

Pedagogy of Permaculture and Food Justice

The Journal of Educational Foundations
Vol. 31, No. 1 & 2
Spring/Summer 2018, pp. 57-85
Copyright 2017 by Caddo Gap Press

Jody M. Luna
Erica R. Dávila
Alyssa Reynoso-Morris

Keywords:

aquaponics, community, education, food injustice, food deserts, Dominican Republic, Monte Plata, permaculture, schools, service-learning, sustainability, community survey

Abstract

We contend that the pedagogy of permaculture offers radical possibilities. In this article, we share our philosophical underpinnings of the pedagogy of permaculture using a case study of an international service learning project. We offer (1) a literature review creating a case for the use of permaculture with definitions for the ethics and principles, (2) we go deeper into permaculture versus conventional design and pedagogy leading into a (3) case study of a permaculture project: the rationale, design, and implementation of community surveys and a school-based aquaponics unit, then we analyze (4) the possibilities of the “Pedagogy of Permaculture,” utilizing permaculture principles to help us think of our practice as critical STEM educators and finally, (5) we focus on the ways permaculture supported our work throughout the experience highlighted in this article. We make a call to you, the reader, to join our movement and apply the Pedagogy of Permaculture to your classrooms and lives.

Jody M. Luna is founder and director of Conscious Designs, Chicago, Illinois. Erica R. Dávila is an associate professor of educational leadership in the College of Education at Lewis University, Romeoville, Illinois. Alyssa Reynoso-Morris is the founder of Schools for Sustainability. Their e-mail addresses are jodyluna@gmail.com, davilaer@lewisu.edu, & alys sareymorris@gmail.com

Introduction

Permaculture is an environmental design philosophy rooted in indigenous practices and cultures that incorporates ethics and supporting principles of design. We lean into the sustainable design theory of permaculture, as we approach this work as critical STEM educators working to advance food justice. Food justice is “the belief that healthy food is a human right, so everyone has an inherent right to access healthy, fresh food” (Henderson, n.d.). “The concept of food justice aligns itself with the goals of social justice, which demand recognition of human rights, equal opportunity, and fair treatment” (Hayes & Carbone, 2015, para. 1). We believe the concept and practice of permaculture can contribute to the fields of education, STEM, and sociology, as well as provide insight on how to address food injustice. We also believe there is a need for a sense of urgency when we discuss saving our environment and finding creative, practical ways to do so, especially given the current disregard to climate change, global warming, environmental science/justice, and food justice coming from our federal administration.

According to Howe, Mildenerger, Marlon, and Leiserowitz (2016) 69% of adults in the United States (U.S.) think that global warming is happening, however only 38% believe that global warming will harm them personally. Englefred (2016) asserts that a grassroots movement is underway to resist this disregard and to cherish and protect our planet:

We must build on the foundations laid by the movements for climate justice, migrant rights, racial justice, and others these last few years. The onus is on us to make a new, multi-tiered movement larger than anything the United States has seen before. (para. 23)

Burke (2017) explains that permaculture as a pedagogy is missing, it is widely used as a design tool but when referring to education, the focus is on instruction of permaculture not using permaculture as an educational design tool. There is a need for us to define “Pedagogy of Permaculture” as a pedagogical approach that uses the ethics and principles of permaculture to design curriculum. Like other permaculture designs, these fundamentals inform decisions through the process and that we stop and evaluate our progress periodically. Burke (2017) says:

Applied to curriculum design, permaculture principles ensure the interaction between elements (subject matter, age groups, teacher-student or student-student or school community), and creates individual solutions tailored to specific students and aimed at sustainability and regenerative solutions. It develops an inquiry based, hands on and solution orientation, the development of integrated, critical thinking mentalities in children, a focus on productivity, and a methodology for the expansion and interactions in a wave or ripple effect, to knowledge connects across subjects and interactively across social groups. (para. 17)

We proclaim that this pedagogy can be used in any course design and to illustrate this, we share our philosophy in this article. We outline an international service learning project through (1) a literature review creating a case for the use of permaculture with definitions for the ethics and principles, (2) we go deeper into permaculture versus conventional design and pedagogy leading into a (3) case study of a permaculture project: the rationale, design, and implementation of community surveys and a school-based aquaponics unit, then we analyze (4) the possibilities of the “Pedagogy of Permaculture,” utilizing permaculture principles to help us think of our practice as critical STEM educators and finally, (5) we focus on the ways permaculture supported our work throughout the experience highlighted in this article.

Tres Hermanas

We come to this work as three sisters, *Tres Hermanas*, who bring our own unique skills to the collaboration. When we speak in one voice the term “we” is used, however when any one individual is referred to in combination with the authors their names are identified.

We are latin@s who had extremely different upbringings, education, and life experiences prior to coming together in this work. We each bring our own unique voice to the table and collaborate as one voice seamlessly at other times. As permaculturists, we strive to inform critical STEM curriculum to see the world through the lens of permaculture ethics and principles in an attempt to create meaningful change in our worlds.

A Case for Permaculture

To understand why there is a need to focus on sustainable development, sustainability education, and ultimately permaculture we start by examining one of the first publications that makes a call to teachers, educators, and the youth, the United Nations (UN) report A/42/427, *Our Common Future: Report of the World Commission on Environment and Development* (1987). Brundtland (1987) summarized the findings of the commission that formed to create a global agenda for sustainability. The commission identifies the threats to “our common future” by gathering experts to create a global consensus on the steps to action.

First and foremost, our message is directed towards people, whose wellbeing is the ultimate goal of all environment and development policies. The Commission is addressing the young. The world’s teachers will have a crucial role to play in bringing this report to them. (Brundtland, 1987, p. 9)

The extensive report reviews all aspects considered under the topic

Pedagogy of Permaculture and Food Justice

of sustainable development and includes guidance for policy-makers, international cooperation, institutional reform, and ends with a call to action. Bruntland (1987) asserts:

The enforcement of common interest often suffers because areas of political jurisdiction and areas of impact do not coincide. Energy policies in one jurisdiction cause acid precipitation in another. The fishing policies of one state affect the fish catch of another. No supranational authority exists to resolve such issues, and the common interest can only be articulated through international cooperation. (p.40)

There is a need for global consciousness, a common consideration for those around us not just for ourselves. Many of the recommendations can directly relate to permaculture: world manufacturers should produce more while using less resources, biological diversity is vital within a functioning system, and encouragement of renewable energy system to name a few (Bruntland, 1987, p. 18-19). There are five different items under this that expand upon this further. The call is the most important part of this report, Bruntland (1987) states:

The next few decades are crucial. The time has come to break out of past patterns. Attempts to maintain social and ecological stability through old approaches to development and environmental protection will increase instability. Security must be sought through change. The Commission has noted a number of actions that must be taken to reduce risks to survival and to put future development on paths that are sustainable. (p. 23)

The crucial decades Bruntland was talking about in 1987 have now past and globally all countries should be well beyond this report's actions. In 2015, the UN created *Transforming Our World: The 2030 Agenda for Sustainable Development*; calling for the world's leaders to transform their nations in the 15 years following. Like Bruntland's report, the UN outlines 17 sustainable development goals (SDG) that all nations will work toward. At the root of this report and commitment by the countries in the UN is to eradicate hunger and poverty (General Assembly resolution, 2015). The U.S. was on track to cooperate and collaborate with the global nation to focus on a better future. Under the Obama administration, the U.S. entered the Paris Agreement; where "each country pledges action to lower its carbon footprint, and countries together review everyone's efforts every few years" (Urpelainen, 2017, para. 4). However, since the 2016 election and the current administration's denial of climate change and dismantling of the US Environmental Protection Agency (USEPA), environmental justice is not a priority of the current federal government. In June 2017, Trump announced his intention to withdraw the U.S. from the Paris Agreement (Urpelainen, 2017). The U.S. federal government continues to distance itself from sustainable development. Local governments and grassroots groups

like permaculturists must increase their activity and involvement. It is important now to create these small-scale local groups to create a sustainable movement through the Pedagogy of Permaculture. Suzuki (in Luna, 2014), stated:

What permaculturists are doing is (some of) the most important activity that any group is doing on the planet. We don't know what the details of a truly sustainable future are going to be like, but we need options. We need people experimenting in all kinds of ways and permaculturists are one of the critical groups that are doing that. (n.p.)

“Permaculture design is exemplified when there is a convergence of common sense, indigenous wisdom, and appropriate technology” (Wilson, n.d.). In 1978, Bill Mollison and his student David Holmgren coined “permaculture” as a portmanteau of *perma*-nent and *agri*-culture (Mollison 1988, p. ix). As the name suggests, it was created originally as a sustainable method of agriculture and evolved over time to include various aspects of life or *culture*. “Social permaculture design is a way to recreate nature’s principles in our own lives, interactions, and social groups” (Stavrinou, 2016, para. 2). Hemenway (2009) states, “permaculture has been used to design buildings, energy and wastewater systems, villages, and even less tangible structures such as school curricula, businesses, community groups, and decision-making processes” (p. 5). The concept is to mimic patterns found in nature to provide the least resistance and maximize productivity. The ideal in a permaculture designed system is that: “wastes become resources, productivity increases, and the natural environment is restored” (Wilson, n.d.).

Glansberg (n.d.) argues, “In its highest form permaculture is not about designing anything. It is a pattern-based approach to designing systemic change efforts” (para. 11). He asserts that it is not just about the gardening approaches or increasing production, “it is about changing how we think about the world primarily. It is meant to crack our certainties about everything from agriculture to economics and how the world works” (para. 13). The permaculture design course (PDC) is meant to challenge our current way of thinking; immersion into the principles and ethics of permaculture allowing a glimpse into a system that can be studied for decades yet there will always be more to learn.

The *Permaculture Designer's Manual* (Mollison, 1988) presents the different principles and ethics of permaculture as well as permaculture applications in all the different climate types. It includes color pictures and line drawings to illustrate the different concepts and provides examples of success in the specific regions. Permaculturists have made progress in educating others on these practices as the practices have become more widespread (Mollison, 1988). According to Mollison (1988),

Pedagogy of Permaculture and Food Justice

Great changes are taking place. These are not as a result of any one group or teaching, but as a result of millions of people, defining one or more ways in which they can conserve energy, aid local self-reliance, or provide for themselves. (p. ix)

Macnamara's (2012) *People & Permaculture* is the first text that does not focus on garden design; it outlines "permaculture thinking and design in our interactions with ourselves and other people to create harmony" (xvii). Like our Pedagogy of Permaculture, Macnamara (2012) uses permaculture to focus on ways to create authentic, abundant lives. Focusing on the second ethic of Care of People, Macnamara (2012) states:

Using permaculture can benefit us on a personal level; we can feel more empowered, healthy, grounded and able to make appropriate decisions. On a social level permaculture connects people and enables synergistic and co-operative relationships. Globally it can help alleviate poverty and improve quality and access to food, water and shelter, so we can meet our needs in non-polluting and non-damaging ways. For the environment, permaculture can restore and protect ecosystems, increase biodiversity, and preserve and regenerate our fundamental resources of life; soil, water and trees. (p. xvii)

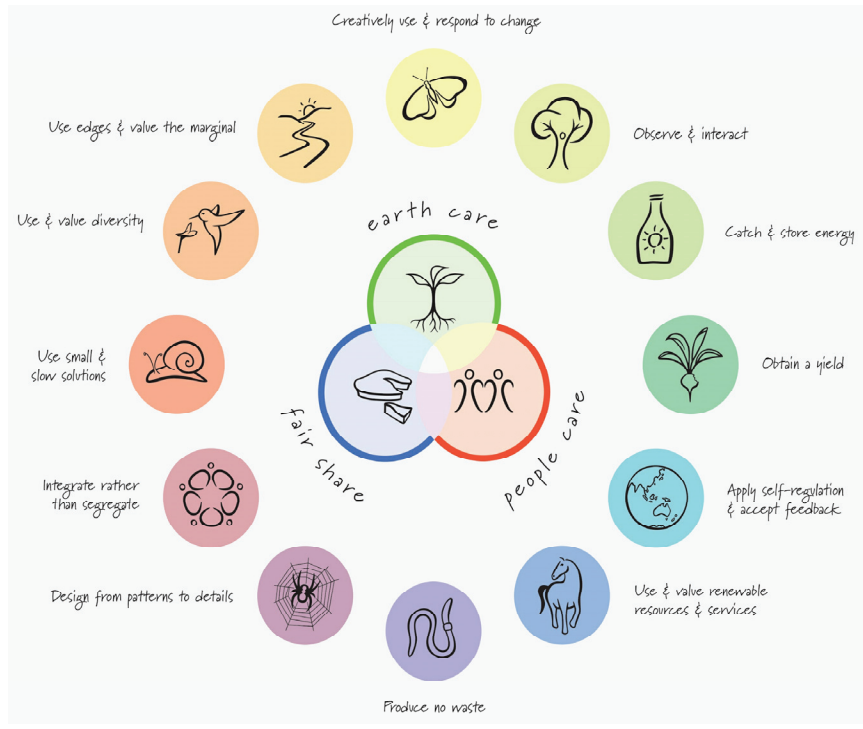
Throughout the text, Macnamara (2012) brings the reader back to the second ethic of permaculture helping the reader/audience to understand how the ethics and principles can be focused on so much more than gardening and agriculture.

Permaculture: Ethics and Principles

The three ethics of permaculture are: Care of Earth, Care of People, and Share of Surplus or Fair Share, as shown in Figure 1. There are 12 principles that help guide the design process that are grounded in these three ethics: 1. *Observe and interact*, 2. *Catch and store energy*, 3. *Obtain a yield*, 4. *Apply self-regulation and accept feedback*, 5. *Use and value renewable resources and services*, 6. *Produce no waste*, 7. *Design from patterns to details*, 8. *Integrate rather than segregate*, 9. *Use small and slow solutions*, 10. *Use and value diversity*, 11. *Use edges and value the marginal*, and 12. *Creatively respond to change*.

The principles work together to create the design process. The basic steps to completing a design are analysis, synthesis, and implementation; however certain fields break this down into steps that are specific to the industry: agriculture, architecture, gardens, etc. While the principles are numbered and seem like steps, like the design process, each is used at various times in the process and can be revisited. They are not necessarily completed in isolation from each other either; they can be used simultaneously as the need arises. For example, principle 1. *Observe and interact or connect* is typically used first but the second step is not always principle 2. *Catch and store energy alone*, it may be used in conjunction with another principle or two.

Figure 1
Permaculture Ethics and Design Principles Image (Telford & Holmgren, n.d.)
Figure reprinted with permission of permacultureprinciples.com



Starting with the analysis phase of the design, principle 1. *Observe and interact or connect* is arguably the most important. This principle requires an immersion to the focus of the design; understanding the different assets and obstacles is important to successful planning. Giving time to observe, interact, and connect with the subject gives the designer the insight into what is needed and what types of interventions can be implemented. According to Hemenway (2009), “the number of connections among elements creates a healthy, diverse ecosystem, not the number of elements” (p. 6). STEM educators can relate principle 1 to animal behavior; predators observe their prey before they strike (interact). Principle 2. *Catch and store energy*, “every cycle is an opportunity for yield” (Hemenway, 2009, p. 6). This principle encourages using the energy of the environment to its full potential. Allowing the individual element of the design to be utilized effectively and none of its energy is wasted but stored. Solar panels and wind turbines are an excellent example of this principle and are discussed in STEM classes. Instead of relying upon non-renewable resources, energy that is already being

Pedagogy of Permaculture and Food Justice

expended is harnessed and stored for later use. Principle 3. *Obtain a yield* is important because it relates to the third permaculture ethic, “Share of Surplus or Fair Share”; when there is a yield a mindset shift happens because members are more inclined to share when there is abundance since the fear of scarcity is removed. Instead members learn that there is plenty for all to benefit from.

Principle 4. *Apply self-regulation and accept feedback* is an important part of the design process. It is so easy to get caught up looking at the small aspects, getting lost in the minutiae. Learning to step back, self-regulate, and get feedback can be difficult, because premature feedback can hinder the creative process, however when one asks for feedback at the right time it is rewarding, as one person cannot foresee all the challenges and components. When it comes to plants and gardening, this can come in the form of an area of the garden not being fruitful while another area is flourishing. Being able to identify what went right and wrong in each area is vital to the remediation of the area that could use some work. “Being open to feedback, and learning to hear it without feeling criticised is important to our development as humans” (Macnamara, 2012, p. 21).

Principle 5. *Use and value renewable resources and services*, such as solar panels, wind turbines, and the time of volunteers can build upon principle 3. *Obtain a yield*. The intention of a permaculture design is to create an ecological solution, therefore utilizing renewable resources is vital to the success of the system; this can be incorporated into STEM classes. Combining principles 3 and 5 will allow renewable systems to be successful and yield a profit. Principle 6 *Produce no waste*; zero waste is created if the waste of a system can be the hero of another and vice versa. Instead, the system produces all the energy. This occurs naturally in nature; the process of photosynthesis for instance produces no waste. Humans exhale carbon dioxide (waste), which plants use to grow, reproduce, and produce oxygen used by humans to survive. In other words, the plants recycle the human waste products and humans use the waste products of plants, and the cycle continues; this is an example of how biology classes can incorporate permaculture philosophy. As permaculturists and critical STEM educators it is our responsibility to learn from and mimic nature to produce no waste.

Principle 7. *Design from patterns to details*, builds on principle 1. *Observe and interact*. Identify the patterns that naturally occur and allow the details to be filled in afterwards. One of the typical methods used in a permaculture design system is to stack functions, orchestrating the natural environment to incorporate different layers of plants to provide a fruitful, functional area in a small space. For example, other plants should surround a fruit tree planted in the backyard, like having green beans or squash climbing up the pine tree. At the base of the tree

herbs and other flowers could be planted to draw beneficial insects or bring nutrients to the soil. Principle 8. *Integrate rather than segregate* builds on these stacking functions to encourage everyone to bring their specialty to the table. Understanding that everyone, plant or person, brings a unique perspective or value to the larger group. Diversity also increases resilience in ecosystems. For instance, if a pest or virus eats or kills all the tomatoes in a diverse garden, the other crops in the garden will survive. However, the entire garden, and therefore, yield, would be lost if this garden was more in line with industrial farming or monoculture, the production of one crop.

Principle 9. *Use small and slow solutions* allows for time to revisit principle 1. *Observe and interact* periodically throughout the life of the design. It also allows for thoughtful feedback and self-regulation. Experimentation is encouraged in permaculture design. There is no way to progress without trying something new. The idea is that the worst thing that can happen is that it does not work exactly as planned, which in the end only advances our knowledge. Principle 10. *Use and value diversity* builds on principle 8. *Integrate rather than segregate* and allows us to remember that we should value the differences that everyone brings. This is true in both the natural environment and our created environments, like work and academic institutions. An ideal situation is where everyone brings their unique skill-set allowing all aspects of the project to be considered. These are called guilds in permaculture; a guild is a group of plants that work together to “form healthy, interacting networks that reduce ... labor, yield abundant gifts for people and wildlife, and help the environment by restoring nature’s cycle” (Hemenway, 2009, p.16). For example, some plants encourage production of nitrogen, a vital element to fertile soil, while others attract beneficial insects which aid in pollination. Ecology STEM classes can incorporate these companion plants into the curriculum.

Principle 11. *Use the edges and value the marginal* refers to the fruitful area between two different diverse systems. These systems intermingle creating a diverse, lively space; principle 11 relates to principle 10 because diversity is embraced in the edges and marginal environments. In a diverse environment, all elements contribute their specialized functions to create a small scale, intensive system. For example, the ecosystem of a pond describes many of these principles, which is taught in biology and ecology STEM classes. The pond attracts many diverse creatures: insects, fish, frogs, birds, plants, humans, etc. All these creatures contribute to the ecosystem in their own way, the edge of the pond where it meets the land is a vibrant, energetic place that is a hub of activity.

Finally, principle 12. *Creatively use and respond to change* allows for principle 9. *Use small and slow solutions* to intersect with principles 1.

Observe and interact and 4. *Apply self-regulation and accept feedback.* Understanding when the plan needs to be adjusted or reconsidered is vital to the success of all projects. It is best to be flexible and respond to the unexpected circumstances that arise. Permaculture projects are long-term commitments, allowing us to learn from our mistakes and improve upon ourselves through experiences.

Permaculture vs. Convention

When thinking of large-scale agriculture systems, the main goal is to “obtain a yield” and, ultimately, a profit. These farms are typically very large, measuring in the thousands of acres, usually of all the same crop. such as corn or soybeans or whatever crop is prolific for the region. This monoculture is counter-permaculture and counter-intuitive. Permaculture encourages inter-planting or companion-planting, where all the varied species bring a different specialty or guild. For example, in Native American culture there is a plant guild called “Tres Hermanas” or “Three Sisters,” these sisters are corn, squash, and pole beans. Each plant has its own purpose, the corn grows into a tall stalk providing a “pole” for the pole beans to grow upon, the beans are a nitrogen-fixers, which is highly coveted in soil fertility. The squash provide safety, because they grow low on the ground protecting the roots of the plants from large animals, like raccoons or rabbits, as well as provide shade to the soil, preventing scorching and over-drying. In a permaculture designed system, this is the goal, that all plants work together to create a “perfect” system.

When visiting a permaculture-design garden, at first it may appear messy. It may be overwhelming to the senses with what seems like overgrown plants, weeds, and miscellaneous found objects like ladders, wheelbarrows, etc. However, after spending time in this permaculture garden, it becomes clear that the old rotting ladder was found on the side of the road and placed as part of a gazebo to provide a quiet seating space and growing up the ladder is a hardy kiwi plant that provides delicious, tart kiwi and shade to the seating space in a climate that is not typically known for kiwi. The overgrown plants are layers of different plants that work together in a guild. At the center is a fruit tree that is surrounded by fruit or nut bearing shrubs, then other smaller herbs and plants around the perimeter. Each of these brings its own specialty to the table like the Tres Hermanas. The principles would be evident in all aspects of this garden.

The images in figure 2 illustrates the progression of a permaculture design for a yoga center in Chicago, IL. The design was a product of a team of recent permaculture design certificate graduates led by Luna

Figure 2
Progress of a Permaculture Garden



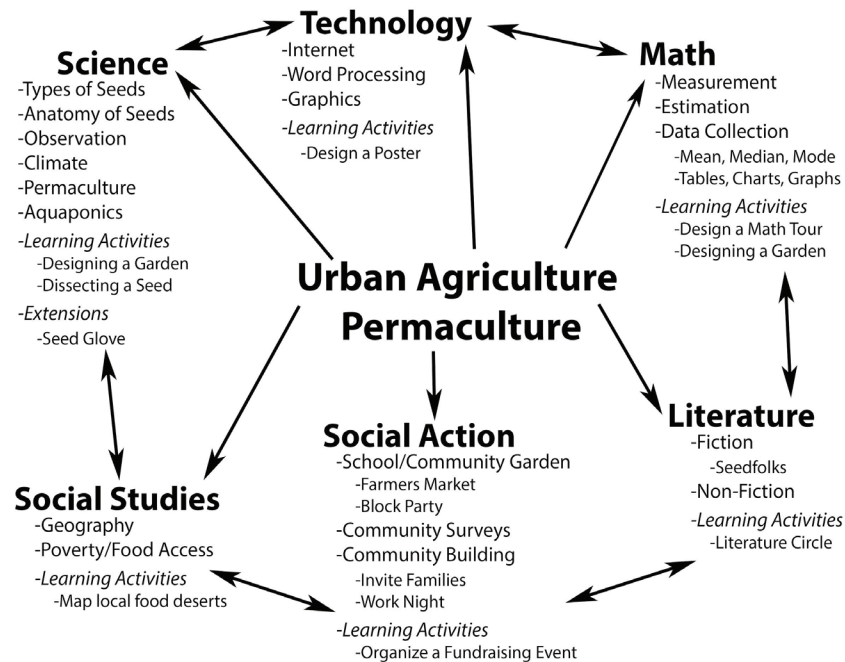
in 2007. The picture on the left is a before picture from November 2007 and the picture on the right is from June 2014. Seven years later, the garden is lush, productive, and fruitful. The progression illustrates the combination of the principles but mostly principle 9. *Use small and slow solutions.*

Similarly, in the design of the project and the courses we wanted to create “an overgrown garden” of individuals. Where everyone worked together bringing their expertise to create a fruitful, meaningful system. We led the students through the steps of observing, interacting, evaluating, self-regulating, inclusion, etc.

Case Study: Pedagogy of Permaculture

When teachers and their students investigate the reasons for the Pedagogy of Permaculture, boundless curricular opportunities arise. Dávila and Luna took on the pedagogical exercise of crafting a curriculum map illustrated in Figure 3 to support our effort to understand how we can bring these very topics into our own college classrooms. This map was created initially with the intersection of Science, Math, and Social Action in mind and has evolved to include other subjects like Literature, Social Studies, and Technology. Like a permaculture design, the map is intended to grow and adjust to current educational needs as well as to provide a springboard for other educators and to help further develop these ideas.

Figure 3
Curriculum Map Created by Dávila and Luna (2009)



Dávila had the privilege to work with many pre-service (PK-12) teachers who explore this curricular map in their own teaching. Furthermore, Luna embarked in a doctoral program to research sustainability education methodology; a mixed-methods investigation of permaculture design education. The six prongs (Science, Technology, Social Studies, Math, Literature and Social Action) are all critical to the work of permaculture, and these prongs are all interconnected. This map serves as a springboard to give teachers and educators ideas that we hope they will explore in their own context. One prong that we are especially interested in sharing is that of “Social Action” which can connect to any of the other prongs. However, since most PK-12 curriculum standards do not list this area of inquiry, which can be the most important with social justice teaching, it can get lost or forgotten. We are urging teachers and educators to get their students involved in the food justice movement and connect their own lived experiences to this global social issue. In the section below, we provide a story of our social action work and how we delved into the Pedagogy of Permaculture together in a multi-course project.

Course Design

This innovative multi-course design culminated in a service learning project in the Dominican Republic (DR). We use this project to demonstrate how educators can incorporate permaculture teachings into their classrooms regardless of the subject matter or academic level. The combination of 3 faculty members, 18 undergraduate students from Pennsylvania (PA), 6 undergraduate students from Illinois (IL), an international community organization, a graduate student expert, college students in the host country, and local hosts speaks to the permaculture principles 7. *Design from patterns to details*, 8. *Integrate rather than segregate*, 10. *Use and value diversity*, and 12. *Creatively use and respond to change*. From the beginning, the idea of combining all the individuals illustrates principles 8. *Integrate rather than segregate* and 10. *Use and value diversity*. The faculty of the very different courses were intentional when using principles 7. *Design from patterns to details* and 12. *Creatively use and respond to change* by first coming up with the overall objective of the project, then identifying the details on how to complete it, responding to the change in our typical curriculum development process. Table 1, a comparison of the two courses, covers the content covered in the syllabi that is required by each university. Key features are the course objectives, the type of course, and the academic assignments and readings.

The connection to the international community organization, Schools for Sustainability, Inc.'s (S4S), was an intentional partnership as the organization has similar philosophies around the politics of food justice and the urgency of integrating education into the realm of sustainability in a real and meaningful manner. S4S' mission is to establish and operate self-supporting high schools that teach and model proficiency in integrated water remediation, food production, renewable energies, and waste management, while students achieve a high school diploma through common core standards. The mission of S4S emulates permaculture principles; water remediation is in line with principles 2. *Catch and store energy*, 3. *Obtain a yield*, and 6. *Produce no waste*; food production embodies the principles 3. *Obtain a yield*, 4. *Apply self-regulation and feedback*, 5. *Use and value renewable resources and services*, and 6. *Produce no waste*; renewable energies epitomizes principle 3. *Obtain a yield*, 5. *Use and value renewable resources and services*, and 6. *Produce no waste*; and waste management demonstrates principle 4. *Apply self-regulation and feedback*, 5. *Use and value renewable resources and services*, and 6. *Produce no waste*. The goal of S4S is to empower the communities that the school will serve to alleviate poverty and address climate change.

Additionally, S4S' organizational culture echoes the ethics and prin-

Pedagogy of Permaculture and Food Justice

Table I
Course Comparison Chart

	Arcadia University Glenside, PA	The Illinois Institute of Art-Schaumburg, Schaumburg, IL
Name of course	GFS 181 Service Learning in Dominican Republic	INTB332 Environmental & Sustainable Design
Faculty	Erica R. Dávila Rochelle Peterson-Ansari	Jody M. Luna
Community Partners	Schools for Sustainability	
Credits	2	4
Class meetings and duration of course	January 23-April 10, 2015 Fridays 2:45pm-4:45pm 12 weeks	January 12-March 25, 2015 Monday/Wednesday, 6pm-8:50pm 11 weeks
Fieldwork in Dominican Republic	March 13, 2015 – March 20, 2015	
Degree Program	Varies	Interior Design
Course Objectives	The course will prepare students for Community Surveying and Aquaponics projects. Explore the historical and cultural context of the Dominican Republic. Engage in service projects in Monte Plata, DR to contribute to the development of a sustainable school.	Collaborate with peers and/or professionals in applying the knowledge and skills of the Interior Design profession. Display an understanding of environmental ethics and the role of sustainability as they relate to the profession of interior design. Select and coordinate furnishings, fixtures, equipment, and finishes related to specific aesthetic and functional solutions.
Type of course	100-level Undergraduate Elective for all first-year students.	300-level Undergraduate Required program course for upper class students.
Academic assignments and reading	Reading, Investigation, and Analyses of <i>A Cafecito Story: El Cuento Del Cafecito</i> by Julia Alvarez. Research projects in preparation for Aquaponics OR Community Surveys. Final Reflection Paper. Global Expo: Presentation of Final Project.	Research and design of aquaponics unit. Design living quarters for future school using recycled shipping containers.

ciples of permaculture. For instance, principle 10, which focuses on *using and valuing diversity*, is rooted in Reynoso-Morris' desire to ensure that we celebrate every member in the organization (college interns, scholars, engineers, farmers, and community organizers) for their experiences and knowledge. Reynoso-Morris is a woman of color from DR and Puerto Rico, and as the co-founder and CEO of S4S, she ensured that permaculture ethics and principles guided all the projects and initiatives S4S launched, including the construction of the aquaponics system and the administration of the community survey. Reynoso-Morris valued the university students and the other project collaborators because of the strengths each team member offered, such as speaking Spanish, cultivating fish, and teaching experience. This is especially important given that the work done in Monte Plata was in a location with a community and culture that Reynoso-Morris was familiar with. Nevertheless, the authors and the volunteers from both schools remained mindful of our positionalities as guests in this space.

The service project in the DR was split in two parts: community surveys and construction of the aquaponics system. Students from each university participated in both aspects of the trip. Dávila was using a virtual tool (Google Hangout) to telecommute and co-teach the Arcadia University (AU) course. The same technology allowed a graduate student from another local university who had experience and expertise in aquaponics to guide the students as well as the faculty in both courses through the technical education needed. Furthermore, the students at The Illinois Institute of Art-Schaumburg (ILIS) collaborated with the graduate student in Pennsylvania and a few of the AU students. The combination of faculty, local college students who worked alongside the students, Reynoso-Morris's leadership, and the cohort of eager university students, emulated permaculture principle 10. *Use and value diversity*, which also speaks to our lens as justice centered educators working to merge the ideas of permaculture into our teaching by valuing the contributions of everyone involved.

The AU course falls into a category of a first-year preview to studying abroad. First year preview courses are short-term study abroad courses that run for 12 weeks through the Spring semester with a trip abroad for 7-10 days during spring break. The purpose of these courses is to provide an opportunity for students to travel, either domestically or internationally, to expose them to the benefits of studying abroad and encouraging them to seek these opportunities for a semester or more in the future. The criteria for this first-year experience can be done in a multitude of ways and for this course Dávila and Peterson-Ansari chose to merge the university criteria with the support needed by our partner and host in Dominican Republic (DR), S4S; a non-profit that

Pedagogy of Permaculture and Food Justice

was founded and directed by Reynoso-Morris, an alumnus of AU. The students were all traditional age students 18-19 years old and were eager to be part of a project focused on sustainability as several of them were active in their respective communities concentrating on the same issues highlighted in the course/fieldwork. At the beginning of the semester Dávila and Peterson-Ansari started the course with students working on an autoethnographic project and reading *A Cafecito Story* written by Julia Alvarez, an American-Dominican author knowledgeable about Dominican culture and challenges. These early weeks were critical in growing into a working team. Next, the students were divided into two groups and began to prepare for their specific project in the DR. Some did technical research on aquaponics (in collaboration with the students in Illinois), while others investigated the methodological project of conducting interviews, which demonstrates principles 8. *Integrate rather than segregate* and 10. *Use and value diversity*.

The other course, taught by Luna, was an environmental and sustainable design course in the Interior Design (ID) program at The Illinois Institute of Art-Schaumburg (ILIS); the course description states: “This course covers the principles and practices of sustainable and environmental design as applied to a design project” (Course Syllabus). There were eighteen students in the course, six participated in the trip to the DR; three of the students were fluent in Spanish. Many of the students in the ID program are non-traditional students who are not recent high school graduates. The students varied in age ranging from mid-30s to early 20s in their 2nd and 3rd years of the program.

The course assignments incorporated research on aquaponics and culminated in the design of a system (described below) for the site of the future school. Students worked in groups to develop the design and create construction documents in both English and Spanish. Reynoso-Morris (2015) stated:

In class, the students learned about aquaponics in preparation of their service trip. Not only did they break ground with S4S by building the system, they became pioneers for sustainable education in the Dominican Republic by doing so. Their research led to the design and construction of a functional aquaponic unit that is being looked after by Jose, the manager of the land granted to Schools for Sustainability, Inc. (para. 8)

Community Surveys

Horton said, “The poor have the answers” in his book, *We Make the Road by Walking: Conversations on Education and Social Change* (1990), and that was at the heart of Schools for Sustainability, Inc.’s (S4S) mission and philosophy. S4S believes that communities are aware of their issues and often have solutions to address them. However, they may not have

the resources and/or infrastructure available to put potential plans into action. Therefore, in line with S4S' ideology and permaculture ethics *Care of People*, S4S administered a community survey in the Sabana Grande de Boya community in Monte Plata, DR, as defined by Mulroy's (2008) definition of a community-needs assessment; a collective undertaking rooted in teamwork and cooperation that engages community members to investigate both the needs and available resources in a community.

In 2014, S4S conducted a brief community survey before the 2015 permaculture project of building an aquaponics system began. These survey results revealed that many members in the community suffer from iron and protein deficiency. Some families raise chickens, nevertheless this is not enough protein for the community. Mothers have lost their children to anemia because iron supplements are not financially feasible and the consumption of iron-rich leafy greens, such as kale and spinach, are not part of the traditional Dominican or Haitian diet. Additionally, iron rich foods are hard to find and expensive as most farm lands are used to produce cash crops, such as coffee, cacao, and sugar cane. This information equipped the S4S team to develop an innovative solution; the construction of an aquaponics system would simultaneously address the protein and iron deficiencies in the community. However, in 2014, S4S did not have the time nor resources to build such a system or to conduct the in-depth community survey needed to assess future needs. Therefore, in line with permaculture Principle 9. *Use small and slow solutions*, S4S worked with faculty to develop courses that focused on: (1) the rationale, design, and implementation of a school-based aquaponics unit and (2) the development, administration, and analysis of a comprehensive community survey.

In 2015, according to the permaculture principle 1. *Observe and interact*, S4S staff and students from both AU and ILIS documented the needs of the community, such as access to affordable and healthy food and water, safe housing, health care, and education through observations and one-on-one interviews with community members. When focusing on people in a permaculture-designed system, assessing and responding to their needs in a respectful manner is key. During these interviews S4S staff and students from both AU and ILIS also collected information on accessible community resources and social capital, such as talents, knowledge, capital, land, infrastructure, time, and social harmony, which enabled employment of principle 5. *Use and value renewable resources and services*. In line with permaculture principles, 4. *Apply self-regulation and accept feedback*, 8. *Integrate rather than segregate*, and 10. *Use and value diversity*, S4S and the students in both courses collaboratively crafted the interview questions, prior to arrival in the DR. This was a process of reviewing and reevaluating the questions for clarity and

cultural competence because we wanted to respect the local community. Volunteers were divided into two teams; each team had one transcriber, one bilingual interpreter, fluent in both English and Spanish, and one recorder who held the recording device. When necessary an additional volunteer engaged the children in the household to ensure that the mother, father, or guardian could focus on the questions and provide accurate answers. Both teams had two facilitators: one bilingual S4S representative and Peterson-Ansari, who has extensive knowledge of qualitative data collection. The bilingual S4S representatives, Reynoso-Morris, and the former chief operating officer (COO) of S4S, visited the community several times before these interviews to establish rapport with the community, which demonstrates *9. Use slow and small solutions*. The team interviewed 40 residents in four days, recording community needs and resources, in the form of both quantitative and qualitative data, allowing S4S to develop an action plan to resolve multiple related problems (Community Survey).

S4S collected quantitative data: age, gender, nationality, place of birth, places of residence, family size, number of children per family and their ages, number of generations in one household, types of occupations in each household, household income, education levels of each household member, and the ratio of single parent households versus two parent households. From this data S4S calculated that the total population of the community was 745, with 57 multi-generation households, and the following averages: family size is 8, education level is 5th grade, and household income is equivalent to \$5.00 U.S. a day for a 10-hour work day. Qualitative data was collected through observations and by asking 20 standard open-ended questions, with additional probing questions as needed, to gain a deeper understanding about the community's views on: education, politics, sustainability, home life, and family. Volunteers observed that most of the homes were made of scrap material: tin, wood, and reclaimed cinder blocks. The average home was about 500 square feet for families of eight or more, compared to the average American home at 2,392 square feet, according to the 2010 census (United States Census Bureau, 2010). It was common for three or four family members to share full-size beds in a variety of gender specific combinations. The qualitative questions informed us that the community was interested in a high school that taught and modeled water remediation, food production, waste management, and renewable energies, in both English and Spanish. Community members agreed with S4S; such knowledge and skills would lead to well-paying jobs and/or entrepreneurial opportunities that foster sustainable economic development (Community Survey). The community exhibited principal *12. Creatively use and respond to change*; our presence in their community and our educational model

that focuses on permaculture principles was a change for them, but they responded positively and creatively by co-creating the action plan for their community.

The community survey helped S4S develop a stronger relationship with the community because we gave them a platform to: share their challenges, goals for community advancement, and concerns about the future school. Day after day, the children chanted the names of the volunteers, “Erin, Erin, Maria, Maria” as they energetically ran alongside our van leaving behind a cloud of dust on the dirt road. As the volunteers approached each home, families greeted us with smiles, hugs, and kisses as is the culture in DR. Not one community member refused to speak with us. In fact, they gave their time without restriction and before the interviews commenced they sat on crates while offering S4S volunteers chairs, so the volunteers could sit comfortably. Many families even offered us coffee for breakfast and rice and beans for lunch. The volunteers were honored by their generosity because during the interviews they learned that most families do not have access to clean drinking water and struggle to eat three meals a day, yet they were sharing the little they had with us. Slowly over time, principle 9. *Use small and slow solutions* relationships were formed helping us to incorporate principles 2. *Catch and store energy* and 3. *Obtain a yield* from our relationships with the community. The community members and the participants of this trip formed long-lasting connections; many exchanged contact information and are friends on social media.

The hospitality continued as community members asked well thought out questions and shared their hopes for the future school, which demonstrates principle 4. *Apply self-regulation and accept feedback*. Community members gave feedback, which is vital to the success of this project and continued relationship. Realizing that we as outsiders are unfamiliar with the specific needs of the community members, we humble ourselves to accept feedback about our interventions to ensure that we are not imposing our intentions upon them. A key question that came up several times was “Will the school accept students of Haitian descent and “stateless” students that were born in DR but had their citizenship revoked?” On September 23, 2013, the Dominican courts ruled that individuals born after 1929 who do not have at least one Dominican parent will have their citizenship stripped (Reed, 2016). The group continued with principle 4. *Apply self-regulation and accept feedback* and informed community members that the future school would be free to all students regardless of their citizenship, and that S4S would provide: two sets of uniforms each year, textbooks, and school supplies to eliminate existing school attendance barriers. If materials are lost or damaged students and/or guardians would be responsible for replacing them to

Pedagogy of Permaculture and Food Justice

teach personal responsibility, respect, and the permaculture principle 5. *Use and value renewable resources and services*. Getting to know the members of the small rural community spoke to principle 11. *Use edges and value the marginal*. This community had been marginalized by the local government, but it like an ecotone, the transitional spaces between two ecological communities or biomes, such as forest and desert, are the most productive parts of each biome because there is a combination of both conditions and species. The Sabana Grande de Boya community is filled with a diverse mixture of creative individuals who have made the best of their situation.

Principle 9. *Use small and slow solutions* is evident in the realization that this work is not limited to this one trip. In 2014, S4S conducted a brief community survey and began to build relationships with the community. Then, in 2015, S4S in conjunction with AU and ILIS classes, an in-depth community survey was completed while the aquaponics unit was built. The surveys created the foundation for another trip. In 2016, S4S collaborated with another nonprofit organization, 33 Buckets, and local community leaders to build a water purification system and to teach lessons on water safety and sanitation to address this immediate, urgent need.

We realize that future projects are still needed because the community needs (1) a secondary school, (2) access to healthy and affordable food options, and (3) a waste management system. First, in 2004, the government built a primary school, which teaches 1st to 5th grade, that the government continues to maintain and staff. Another non-profit organization built a classroom where a local teacher teaches kindergarten. However, if students want to further their education they need to walk about a mile to the closest school (A. Jean, personal communication, March 17, 2015). Second, the aquaponics system will provide fish for protein and spinach, which is rich in iron, for some members in the community. Unfortunately, the aquaponics system built does not produce enough food for the entire community; therefore, other efforts need to be made, such as planting community gardens and/or constructing more aquaponics systems. Third, this community lacks a system to remove, repurpose, or recycle human and organism waste, which spreads bacteria and viruses. In cities, like Santo Domingo and Santiago, pipes remove water waste from kitchens and bathrooms and trash trucks collect solid waste. In small, rural, isolated communities, such as this one, there is no waste management system, therefore trash is dispersed throughout the community, “out houses” replace bathrooms with plumbing, and trash is burned, which releases toxic fumes that community members inhale. As per the permaculture principle 1. *observe and interact*, volunteers noticed how waste-conscious the community was because they

reuse water bottles to store food or laundry detergent and rice bags like suitcases to hold clothes, but this resourcefulness does not prevent the spread of illnesses due to the absence of a waste management system.

As stated by Hartlep and Bute (2017), “We need to ask people outside of academe how to respond to the ‘wicked problems’ that face our world and society” (p. 4). The community surveys helped S4S better comprehend the needs and available resources of the Sabana Grande de Boya community. The surveys also revealed that the community’s primary asset was their willingness to collaborate with local and international organizations to improve the lives of their children. These conversations and surveys were the first significant step in building relationships rooted in trust; contractors in the community were eager to build the future school alongside S4S and every mother interviewed stated they would send both their sons and daughters to the future school. Community organizers studying to be educators stated they would be interested in teaching at the future school. The surveys incorporate the permaculture principles 8. *Integrate rather than segregate*, 10. *Use and value diversity*, and 12. *Creatively use and respond to change*, because S4S and the community were able to determine how to actualize their missions and visions together.

Aquaponics

Aquaponics is a hybrid system that combines hydroponics and aquaculture or fish farming. Aquaponics is the epitome of a permaculture-designed system because it is a closed-loop system. The fish waste provides the plants with nutrients they need while the runoff from the plants includes the necessary bacteria to break down the ammonia in the water, providing a natural filtration system. Systems relate to a series of pipes that connect the fish tank to the flood tank to the grow bed. There is evidence of indigenous cultures using low-tech versions of aquaponics. The Aztecs in Mexico developed chinampas, or floating gardens, to feed the vast Aztec population by creating floating garden beds in Lake Texcoco (Chinampas, n.d.). These feats of engineering were cultivated with companion plants like the Tres Hermanas. In *The Taínos: Rise & Decline of the People Who Greeted Columbus*, Rouse (1992) said “[Taínos] trapped [fish] in weirs, and stored both fish and turtles until they were ready to eat them” (p. 13). The Centro Cultural Eduardo León Jimenes, a museum in Santiago, explained that the weirs were located near the conucos or community gardens (Colección Antropológica [Conuco] (n.d.). This literature and the exhibit demonstrates that the Taínos cultivated fish in weirs and crops in conucos, which is similar to how aquaponics systems work. Due to colonization, much of this indigenous knowledge was lost

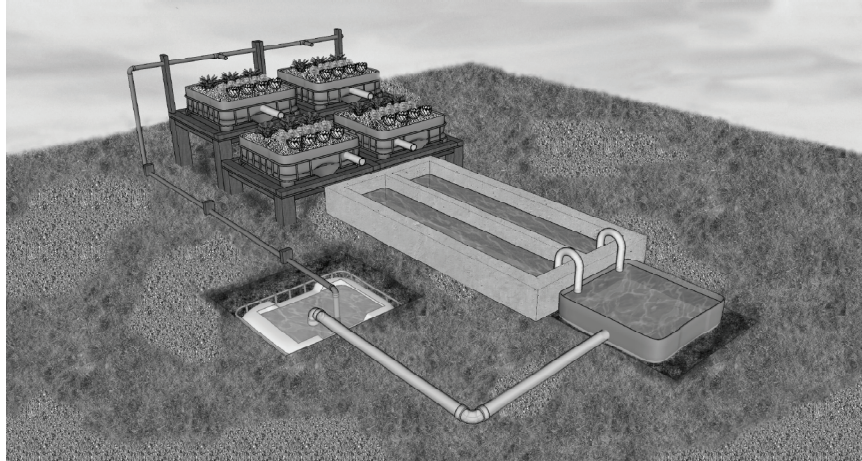
Pedagogy of Permaculture and Food Justice

(Wrench & Wilson, 2012). Bringing back these teachings and connecting our community to their roots empowered them. This was evident as they asked specific questions and smiled with excitement after our volunteers informed them that the Taínos used a system like aquaponics.

For our aquaponics project the first stages were introduction to the project, the client, and background research. There was limited information on the site; we had only a few pictures and a verbal description. Leonel Fernandez, the former president of the Dominican Republic, and his political adviser Cesar Fernandez gifted S4S the property. The senator of the providence of Monte Plata, Charlie Mariotti, was a crucial connection; it was through him that we met with Isabella Voigt who helped S4S book the hotels, transportation, and meals. S4S implemented principal 5. *Use and value renewable resources and services*, and 10. *Use and value diversity* by utilizing resources, such as the land, and by leveraging their relationships with these individuals, with diverse skills, to accomplish our shared goals. The property is set in the mountains and has highly sloped areas. Through images that Reynoso-Morris shared, the class identified the site using the free resources of Google Maps to find aerial maps and street views, which embodies principal 5. *Use and value renewable resources and services*. As per permaculture principles 7. *Design from patterns to details*, the students designed the aquaponics system with patterns in mind; they incorporated the mountains and Google images into their plans and used principle 9. *Use small and slow solutions*, to modify the architectural renderings slowly prior to their arrival and then upon their arrival on site. The graduate student expert in aquaponics introduced the class to aquaponics and discussed the important goals of the current project.

By the end of the class, the students identified the various aspects of the project (assignments) and organized themselves into groups. The assignments included research, the design, and documentation of the aquaponics unit, as well as designing other spaces on the future campus like residential halls, the cafeteria, study area, and social spaces. One group did a thorough research exercise into the function of aquaponics systems and the diverse types that could work depending on the circumstances. This group informed the design drawing group and worked together to come up with a design that worked in the site situation as the students knew it. The only information Luna and her students had about the site conditions was that there was an existing covered tank that was to be used as a base of the system for the fish tank. The students designed a system, Figure 4, and that could be modified as per principle 4. *Apply self-regulation and respond to feedback*; they created construction documents for the unit drawing the floor plans, elevations, and details of the system. During the course, Luna and her students

Figure 4
Rendering of Aquaponics Unit Design by ILIS Students (2015)



took a field trip to tour the Loyola University, Institute of Environmental Sustainability “Eco-dome” which houses a 31,000 square-foot greenhouse with two different aquaponics systems (“Aquaponics,” n.d.). A Loyola student guided the class through the building, explaining the different aquaponics systems and the benefits of using one over the other.

The students had a technical understanding of how the system worked and one of the students translated the drawings into Spanish so that we had documents to share with the local jurisdiction. The drawings proved beneficial during the trip as the local municipal engineer did a site visit during construction and was skeptical of the whole project until he saw the Spanish set of drawings. Although the drawings were one of the most grueling parts of the project for the students since they did not have all the information beforehand. The students learned to be patient and *9. Use small and slow solutions* as well as how to *12. Creatively use and respond to change*. Design connects to permaculture principle *1. Observe and interact*; the first step after meeting with the client in an architectural/interior design is to visit the site/space, become familiar with and document the existing conditions of the space or plot of land. Connecting the current conditions with the needs of the future is vital to a successful design outcome.

While in DR we faced many challenges and had to remember permaculture principle *12. Creatively use and respond to change*. First, we experienced some difficulties obtaining all the equipment. Reynoso-Morris and Luna arrived with the S4S project team the day before the students and other professors arrived. We found that we were miss-

Pedagogy of Permaculture and Food Justice

ing the Intermediate Bulk Container (IBC) totes which are the main component of the system, see Figure 4 for more detail. Sarachilli (2015) stated:

The aquaponics system is an exercise in problem solving, beginning with transporting supplies. PVC pipes and connectors, solar panels, pumps, plastic caps, rock dust, styrofoam boards, screwdrivers, drills, power saws, paint and brushes, sponges and cleaning supplies, and other assorted tools were scattered among suitcases and carry-ons or purchased locally...Local favors are a crucial part of success in building the system: A neighbor knows someone with a large saw in his backyard; a friend of a friend owns a farm and would be happy to supply tilapia; someone has a contact who can secure used shipping containers coated in coagulated chicken fat that clogs the drain plug. (para. 29-31)

Once the rest of the team arrived on the actual site, the authors as well as the volunteers had an opportunity to apply principle 1. *Observe and interact*. The whole team observed the on-site conditions and the second obstacle was that the existing covered water trough, that was to be used for the fish tank, was placed on a steep slope. So the area had to be filled in and reinforced to ensure stability. The earth that was dug out of the ground for the grow bed was used to fill in the ground and level the surface, the top of the IBC tote used for the grow bed was used as a retaining wall. The totes come in a steel frame for protection, which was cut and combined with rocks, rubble, and earth that created a durable area for the flood tank to reside. This work speaks to principles: 1. *Observe and interact*, 4. *Apply self-regulation and accept feedback*, 6. *Produce no waste*, 7. *Design from patterns to details*, and 12. *Creatively use and respond to change*. The students worked tirelessly in hot-humid weather and completed the unit in time to see it in action. The first few days were spent preparing the site: digging the hole for the grow bed, leveling the land, testing the water pH levels, and prepping the IBC totes. The IBC totes were previously used for transporting milk and other fats; therefore, a labor-intensive task was cleaning all the gunk out of them before they could be cut to size and painted. On the last day of the trip, it was time to put the IBC totes in place and set up the solar panel and pumps. We were able to get the system running and procure seeds for Jose, the land manager, to plant after we departed. Overall throughout the process we focused on the “Pedagogy of Permaculture” by incorporating all the principles at some point.

The Possibilities of Pedagogy of Permaculture

The team that undertook the project highlighted in this article functioned within the principles of permaculture by connecting people with various areas of expertise to brainstorm, craft, and create the initial

steps for designing a school that teaches and implements environmental, economic, and social sustainability practices. This project did not follow the more traditional learning modalities favored in higher education, which position faculty/instructor(s) as experts. Instead, we honored the necessity of each person's contributions for innovation, rooted in the spirit of permaculture. We encouraged the development of innovative ideas by fostering an environment where members participate as equals to enhance creativity and independent thought through examination, rather than accepting existing traditional methods. We started our work using principle 10. *Use and value diversity* to guide the way the various "experts" collaborated in the planning of the service learning courses and experiential component. Additionally, we recognized that the courses that supported these projects still exist within the confines and structures of higher education, such as pre-determined schedules and grading procedures. The university requirements and objectives are outlined in Table 1. The descriptions of the courses illustrate how we bridged the gap between the institutional requirements and our desire to create a more authentic learning experience. The principles of permaculture frame the course designs.

Principle 12. *Creatively use and respond to change* was another focus, as Luna, Dávila, Peterson-Ansari, and the volunteers had to adapt to a unique way of life. The working styles in the U.S. and DR are drastically different. The pace of life is slower than in the U.S.; every day we had to adapt to a different working style, allowing students to incorporate other principles: 4. *Apply self-regulation and accept feedback*, 9. *Use small and slow solutions*, and 10. *Use and value diversity*. For example, since most of us live in a temperate climate, the high temperature was a significant challenge. In DR, locals deal with this by taking long "siestas" (breaks) mid-day when the heat is at its peak. Most of our students are used to eating "on the go" while performing other tasks so at first, the students did not see the benefit of these extended lunch breaks. However, the students ended up taking advantage of the siestas by resting after lunch, which had a positive impact on their productivity and health. Another difference was that a trip to the hardware store for a minor item took double the time than is typical in the U.S. because the stores did not open until 9am, lack of technology lengthened the check-out process as all transactions were added up manually and then paid for in cash, and culturally employees speak with customers at length slowing down the pace at which the store operates. It was a practice in patience for everyone and we implemented principle 9. *Use small and slow solutions* throughout the trip. We were cognizant of our limitations while working in a rural community in the developing world versus our positionality as inhabitants of urban areas in the U.S.

Call to Action: An Overgrown Garden of Individuals

While permaculture and critical STEM is still not part of the mainstream conversation on preserving our natural resources, there are pockets of communities across the globe using these ideologies for community gardens as well as other projects (Becker, 2016). According to Hemenway (2009), “any design, whether it is of a garden, a house, or a nonprofit corporation, that uses these principles will be more efficient, effective, and ecologically balanced than one that violates them” (p. 7). Using this ideology, we believe it is critical to use these examples to broaden the conversation of critical STEM pedagogy and permaculture to the public. Many communities across the globe are at the crux of food injustice and fighting for basic human rights. For example, recent studies are examining the injustice of food deserts. “Food deserts can be described as geographic areas where residents’ access to affordable, healthy food options (especially fresh fruits and vegetables) is restricted or nonexistent due to the absence of grocery stores within convenient travelling distance” (“Food deserts,” n.d., para.1). While food deserts tend to be associated with urban spaces, there is also a critical need for food justice on a global scale. In 2015 there were a total of eight countries that rank very high (40% +) in prevalence of undernourishment in the population; The World Bank (2015) reports that the only country in the western hemisphere is Haiti at 47%, the country that shares their island with the Dominican Republic (DR). The majority of the community S4S and the authors worked with in the DR are Haitian refugees and through interviews with the locals we learned that one of their most urgent social justice issues was their struggle to navigate their status as refugees, which led to serious injustices including lack of basic needs like food and water. This was the context in which our work unfolded and the impetus for the aquaponics project highlighted in this article.

Collectively, we ground our work in the larger context of global food justice and we hope that the project highlighted in this article contributes to the conversation and more importantly the activism around sustainability and food justice. The people we had the privilege to interview in Sabana Grande de Boya, DR spoke of their lived experiences, which includes a lack of clean drinking water and struggling to eat three meals a day. This is the reality in this refugee community in the DR and in countless communities around the globe. Nevertheless, the stories they shared showed the resilience of the community as well as the strength of each family unit; community members also spoke of their plans for their community with hope.

In our collective, we aspire to continue the work in DR, specifically

working on building the school, a waste management system, community/school permaculture gardens, and additional aquaponics systems. In addition, we plan to carry our skill set to our current places of residence in Philadelphia, PA and Chicago, IL, two cities who have many pockets of food deserts yet lots of activist work trying to reverse this dire reality. As Giroux (2016) argues,

The struggle over public education is inextricably connected to a struggle against poverty, racism, violence, war, bloated defense budgets, a permanent warfare state, state sanctioned assassinations, torture, inequality, and a range of other injustices ... And such a struggle demands both a change in consciousness and the building of social movements that are broad-based and global in their reach. (p. 359)

As educators and advocates for justice centered education, we see the strong parallels amongst the permaculture principles and frameworks of social justice education (Chapman and Hobbel, 2010) and the larger aims of educational foundations. We strongly believe that the “Pedagogy of Permaculture” highlighted in this article can be utilized to better understand social justice issues, including but not limited to, poverty, environmental degradation, racial inequality, and immigration. In closing, we aim to center Kumashiro’s (2017) call from the “7th International Conference on Education and Social Justice” to hone in on the power and possibilities of “Movement Building for Equity and Justice in Education.”

After the conference in December 2017, Luna and Dávila, who presented at the conference met to think about their role in the movements of “sustainability and education” and “environmental justice.” Luna and Dávila built upon their conference presentation and invited the third author, Reynoso-Morris, to co-write with us to contribute to the movement building across cities (Philadelphia and Chicago), across positionalities, and across generations. We aspire to continue to build and create within these movements. We make a call to you, the reader, to join our movement and apply the Pedagogy of Permaculture to your classrooms and lives.

References

- Aquaponics*. (n.d.). Retrieved from <https://www.luc.edu/sustainability/initiatives/urban-agriculture/aquaponics/>
- Becker, M. (2016). The permaculture classroom: A systems-based approach. *Edutopia*. Retrieved from <https://www.edutopia.org/blog/permaculture-classroom-systems-based-approach-michael-becke>
- Bruntland, G. H. (1987). *Our common future: Report of the world commission on environment and development*. (UN Publication No. A/42/427). United Nations.

Pedagogy of Permaculture and Food Justice

- Burke, K. (2017, November 8). *Permaculture design as a pedagogical resource*. Retrieved from <http://www.resilience.org/stories/2017-11-08/permaculture-design-as-a-pedagogical-resource/>
- Collección Antropológica* [Conuco]. (n.d.). Centro Cultural Eduardo León Jimenes. Santiago, Dominican Republic.
- Chapman, T. K., & Hobbel, N. (2010). *Social justice pedagogy across the curriculum: The practice of freedom*. New York, NY: Routledge.
- Chinampas: The ingenious floating gardens of the ancient Aztecs*. (n.d.). Retrieved from <https://simplecapacity.com/2016/08/chinampas-floating-gardens-aztecs/>
- Englefried, N. (2016). *Why there's hope for the climate movement under Trump*. Retrieved from <https://wagingnonviolence.org/feature/hope-climate-movement-trump/>
- Feeding America*. (2018). Retrieved from <http://www.feedingamerica.org/>
- Food deserts*. (n.d.). Retrieved from <http://www.foodispower.org/food-deserts/>
- General Assembly resolution, *Transforming our world: the 2030 Agenda for Sustainable Development*, A/RES/70/1 (2015, September 25). Retrieved from http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E.
- Giroux, H. A. (2016). When schools become dead zones of the imagination: A critical pedagogy manifesto. *Policy Futures in Education*, 12(4), 491-499.
- Glansberg, J. (n.d.). *An open letter and plea to the permaculture community*. Retrieved from <http://patternmind.org/an-open-letter-and-plea-to-the-permaculture-community/>
- Hayes, C. R., & Carbone, E. T. (2015, December 8) Food justice: What is it? Where has it been? Where is it going? *Journal of Nutritional Disorders and Therapy* 5(4), 1-5. doi:10.4172/2161-0509.1000179
- Hemenway, T. (2009). *Gaia's garden: A guide to home-scale permaculture*. White River Junction, VT: Chelsea Green Publishing Co.
- Holmgren, D. (2002). *Principles and pathways beyond sustainability*. Australia: Holmgren
- Horton, M. (1990). *We make the road by walking: Conversations on education and social change*. Philadelphia, PA: Temple University Press.
- Howe, P., Mildenerger, M., Marlon, J., & Leiserowitz, A. (2016) Geographic variation in opinions on climate change at state and local scales in the USA. *Nature Climate Change* 5(6), 596-603. doi: 10.1038/nclimate2583.
- Kumashiro, K. (2017). *7th International conference on education and social justice*. Retrieved from <https://www.kevinkumashiro.com/conferencedecember2017>
- Luna, J. M. (2014). *A mixed-methods study of sustainability education* (doctoral dissertation).
- Macnamara, L. (2012). *People & permaculture: Caring and designing for ourselves, each other and the planet*. White River Junction, VT: Chelsea Green Publishing.
- Mitchell, T. D. (2008). Traditional vs. critical service-learning: Engaging the literature to differentiate two models. *Michigan Journal of Community Service Learning*, 14(2), 50-65. Retrieved from https://education.uoregon.edu/sites/default/files/traditionalvs_critical_service-learning.pdf
- Mollison, B. (1988). *Permaculture: A designers' manual*. Australia: Tagari

Publications.

- Mulroy, E. A. (2008). Community needs assessment. In T. Mizhari & L.E. Davis (Eds.), *Encyclopedia of social work*, 20th ed. (pp. 385–387). New York, NY: Oxford University Press.
- Pattillo, D. A., (2017). An overview of aquaponic systems: Hydroponic components. *NCRAC Technical Bulletins*, 19(3-2017). Retrieved from http://lib.dr.iastate.edu/ncrac_techbulletins/19
- Permaculture design principles*. (n.d.). Retrieved from <http://permacultureprinciples.com/principles/>
- Ramos-Reynoso, A., & Crutchley, J. (2015, June 29). *Millennials break ground and create hope: Use eco-trip to stimulate business!* Retrieved from https://www.huffingtonpost.com/alyssa-ramosreynoso/millennials-break-ground_b_7684014.html
- Reed, K. (2016, January 26). Dominican Republic violated int'l law in canceling citizenship. *North Carolina Journal of International Law*. Retrieved from <http://blogs.law.unc.edu/ncilj/2016/01/26/dominican-republic-violates-intl-law-in-canceling-citizenship/#2>
- Rouse, I. (1992). *The Taínos: Rise & decline of the people who greeted Columbus*. New Haven, CT: Yale University Press.
- Sarachilli, C. (2015). Sustaining hope. *Arcadia: The Magazine of Arcadia University*, Spring/Summer 2015. Retrieved from <https://www.arcadia.edu/story/sustaining-hope>
- Stavrinou, K. (2016, June 12). *Permaculture principles in pedagogy*. Retrieved from <https://regenerativepedagogydotcom.wordpress.com/2016/05/16/permaculture-principles-in-pedagogy/>
- Telford, R. & Holmgren, D. (n.d.). *Permaculture design principles*. Retrieved from <https://permacultureprinciples.com/principles/>
- Understanding hunger and food insecurity*. (2018). Retrieved from <http://www.feedingamerica.org/hunger-in-america/what-is-hunger-and-food-insecurity.html>
- United States Census Bureau. (2010). *Median and average square feet of floor are in new single-family houses completed by location*. [Data file]. Retrieved from <https://www.census.gov/const/C25Ann/sfttotalmedavgsgft.pdf>
- Urpelainen, J. (2017, November 21). *Trump's withdrawal from the Paris agreement means other countries will spend less to fight climate change*. Retrieved from https://www.washingtonpost.com/news/monkey-cage/wp/2017/11/21/trumps-noncooperation-threatens-climate-finance-under-the-paris-agreement/?noredirect=on&utm_term=.177f2b73d3f4
- Wilson, B. (n.d.) *About permaculture*. Retrieved from <https://midwestpermaculture.com/about/permaculture/>
- The World Bank*. (2018). Retrieved from <http://www.worldbank.org/en/research>
- Wrench, B. & Wilson, B. (2012, December 6). *Chinampas gardens*. Retrieved from <https://midwestpermaculture.com/2012/12/chinampas-gardens/#more-9267>