

Engagement in Practice: Community Engaged Scholarship to Address Local Food Insecurity

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Abstract

Ohio's Miami Valley was severely impacted by the recent economic crisis. As a result, more than 18% of households in Dayton, OH currently experience food insecurity. Last year, our local food bank partnered with more than 100 community agencies to distribute 9.8 million pounds of food to over 70,000 residents. In this case study, the author's collaborative partnership with the local food bank serves as a catalyst for the development of a cohesive, integrated teaching and scholarship program focused on community engagement. Several research and capstone projects aimed at improving efficiency and reducing operational costs at the food bank are summarized. Then, opportunities for expanding the scope and impact of the research agenda are discussed. Specifically, these opportunities focus on interdisciplinary collaborations centered on the use of sustainable urban agriculture as a means to increase access to fresh produce within the emergency food network, improve health outcomes for socially disadvantaged people, revitalize neighborhoods, and alleviate urban poverty. Finally, plans to incorporate formal assessment and reflective activities related to community engaged learning are presented.

1. Partnership Development

The University of Dayton's heritage focuses on building community, educating the whole person, and promoting social justice. As scholars in such a community, we are called to address critical, community-identified needs through community engaged scholarship. At the University of Dayton, the Fitz Center provides students, faculty, and community partners with resources to not only initiate and develop collaborations, but also develop and assess innovative community-engaged curriculum [1]. The Fitz Center hosts a variety of programs for initiating contact between faculty and community partners including open houses, monthly breakfasts, and bus tours. The monthly breakfasts and bus tours are generally themed – that is they focus on a specific community issue such as infant mortality, homelessness, food insecurity, etc. My partnership with The Foodbank, Inc. began on one of these bus tours. The purpose of this *Engagement In Practice* paper is to describe the development of a community-engaged scholarship program through a sustained partnership with The Foodbank, Inc..

Food banks serve as central warehouses that procure, collect, and distribute food to partner agencies including food pantries, community kitchens, shelters, etc. On a Fitz Center bus tour, I learned that The Foodbank serves over 70,000 residents by distributing food to more than 100 community partners. Last year, The Foodbank distributed nearly 10 million pounds of food (including more than 2 million pounds of fresh produce). The Foodbank's warehouse was designed by Toyota and follows best practices with respect to facility layout and facility logistics. Specifically, items move through the warehouse from back-to-front and layouts for repacking operations are optimized. Thus, the operations within the warehouse already operate at very high levels of efficiency. Furthermore, the staff at The Foodbank embrace a culture of continuous improvement. When they learned of my background in applied operations research, they were eager to collaborate on projects to improve the efficiency of operations and reduce

expenses. We immediately identified two projects related to vehicle routing which will be discussed in the next section.

In follow up discussions with food bank personnel, I also learned that The Foodbank wishes to support neighborhood revitalization efforts and improve access to fresh produce by constructing a sustainable urban garden. The Foodbank's warehouse is located in a blighted urban neighborhood, and industrial waste has contaminated the property's soil. Therefore, all produce must be grown above ground. In summer 2016, proof of concept for the garden was demonstrated. Approximately 50 raised beds, built on an unused asphalt parking lot, were used to grow a variety of crops that were distributed through The Foodbank's free market and mobile food pantries. Many sustainable practices were implemented, including the use of low carbon emission cinder blocks to build the beds, the installation of a pollinator garden, and the creation of a composting site. This summer, the garden will be expanded. The details of both completed and upcoming projects related to sustainable urban agriculture are also provided below.

The remainder of this paper is organized as follows. In section 2, four recent projects are summarized using two different frameworks for conducting research with community partners. The first framework provides a more traditional approach in which researchers work *for* community partners, and the second approach utilizes a community-engaged methodology that focuses on working *with* our partners. The first three projects were developed using the traditional framework, while the fourth utilizes the community-engaged framework. In section 3, additional opportunities for incorporating assessments related to community-engaged learning are discussed.

2. Project Design and Execution

The first three projects described in this section follow a more traditional research methodology as shown below in Figure 1 [2]. With this approach, university partners tend to work *for* community partners. Following this methodology, my students, colleagues, and I first identified interesting problems and research questions in conjunction with The Foodbank staff. Then, the research team began designing and conducting the research. We worked closely with our partners at The Foodbank to ensure we had the most accurate data and that our solution approaches were in line with The Foodbank's mission to distribute food to people in our area. As my partnership with The Foodbank has grown, our projects are developed using a more community-engaged methodology as shown in Figure 2 [2]. Using this methodology, we still work closely with our partners to develop our research questions, but now, our projects focus more on the co-creation of knowledge as well as social and cultural change.

Thus far, students have either participated in the projects as part of a summer research experience (community gardens) or through an Engineering Management master's capstone project (donation collection and audit scheduling). To successfully complete the capstone project, students are expected to identify a significant problem, locate the necessary data and information to solve the problem, and utilize the proper quantitative tools to develop and implement a solution. Students submit a final report that is evaluated on problem significance, review of the literature, data collection and analysis, methodology, and results. Plans to incorporate assessment relative to community engaged outcomes are discussed in section 3.

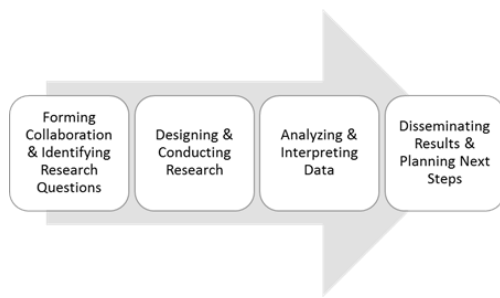


Figure 1. Community-Focused Scholarship



Figure 2. Community-Engaged Scholarship

2.1 Improving Operational Efficiency

As mentioned previously, earlier projects focused on improving efficiency and reducing operational costs. Transportation related costs are among the largest of The Foodbank's operating expenses, and the research team identified several different vehicle routing projects. The details for two recent vehicle routing projects are provided below. The first project develops routes for collecting donations from local retailers, and the second project focuses on routing for compliance audits.

2.1.1 Donation Collection

Identifying Research Questions – At the time of this study, five trucks collect donations from more than 60 local retailers, and these retailers provide donations between one and five days each week. Some retailers enforce dock time restrictions. Therefore, The Foodbank must decide which trucks to send to each location on each day. To complicate routing decisions, two of the five trucks operated by The Foodbank were donated from a large national retailer and are currently adorned with their corporate logo. Because of this, three other large retailers have requested that these two trucks not be used to collect donations from their stores.

Designing and Conducting Research – Optimizing the routing schedule for the full set of store locations was originally presented as a vehicle routing problem with time windows and incompatible loading constraints. Through a collaborative effort between researchers and food bank personnel, the truck drivers agreed to begin their routes one hour earlier (6:30 am local time) to eliminate the dock time restrictions; thus, simplifying the problem.

Analyzing & Interpreting Data – During the course of this study, our collaborators from The Foodbank provided an initial clustering of stores based on collection needs and loading constraints. This clustering resulted in 18 required routes (of the 25 routes available – 5 trucks times 5 days). This provided additional capacity for other programs such as deliveries to partner agencies and mobile food pantries. A traveling salesman problem was used to optimize the routing of the stores within the clusters. Optimal routing of the clusters resulted in a reduction of over 22% in the weekly total distance traveled. A local search heuristic was then used to improve the store clustering and resulted in an additional 7% improvement.

Disseminating Results & Planning Next Steps – This study was completed as part of a student’s capstone project, and the results were published and presented at the Industrial and Systems Engineering Research Conference [3].

2.1.2 Auditor Travel

Identifying Research Questions – In addition to the donations received from local business and citizens, The Foodbank also receives funding from state and federal agencies. For compliance purposes, each of The Foodbank’s 100+ partner agencies must receive an annual on-site audit. In this work, we examine how to effectively schedule on-site audits while satisfying the differing stakeholders in the food bank system.

Designing and Conducting Research – We aim to improve the agency audit schedule in a way that accommodates multiple stakeholders and addresses several nuances specific to the non-profit, compliance-based application. We use a multi-criteria approach for developing auditing schedules that (i) reduce the number of days the auditor must conduct agency audits; (ii) reduce the cost of the agency audits (i.e., reduce distance traveled); and (iii) accommodate agency staff and community patrons by scheduling audits during *preferred times* whenever possible. Preferred times are those that do not interfere with an agency’s ability to serve their clients.

Analyzing and Interpreting Data – We formally define The Food bank Compliance Problem [4] via a multi-criteria, mixed-integer program. We evaluate both exact and heuristics solutions. Our results indicate the total number of miles required to complete the agency audits can be reduced by 20-30%, and the number of days the auditor must be out of the office can be reduced by 40-50%.

Disseminating Results & Planning Next Steps – This work has been presented at various INFORMS meetings and a manuscript is currently under review at a journal [4]. Also under review is a related paper detailing the development of a Spatial Decision Support System (SDSS) for assisting the auditor in making real-time compliance audit scheduling decisions. This SDSS was created as part of a student capstone project and is currently in use at The Foodbank [5].

2.2 Increasing Access to Fresh Produce

To address the nutritional needs of targeted, at-risk populations (such as children, the elderly, and individuals with special dietary needs), The Foodbank has worked diligently over the past several years to increase the amount of fresh fruit and vegetables distributed to its partner agencies. Recently, they have expanded their outreach efforts through the construction of a community garden. The details for recent community garden projects are provided below.

2.2.1 Community Garden

Identifying Research Questions – In summer 2016, The Foodbank created a community garden utilizing best practices in sustainable urban agriculture. The research team utilized a systems engineering approach to focus on two areas related to garden expansion: garden layout and produce production planning.

Designing and Conducting Research – The community garden serves a variety of purposes including community beautification, educational outreach, and produce production. Thus, various garden layouts were designed and developed with each of the community stakeholders in mind. In addition, the research team developed and deployed a survey to identify the types of fruits and vegetables The Foodbank’s clients would eat. The research team conducted personal interviews with more than 140 clients at 7 mobile food pantries.

Analyzing and Interpreting Data – Multiple garden designs were presented to The Foodbank, and a new layout will be chosen and implemented before the next growing season. From the survey instrument, we learned that 88.6% of clients report eating out (including fast food) 0-4 meals per week, and 56% of surveyed clients prepare 9 or more meals per week at home. Most clients have access to cooking ware and pantry staples and are willing to at least try most of the fruits and vegetables included in the survey. We note that recipes should be included when distributing greens (mustard & collard) okra, radishes, and herbs.

Disseminating Results & Planning Next Steps – This work has been presented at local INFORMS meetings and will be presented at the University’s Undergraduate Research Symposium. Plans are currently underway to expand both the size of the garden as well as community outreach programs.

2.2.2 Sustainable Urban Agriculture

With upcoming projects related to sustainable urban agriculture, the research team is moving from community-focused to community-engaged scholarship. Thus, this project is described using the framework from Figure 2. We have expanded our collaboration to include a local alternative high school as well as researchers from sustainability and dietetics.

Community Driven Priorities – Each community partner has a specific mission. The mission of The Foodbank is to relieve hunger in our area through the acquisition and distribution of food. The alternative high school’s mission is to provide at-risk students with the tools needed to achieve educational, future career, and life successes. Thus, it is imperative to ensure that community-engaged projects are addressing the specific missions of our partners.

Shared Equitable Decision Making – The partnership between The Foodbank and the alternative high school began when the following question was proposed to the students: “How can The Foodbank produce more food in its community garden while also further establishing a culture of health and nutrition among constituents in our community?” In response to this question, the high school students have designed an amphitheater and aquaponics system that will produce vegetables and fish for The Foodbank’s hunger relief programs while also serving as a community asset, nutrition, and STEM educational piece.

Analyzing and Interpreting Data – Mixed-methods approaches will be utilized to assess both the educational and community/health related outcomes related to participation in the aquaponics program. In addition to quantitative metrics (such as pounds of food produced), the research team plans to use *photovoice*, which combines photography with grassroots social action, to

better understand changes in students attitudes, behaviors, and efficacy related to healthy eating, sustainable agriculture, and community engagement.

Disseminating Results & Planning Next Steps – As the project(s) progress, the research team will use various medium to disseminate results to a wide audience. Thus, we will target not only peer reviewed publications, but other, more publicly accessible avenues such as social media, newsletters, community meetings, etc.

3. Assessment of Learning and Engagement

The majority of efforts to date have been focused on developing partnerships, expanding collaborations, and executing projects. This early work, focused on improving operations, was easily quantifiable as most project results could be measured in dollars or time. For this scholarship program to become truly “community-engaged”, more effort should focus on setting clear community engagement and learning goals with students as well as incorporating critical reflection into the projects to generate and deepen learning [6]. With community-engaged scholarship, it is imperative for project goals to balance the needs of the community partners while providing meaningful experiences for students. Additionally, the students must engage in critical reflection that includes articulating linkages between course concepts and community engagement, addressing power and privilege, analyzing one’s role as a justice minded citizen, and examining new perspectives and changed views. A very valuable resource in formalizing this type of engagement and reflection is the Community Engaged Learning Partnership Agreement form provided by the Fitz Center. This form guides the student, faculty member, and community partner in establishing a collaborative, reciprocal relationship where all are positioned to be co-learners, co-educators, and co-generators of knowledge.

References

1. Fitz Center for Leadership in Community: University of Dayton, OH (website)
<https://www.udayton.edu/artssciences/ctr/fitz/>
2. Post, M.A., E. Ward, N.V. Longo, and J. Stamarsh, eds (2016), “Publicly Engaged Scholars.” Stylus Publishing, Sierling, VA.
3. Crawford, G. and Author 1 (2016), “Reducing Operational Costs for a Hunger Relief Charity through Vehicle Routing.” Proceedings of the Industrial and Systems Engineering Research Conference, Anaheim, CA.
4. Author 1. and S.G. Nurre (2016), “A Multi-Criteria Vehicle Routing Approach to Improve the Compliance Audit Schedule for Food Banks,” under review at a journal.
5. Aboujaoude, M. and Author 1 (2017) “A Decision Support Tool for Scheduling Food Bank Compliance Audits” under review at a conference.
6. F. Center website resource “Principles and Good Practice for Combining Community Engagement and Learning” (to be updated after blind review)
7. Fitz Center for Leadership in Community: University of Dayton, OH (website)
“Community Engaged Learning Partnership Agreement”
https://udayton.edu/artssciences/ctr/fitz/community_engaged_learning/img-docs/6-cel-learning-agreement.pdf