2020

EPICS Urban Farming: Bringing Sustainable Fresh Food to Gary, Indiana

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Recommended Citation

Klein, Elijah (2020) "EPICS Urban Farming: Bringing Sustainable Fresh Food to Gary, Indiana," *Purdue Journal of Service-Learning and International Engagement*: Vol. 7 : Iss. 1 , Article 22.

DOI: 10.5703/1288284317247

Available at: <https://docs.lib.purdue.edu/pjsl/vol7/iss1/22>

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to seeing the volunteers each week and will be disappointed when volunteers miss weeks. Getting to know the children and developing relationships with them is incredibly rewarding. Volunteering at the Hub is a great opportunity for any Purdue student who wants to give back to the Lafayette community and unwind by spending just a couple hours each week coloring, reading, playing basketball, tag, video games, and just spending time with a large group of energetic children. Volunteering at homework time also provides an opportunity for students studying education, social work, or health professions to practice their skills working with kids by motivating them to focus on schoolwork. Purdue students with a STEM background may consider sharing their technical skills with the new First Lego League robotics as well. Student volunteers have been brought to the Hub through EPICS projects, academic clubs, and Greek life. The Hartford Hub's website provides a link for signing up as well as training videos and guidelines for volunteers.

For students who want to incorporate volunteering at the Hartford Hub into their studies, there are Dr. Ware's classes and research group. The HONR 29900: Urban Youth Advocacy and HONR 39900: Well-Being courses focus on increasing the interactions between Purdue students and the Lafayette community. Students learn about defining and researching well-being while directly applying that knowledge in a project with a community partner, one of which has been the FCDC's Hartford Hub. Students practice skills such as gathering data through surveys, interviews, and direct observation and recording it in a research log. They then apply methods of qualitative data analysis to help community partners find solutions. HONR classes are available to all Purdue students with a GPA of at least 3.00, and the Ware research group is open to all students as well. The group works to help empower the urban poor populations of Lafayette to improve their quality of life and well-being using similar research methods and working with community partners such as FCDC and the Hartford Hub.

Takeaways

The Hartford Hub is a community center that has been effective at enriching the lives of Lincoln Neighborhood residents and volunteers that help run the programs. Purdue students have volunteered in different ways, many through Dr. Ware's research group and courses, and there are still many opportunities for students to get involved. Purdue students looking for opportunities to volunteer should consider the Hartford Hub to develop their skills working with children in a constructive and

fun environment. Additionally, Dr. Ware's research group and honors courses can give students valuable experience in using qualitative and participatory action research to better understand and impact our communities. Volunteering at the Hub gives students context for their own community as a part of the Greater Lafayette area, encouraging them to take ownership of their time spent here. Constantly surrounded by fellow college students, we can forget how valuable our time and friendship can be to others. By volunteering locally at the Hartford Hub, students can diversify and enrich their Purdue experience by taking an opportunity to develop themselves and have fun developing relationships with their neighbors.

D'Aloia, M., & Young, N. (2020). A Purdue Community Partner: The Hartford Hub of Lower Lincoln. *Purdue Journal of Service-Learning and International Engagement*, 7, 135–138. <https://doi.org/10.5703/1288284317246>

EPICS Urban Farming: Bringing Sustainable, Fresh Food to Gary, Indiana

Elijah Klein (*First-Year Engineering*)

Student Author Bio Sketch

Elijah Klein is a freshman pursuing Computer Engineering at Purdue University. He intends to work in industry on laptop technology after graduation. He joined Engineering Projects in Community Service (EPICS) to gain career experience and has been a part of the Urban Farming team for a semester. In this article, he describes his experiences working to design a sustainable urban farming solution.

Introduction

The United States Department of Agriculture (USDA) tracks food access based on several factors including accessibility to sources of healthy food, family income, vehicle availability, average neighborhood income, and availability of public transportation. The reason they track these factors is to track indicators of food deserts, as well as to track the expansion or contraction of food deserts. Most of Gary, Indiana fits these factors at half mile and 10-mile tract measurements. This means that for 33% of the population, there is at minimum a half mile to the nearest grocery store in urban areas, and over 10 miles in rural areas (Food Access Research Atlas,

EPICS Urban Farming team.

2019). This distance, combined with other factors such as low income and lack of public transportation availability, make Gary, Indiana a food desert. To better gauge what the community believes are the top five issues that they are facing, Methodist Hospitals—a not-for-profit, community-based health care system, local to Northwest Indiana, and primarily centered in Lake County—performs a Community Health Needs Assessment (CHNA) every three years (Methodist Hospitals, 2019). The data from their 2019 CHNA shows that 46% of the residents interviewed from Gary place food access, affordability, and safety in the top five health issues they face in their day-to-day lives. This is more than one and a half times the results reported from the rest of Lake County at 29% (Methodist Hospitals, 2019). There is a clear need for a solution that provides healthy, accessible food to the community.

In response to this need, EPICs partnered with a local pastor in Gary, Indiana to develop innovative food solutions for those in need. As a result, community members will receive fresh food on a regular basis, and students learned how to use their educational backgrounds to solve community problems.

Community Partner Description

Pastor Marty Henderson is a master gardener at Peace Garden and Farms, as well as the senior pastor of Peace Baptist Church. Through the program Indiana Grown for Schools, Pastor Henderson has been bringing healthy,

fresh food from his farm to local schools. This promotes healthy eating within the younger generation and offers it so that there is no extra cost (Indiana Grown for Schools, 2020). Pastor Henderson also feeds 85 families in Gary through his restaurant, Sunday Dinner, which is based out of the community center shown in Figure 1.

Pastor Henderson also works with Work One to provide jobs to justice-served individuals at his restaurant, Sunday Dinner, and his farm. This offers them a next step to becoming a part of the community again and encourages growth in the community. While Pastor Henderson has a very wide reach within the community, he wants

Figure 1. Satellite view of the motor pool and community center. Original image provided by the Army Reserves.

to be able to provide more. The short growing season, urban environment, and extreme temperature fluctuations between seasons make it difficult to attain this goal throughout the year. Purdue students are helping find a way to achieve this goal in an urban area such as Gary.

EPICS Team Opportunities and Impact

Engineering Projects in Community Service (EPICS) is a service-learning program at Purdue that gives students professional work experience with a community partner to design a solution based on their needs. The EPICS Urban Farming team is comprised of 17 undergraduate students, partnered with Pastor Henderson, to help combat the issue of food deserts within Gary, Indiana. Over the past year, our team has been working to develop an urban farming option that is efficient, cost effective, easily maintained, and able to produce nutritious foods based on the needs of the community.

The original idea was to build rooftop gardens on the motor pool next to the community center as shown in Figure 1. Rooftop gardens would also allow the community to get involved with growing crops in the gardens. However, after further research, we decided against this option due to its not being a year-round solution, structural issues with the motor pool, and the amount of labor required to maintain such a project. The team then decided on an aquaponics system, which would allow crops to be grown year-round while being efficient and sustainable. There are plans to later expand the project with the rooftop gardens and add solar panels to supply the electricity for the aquaponics system. Even with a theoretical food production solution, the Urban Farming

team also needed to develop a method of getting the food to the community effectively.

Aquaponics System Implementation

There is only so much that Pastor Henderson can do with his current growing space as the harsh weather makes it impossible to grow outside in the winter. However, over the past year, we have developed an aquaponics system that will not only be able to produce fresh vegetables but also yield fish that can then be sold.

An important part of designing an aquaponics system is deciding on what the plants are grown in to best fit the user's needs. In our preliminary testing, we considered a biologic compound as a germinating material (Figure 2), which would have been a great choice for being ecologically friendly, but the adhesive substance in it would break down over time and clog the pipes. After several iterations of testing, we found that sand-based germinating material in tandem with fine filter containers suspended in water not only prevents pipes from being clogged but also yields better results in testing as shown (Figure 2).

Once we determined the germinating material for our design, the next step was to add sensors to monitor important environmental factors that would affect the productivity of the system, such as flow rate of the water, pH, and dissolved oxygen (Figure 3). We finalized our design with piping, shelves, and lighting to produce a prototype aquaponics unit to test with live fish. Once our system has been proven to work with live fish (Figure 4), we will order and deliver it to the motor pool. The delivery itself will be done in three phases to account for

Figure 2. Germination material test for EPICS Urban Farming aquaponics.

Figure 3. Sensor testing for EPICS Urban Farming aquaponics prototype: water flow rate, pH, and dissolved oxygen.

growth of community interest over time, as well as having a lower initial cost.

When developing a system like this, there is a need to compare it to other available systems to confirm that the system is more cost effective or efficient to warrant building something new as opposed to buying something premade. Using a 2 to 1 ratio of bluegill and lake perch fish, our system should produce plants at \$11.82 per plant site, yielding 2,040 lbs. of food per growing season when the aquaponics system is operating at full capacity. Comparing our cost per plant site to that of several pre-constructed systems, we determined that the Family Plus system by Nelson and Pade is the only preconstructed system that has a lower cost at \$8.23 per plant site. Comparing the actual maximum capacity, though, our system will have 2,040 plant sites compared to the 1,649 of the Family Plus system. The Urban Farming system will also be able to produce 1,275 lbs. of tilapia versus the 460 lbs. from the Family Plus system (Nelson and Pade, 2020). Once these fish have fully grown, we will do a fish fry or fish sale based out of Sunday Dinner. The profits from this sale will then go toward paying for the

Figure 4. Aquaponics prototype setup for testing plant growth with live fish.

next phase of expanding the aquaponics system until all three phases are complete.

Producing fresh produce is the goal of the Aquaponics team, but the actual distribution method is being designed and tested by the Community-Based Agriculture (CBA) team. The Soul CBA program will be comparable to Blue Apron: boxes with the CBA logo sticker Figure will be delivered to families with a recipe card (Figure 5). This recipe card will outline storage and nutritional information for the included ingredients as well as the recipes for a main and side dish (Figure 5). This is so that the recipients can keep the recipe cards for future use to continue making recipes that they enjoy.

A focus for this part of the project is also to make it enjoyable by basing the recipes on culturally relevant and healthy foods. To confirm that we are moving in the right direction, we are testing the project with eight local families who volunteered through the help of our project partner, Pastor Henderson. During this test, the families will receive CBA boxes and be asked for feedback on the program. Once the program is fully refined, and we have yielded the necessary produce from the aquaponics system, we will expand the program to reach as many in the community as possible.

Reflections on Community and Student Impact

While the project is still ongoing and progress has been affected by COVID-19, there is still success in the progress that we have already made. The aquaponics system that we have designed is more effective than the preconstructed competitors, and our CBA system is an

VEGETABLE STEW & SMOTHERED GREENS

March's entree and side dish are Vegetable Stew and Smothered Greens! These recipes are from the National Institute of Health and Purdue Extension and feature hearty versions of soul foods we know and love. These versions of the recipes are low fat and chock full of vegetables.

STORAGE INFORMATION

Mustard greens	Gently wrap unwashed mustard greens in paper towels and store loosely in plastic bags. Keep moist and cool in the lower part of the refrigerator in the high-humidity bin can be canned, pickled, dried, fermented or frozen
collard greens	can be stored in the fridge for 5 days can be frozen for 4-6 months
hot pepper	can be stored on the countertop or crisper for 5 days can be dried or frozen
kale	can be stored on the countertop or crisper for 5 days can be dried or frozen
Summer squash	Can be stored in the fridge and used within 3-4 can be frozen or dried
onions	store in a cool place can also be canned, pickled or dried

Side Dish: Smothered Greens

This assortment of vegetables is flavored with turkey stock and is also a classic soul food!

Makes 8 Servings -- 1 Serving = 3/4 cups

Calories: 165	Total Fat: 4 g
Saturated Fat: 1 g	Cholesterol: 51 mg
Sodium: 81 mg	Total Fiber: 2 g
Protein: 21 g	Carbohydrates: 11 g
Potassium: 249 mg	

Main Dish: Chicken Gumbo

This heart healthy vegetable stew is low in sodium and the amount of vegetables will help you meet your daily recommended amount.

Makes 8 Servings -- 1 Serving = 1 1/4 cups

Calories: 100	Total Fat: 1 g
Saturated Fat: 0 g	Cholesterol: 0 mg
Sodium: 37 mg	Total Fiber: 5 g
Protein: 3 g	Carbohydrates: 23 g
Potassium: 607 mg	

Vegetable Stew Ingredients

- 3 cups water
- 1 low-sodium vegetable stock bouillon cube
- 2 cups white potato (2 in. strips)
- 2 cups carrots, sliced
- 2 ears fresh corn
- 4 cups summer squash (1 in. squares)
- 1 cup summer squash, cut in 4 chunks
- 1 tsp thyme, ground
- 2 cloves garlic, minced

Smothered Greens Ingredients

- 3 cups water
- 3 tsp fresh hot pepper
- 1/4 tsp cayenne pepper
- 1/4 tsp cloves (ground)
- 2 cloves garlic (crushed)
- 1/2 tsp thyme
- 1 scallion stalk (chopped)

Vegetable Stew Directions:

1. Add water and bouillon in a large pot. Bring to a boil.
2. Add potatoes and carrots to the broth and simmer for 5 minutes.
3. Cut the corn off the cob.
4. Add the remaining ingredients except for the tomatoes, and continue cooking for 15 minutes over medium heat.
5. Remove the four chunks of squash and puree in a blender.
6. Return pureed mixture to pot and let cook for 10 minutes.
7. Add tomatoes and cook for 5 minutes.
8. Remove from heat, and let sit for 10 min. To allow stew to thicken.

Smothered Greens Directions:

1. Place all ingredients except greens into large stock pot and bring to a boil
2. Prepare greens by washing thoroughly and removing stems
3. Tear or slice the leaves into bite sized pieces
4. Add greens to turkey stock and cook until tender (20-30 minutes)

Figure 5. Example of Community-Based Agriculture team's recipe and nutrition card for EPICS Urban Farming.

unexplored idea that has already gotten attention from groups with similar goals. There have been issues such as the current pandemic, but the project will continue to be sustained and grown by new and old students alike. We hope to get the system up and running as soon as possible, which will make the community impact much more quantifiable.

As a freshman, it is very difficult to get meaningful, professional work experience but EPICS has allowed me to gain this experience. As a member of the Urban Farming team, I have been exposed to a variety of engineering disciplines as well as learned how to work with them, earned a certification to work with fish in a lab setting, and learned how to handle the financials of a project. The most valuable thing that I have taken away from my time in EPICS is the experience of working with a client to design a product that fits their needs. I am glad to have worked with this team to gain experience in a way that also lets me help the community.

Before this I did not know explicitly what a food desert was. I knew that there were areas with lower food access but learning how widespread this issue is has raised my awareness as well as my desire to help. Having the opportunity to do something that can have such a large impact within our community is immensely gratifying and is an experience that will stay with me for the rest of my life.

Getting Involved

There are a lot of reasons to get involved with EPICS, such as the experience offered in working with the community. Specifically, with the Urban Farming team, there is a different relationship that exists within the team. This team offers a unique connection point

between students across all engineering disciplines; from computer to biological engineering, there is a place on the team for all of them. Having this integration gives students an opportunity to learn in depth about other disciplines as well as make connections in them. The community service is incredibly gratifying as well; being able to serve others and make such a difference is an immensely rewarding experience in itself. Getting to work on this team is an experience that will stay with students long past EPICS, and even graduation.

Conclusion

Ultimately, our project will not be a complete solution to the issue of Gary, Indiana being a food desert. It will be a step in the right direction, though, providing easily accessible, healthy food and encouraging healthy eating. The outreach will start within a small circle at first but expand over time. Pastor Henderson's ministry and involvement throughout the community is going to be invaluable in this regard. The extent of this project is likely something we do not fully realize yet. Our team has designed one of the most efficient aquaponics systems available and revolutionized a delivery method that can carry a longer lasting impact than one week. If this project succeeds as well as projected, it could be adapted to be applied in other areas facing similar issues. We hope that as this project expands, the outreach will be even greater than we could have expected.

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Acknowledgments

To the man who showed me that I am an engineer, Hal Scripka. To my writing advisers, Tamara Benjamin and Sanoar Rahman, who are also my EPICS adviser and teaching assistant, respectively. To our project partner, Pastor Marty Henderson, for our partnership. Most of all, thank you to the entire EPICS Urban Farming team for being so dedicated to making this project what it is today.

Klein, E. (2020). EPICS Urban Farming: Bringing Sustainable, Fresh Food to Gary, Indiana. *Purdue Journal of Service-Learning and International Engagement*, 7, 138–143. <https://doi.org/10.5703/1288284317247>

Housing Instability in the Lafayette Community and Beyond

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Student Author Bio Sketch

Aameneh Kermani is a freshman in the Honors College & College of Health and Human Sciences. She is majoring in Brain and Behavioral Sciences with minors in Psychology and Biology. She plans on going to medical school after graduation. In high school, she was part of Key Club, through which she volunteered at the Salvation Army once a month to help serve meals to elderly people. In this article, Kermani describes her experience volunteering at the Lafayette Habitat for Humanity ReStore (ReStore), and the methods used to fight housing instability in the Lafayette community and beyond.

Student Introduction

I was introduced to the option of volunteering at the Lafayette Habitat for Humanity ReStore through my service-learning English 108-S class. This class required us to connect and collaborate with a community partner of our choice, with the goal being to serve the community and become a better writer in the process. The ReStore was my first pick because I had volunteered

Figure 1. Raising awareness mindmap.

throughout high school with my local Key Club. I had worked with people at the Salvation Army, and seen what poverty looked like firsthand. After researching the ReStore’s mission and goals, I knew it was the right pick for me. I wanted to help reduce the rates of housing instability in my community, so I started volunteering every other Wednesday and Friday for two hours. This allowed me to get acquainted with the ReStore staff and know what my responsibilities were. I collaborated with the ReStore manager, Nancy Ingram, about what I could do each time I volunteered and interviewed her for a project I did on raising awareness of resources in the Lafayette community (Figure 1). With this experience in hand, I asked myself this question: How can my volunteering hours at the ReStore help improve the marketing/advertising of their resources and address the housing instability many people face in the Lafayette community and beyond?

Community Partner Description

The ReStore is a nonprofit organization working to “build affordable homes in the Greater Lafayette area to empower families with strength, stability, and self-reliance.” The ReStore is a donation center where every item sold has been donated by members of the community and all the proceeds go to building houses for low-income families around the world (“Restore,” n.d.). Some items they currently sell are flooring, plywood, kitchen appliances, furniture, lighting supplies; almost any items that can be used to remodel a house, they sell.