partners in this study that represented semantic and pragmatic overlaps of the theoretical framework suggested implications for consideration of communication as its own process within the EEP as it contributes to initiating action and learning within the EEP. Of particular interest is the fact that community partners in this study described learning as a function of having participated in the EEP, despite the lack of existing literature on their learning. This implicates an opportunity to more deeply investigate how participation in engineering engagement spaces contributes to community partner learning. Such investigations could provide further insight into community partner experiences of EEPs and begin addressing the gap in the literature associated with community partners in research on those spaces.

5.6.5 Beyond Engineering Engagement Programs

The scope of this study was to investigate the meaning made by community partners related to their experiences in engineering engagement programs. The motivation behind this scope, as described in chapter one, was to develop a richer picture of the perspectives and experiences of the most local stakeholders to these programs – community partners. Though the scope of this study resulted in the aforementioned findings and implications, there were elements of community partner perspectives that were not included within the analysis of this study because they were beyond the scope of the engagement program the participant was involved in. While this scope allowed the analysis of this study to remain focused on community partner voice and meaning related to the engineering engagement program, the elements of community partner voice that fell beyond the scope of this study have potential implications for the way community partner perspectives are investigated.

Though future studies would be needed to explore the elements of community partner voice that fell beyond the scope of this study, each community partner described elements of their prior work and skillsets that are not represented in this study. However, the research question that guides

this study focuses solely on meaning made related to the engineering engagement programs which precludes analysis of meaning made around and beyond the scope of the engineering engagement program. This missing data implies a potential need to reframe inquiry into the experiences and perspectives of community partners to make space for components of those perspectives and experiences that may not directly relate to the engagement programs they are involved in. Reframing inquiries of these perspectives could provide more insight into the mental models and motivations of community partners which in turn could translate to deeper and more informed engagement practices for community partners within these programs.

5.6.6 Implications for Literature

Findings from this study provide useful implications for existing research on community partners in engineering engagement programs. Community partner reflections on their experiences as a part of this study supported existing trends in research that tend to prioritize student outcomes. Despite the scope of this study being centered around community partners, community partners themselves made meaning primarily related to projected student outcomes. Furthermore, community partner meanings uncovered in this study reflected each of Bell and Carson (2009)'s motivation types in service-learning. All three partners described long-term and capacity-building motives related to extending the lifecycles of their work and expanding the reach and depth of their existing work. Additionally, all three partners described altruistic motivation related to their stakeholders and the ways their work in the engineering engagement program could improve the lives of immediate and long-term stakeholders. Finally, both Toni and Yasmine described motivations related to furthering their higher education relationship by making meaning around the ways involvement in their engineering engagement programs extended their networks and allowed them to meet and interact with students and university partners.

In terms of Macquarie University's PACE (Professional and Community Engagement) (Lloyd et al. 2011, 2015), community partners in this study made meaning around the following benefits:

- Completion of projects/additional human resources
- New perspectives and energy

- Capacity development (individual and organizational)
- Enhanced organizational profile
- Community benefit
- Improved productivity
- Personal satisfaction in contribution to student learning

The only benefit from the PACE framework *not* addressed by community partners in this study was “networking with other partners” which was likely due to the nature of the particular engineering engagement programs that the partners in this study were involved in. While community partners in this study described networking with students, partners did not make any meaning around other community partners in their respective engagement programs. Though the interview protocol asked community partners about interactions with other community partners, each participant in this study described *not* interacting with other partners associated with the engagement program. This lack of finding may reflect the nature of the engagement program and could be further explored in future studies.

5.6.7 Implications for Existing Frameworks

Findings from this study suggest the need for a more nuanced investigation into the roles community partners play in engineering engagement settings. Findings from this study suggest that community partners make meaning of their experiences in engineering engagement program related to elements not completely represented by existing frameworks. The Model for Project–Based Community Engagement set forth by Leidig and Oakes (2021) and the SOFAR framework (Bringle et al., 2012) could be further elucidated to represent:

- local stakeholders (beneficiaries, decision makers, etc)
- Relationships and power dynamics
- Organizational needs versus skillsets of the students

- The role the design process
- Communication as its own node

The following discussion describes how each of these could be further elucidated.

Community partners in this study made meaning around the impacts of local stakeholders not directly present in their engineering engagement programs. Though the SOFAR Framework includes “community residents” and the Leidig and Oakes Model include a node called “other stakeholders,” community partner voice from this study suggest these nodes are experienced by the community partners as its own process of engagement and communication. This suggests a need to further elucidate how local stakeholders impact the engineering engagement space. These local stakeholders could include beneficiaries of projects/solutions as well as relevant boards and organizations that have influence on the context or decision making process that houses the community partner’s problem.

Relationships and power dynamics surfaced as contributing factors to community partner experiences within this study. However, existing frameworks related to engineering engagement spaces represent relational dynamics visually (with arrows) but do not more deeply explore the power dynamics potentially latent within those relationships. As discussed in Chapter 1, engineering engagement spaces have the potential to be rife with social distance due to privileges associated with the presence of engineers and engineering mindsets. Thus, future studies could investigate the role that power dynamics play on relationship building within engineering engagement spaces.

In addition to relational power dynamics, community partners in this study also made meaning around the differences between the skillsets of the students they were working with and the needs of their organization. For most partners, this involved moderating expectations of student work and communicating organizational needs in a particular way so that student work would address the nuances of the organization’s needs. This translation on behalf of community partners suggests a potential need to further investigate the “community partner” node within the Leidig and Oakes model and the “community organization” node in the SOFAR Model, as these nodes present their own unique influence on the community partner experience of engineering engagement programs.

Furthermore, both the SOFAR framework and the Leidig and Oakes Model attempt to represent the design process via arrows that indicate the flow of conversations and decisions. However, findings from this study suggest that the design process itself plays a role in the meaning community partners make of their experiences. Thus, the design process itself could be the focus of future research in this area with particular attention to how the structure of the design process within the engagement program affects the experiences of the community partners.

Additionally, communication as an activity and process surfaced as an important factor in community partner meaning making. However, existing models of these spaces imply that communication is an activity housed within the relational components as represented by the arrows in the frameworks themselves. However, given the prevalence of semantic and communicative components represented in the findings from this study, future models of engineering engagement programs may benefit from representing communication as its own consideration or dedicated layer within the framework so that decisions and power dynamics may be more clearly elucidated.

5.6.8 Expansion of Zittoun and Brinkman (2012) Framework

As discussed above, findings from this study also have useful implications for the expansion of the theoretical framework used to guide data analysis of this study. The presence of findings representing the intersections between pragmatic and semantic meanings suggest the need for deeper investigation of the theoretical and applied connections between thinking, communicating, and doing. Though analysis within this study framed thinking and communication as semantic factors during data analysis, themes and findings associated with these factors suggest a corroborative relationship between semantic and pragmatic factors in which these two elements of the framework are mutually dependent. The intersections of communication that initiates action and learning by doing indicate the need to further elucidate the symbiotic relationship between language and symbols (semantics) and doing (pragmatism). It is possible that communication itself could serve as an additional part of the theoretical framework that mitigates the presentation of pragmatic, semantic, and existential factors.

5.7 Limitations

Within the context of this study, a few mitigating factors arise as potential limitations of the insights generated from this study. First, though the chosen methodology of a general qualitative research study supports the interpretive nature of the research question, a case study analysis of participant experience in engineering engagement programs may have yielded more data collection about the nature and structure of the engagement programs and provided a means by which to more accurately compare meaning made by various community partners. Additionally, the use of audio recording and transcripts as the primary data source for this study, limited the role body language and context could play in data analysis and may have limited the extent to which meanings made by community partners were interpreted.

The analysis presented in this study reflects the interpretation of a sole researcher with articulated pre-existing relationships within the settings of this study. While the goal of this positionality was to increase the community partner's ability to relate to the researcher, this potential for that familiarity to bias interpretations could have been mitigated with peer debriefs in which partners are given the chance to agree with, disagree with or augment findings and themes. Additionally, the use of the theoretical framework was limited to data analysis with the goals of providing structure to the illustration of meanings made by community partners. While this was helpful during analysis, the philosophical comprehensibility of the framework resulted in the use of subjective interpretation of the differences between pragmatism, semantics, and existentialism that could have been more deeply elucidated by community partners themselves, instead of the researcher. Future studies should consider using the theoretical framework to inform the interview protocol and probing questions to create more alignment between community partner experiences and meanings made about those experiences.

Beyond the context of this study, the research question itself reflected the professional positionality of the researcher. Though the goal of the research question was to provide insights to better prioritize the voice and experience of community partners, framing the research question around the engineering engagement program that partners participated in limited the scope of the data that could be analyzed. In this sense, conducting this study from the perspective of an engineering educator resulted in prioritizing the engineering engagement programs within the research question which limited the ability of the data to speak to perspectives of community

partners that may not have been related to their engagement with engineers, but could have been relevant to their general worldview and the ways they navigate the problem at hand, the students, and/or their external stakeholders. Future inquiries may benefit from understanding community partner perspectives within and beyond these spaces including things like their personal and career trajectories, side jobs, and passions.

Investigations into community partner perspectives would also benefit from a wider variety of data types than collected within the scope of this study. Though interviews are useful to uncover participant perceptions, a more nuanced investigation into community partner perspectives may best be accomplished via a case study methodology in which multiple data types are used to create richer pictures of community partner perspectives in and around engineering engagement programs. Observations of interactions with students and analysis of artifacts and documents associated with the engineering engagement programs may provide deeper insight into community partner worldviews and perspectives of their experiences.

5.8 Conclusions and Future Work

The purpose of this study was to answer the question: what meanings do community partners make of their experience in engineering engagement programs? After conducting and analyzing interviews with three community partners from three different engineering engagement programs, this study presented several themes associated with pragmatic, semantic, and existential meanings made by community partners within this study. Further, this study presented findings associated with overlaps between those meaning types and discussed connections between those findings and existing literature on community partner perspectives of engineering engagement programs. Findings from this study suggest implications for expansions of existing frameworks of constituents and components of engineering engagement programs, as well as potential opportunities to engage community partners more deeply in the assessment of student contributions and trajectories as a function of participation in EEPs.

Additionally, findings from this study suggest an opportunity to investigate the communication and thinking between students and community partners to better support the experience of the community partner (and potentially, the learning of the students). Lastly, findings from this study suggest that participation in EEPs presents the opportunity for community partners

to learn by doing which can be more deeply investigated to begin addressing the gap in the literature associated with community partners in research on engineering engagement spaces.

Limitations to this study related to data collection and the scope of the research question suggest a need for engineering educators and researchers to investigate community partner perspectives beyond the scope of their engagement with engineering students. As we continue to explore best practices for engineering engagement programs, engineering educators will need to be intentional and critical around bracketing their own positionalities and curricular priorities in order to research studies and that investigate engagement programs that “produce solutions that meet specified needs with consideration of public health, safety, and welfare” and to “consider the impact of engineering solutions in global, economic, environmental and societal contexts (ABET, 2019).” The quality of the engineers we put out into the world and the ability of those engineers to consider the implications of their work and build holistic relationships with stakeholders will be a function of the intentionality of their educators to create learning experiences that allow them to witness and practice this sort of engagement. While there has been a recent push to consider the “hidden” or implicit aims of the curriculum (Villanueva, 2018), this study suggests a need to review and revise the curriculum and practice associated with engagement programs as well. Extending beyond and through the goal of “doing no harm,” engineering educators have the responsibility to learn the contexts and perspectives of their stakeholders to understand how harm may manifest or be avoided. Even more so, we should consider how engineering engagement programs can be humanizing experiences for stakeholders including community partners, such that their experience and learning is just as much a priority as our engineering students’.

APPENDIX: INTERVIEW PROTOCOL

Early Experience

So how did you first hear about this project? What made you get involved?
How would you describe the students you are working with?
Do you know their age/discipline?
How often will you be meeting with the students you are working with?
How would you describe the problem you will be working on and its usefulness to your work/experience?
What are you hoping to get out of this project?
What do you expect it to be like?
What do you expect from engineers/designers?
What do you expect from other community partners?
What do you expect from other key players?

Mid Experience

How would you describe the problem you will be working on and its usefulness to your work/experience?
Tell me about how your meetings with the students usually go? How often have you met?
Do you interact with the students outside of your meetings? How would you describe those interactions?
What has been your favorite part of the experience for you thus far?
Can you describe a way that being involved in this experience has impacted you?
Can you describe a way that being involved in this experience has impacted problem you came here to address?
How would you describe your relationship with the engineers/designers you worked with? with the other community partners? with the other key players?
Do you recall being uncomfortable at any point?
If you could change anything about your experience, what would you change?

Post Experience

How would you describe the problem you will be working on and its usefulness to your work/experience?
What were you hoping to get out of this project?
What was your favorite part of the experience for you thus far?
Can you describe a way that being involved in this experience has impacted you?
Can you describe a way that being involved in this experience has impacted problem you came here to address?
How would you describe your relationship with the engineers/designers you worked with? with the other community partners? with the other key players?
Is there anything you hoped to see come out of this project but didn't?
What surprised you about your time in this experience?
Do you recall being uncomfortable at any point?
If you could change anything about your experience, what would you change?

Since the experience, what stands out in your memory about your time there?

Describe what you learned during this experience

Do you think you would do something like this again? Why or why not?

Would you recommend an experience like this to other folks in your community? Why or why not? If so, how would you describe the experience?

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