# Food Systems, Security, and Solutions

## Struggles and Progress in Equity, Sustainability, and Resilience

Tarrey Banks

**Tarrence "Tarrey" Banks** is a founder of The Project School, focusing on design-thinking, sustainability, and social justice, through Project, Problem, and Place-based Learning (P3). Tarrey is currently in his last year of PhD work in the Sustainability Education program at Prescott College and is a Teaching Fellow at Indiana University's Creativity Lab focusing on "Re-Crafting Math" though the makerspace environment. He is the father of Lily and Sam and married to a fellow educator, Heather Banks.

Last fall I attended the School Reform Initiative Winter Meeting in Tucson, Arizona. As a component of the meeting I attended a field experience to visit three elementary schools in the Tucson area that were doing gardening and some form of aquaponic system work. During these visits, I was sending pictures to my teaching partner and my principal. Those visits and photos became the spark for the idea to focus our work on aquaponics. When I returned to The Project School, I began the conversation with my partner about what a project-, place-, and problem-based curriculum (P3) centered around aquaponics could look like.

The Project School (TPS) is a K–8 teacher-designed, project-based, public charter school located in downtown Bloomington, Indiana. TPS was developed by a group of teachers committed to creating a school that engaged students in relevant curriculum connected to and immersed in their local communities.

Over the last few years, our school has been engaged in a long-term partnership with the Indiana University School of Education. Through this partnership, we have become part of the growing "Maker Movement," which is dedicated to small-scale design and manufacturing in a "do it yourself" spirit *(see box on next page)*. Utilizing the expertise of several faculty members who are passionate about "makerspaces," design thinking, and project-based learning, we have transitioned our classroom space at TPS into a makerspace, one that ultimately looks like a fully functioning workshop with tools of all kinds and some high tech components as well (laser cutter, 3D printer, and circuitry materials).

Our classroom makerspace has allowed us to utilize the design process in our curriculum, and as we brainstormed about the aquaponics project, we knew we wanted it to have a heavy emphasis on design and the design process as well.

## A "Makerspace" Classroom

Our classroom is a fully functional workshop, also known as a "makerspace." The idea of makerspaces in schools is a direct extension of the Maker Movement, which is and has been picking up steam all over the world. Makerspaces and the Maker Movement are fueled by the "do it yourself" (DIY) spirit of small-scale designing and manufacturing. This can range from crafting to high technology. Makerspaces are thus spaces where people can come together in community to create and inspire each other. Sometimes, those spaces act like a high-tech lab with a fully functional 3D printer and laser cutter. Sometimes they're more like my grandfather's workshop, providing tools for tinkering and building. But regardless of the shape it takes, a makerspace allows students to fully engage in the design process from beginning to end and experience all the highs and lows that naturally occur along the way. Kids are drawn to the design process; they are fully engaged when a compelling design problem is posed and they have the tools and resources to put their best ideas to the test.

During this preliminary brainstorming period last spring, my partner and I were approached by our university partner and one of his teammates about a grant opportunity. The university had launched a request for proposals to set up an on-site makerspace in the School of Education. The grant would be a partnership with schools and youth-serving organizations, and would be project-based, in the sense that any and all equipment and materials purchased would be used to complete a specific project. The opportunity pushed my partner and me to work out the details of the idea we were brainstorming. After a great deal of thinking and talking, we landed on a structure for the project, which was ultimately funded by the grant: students would be placed into teams of six to eight, and each team would have the same basic design challenge: to build a closed-loop, self-sustaining, aquaponic system that would only take up the tabletop footprint of a 20-gallon aquarium.

Students utilized tools and technology at makerspaces in both the Bloomington Project School and Indiana University School of Education.

This unit is multidisciplinary in nature and is connected to a larger and broader year-long study of food systems issues and solutions. Last year, we settled on *The Omnivore's Dilemma* (Pollan, 2006), as a core text for this year-long study, and we decided to focus on it as the literacy component of our aquaponics project, too.

When we had looked for resources last year to help us think through our curriculum, we had stumbled upon a unit of study for *The Omnivore's Dilemma* developed by the Outward Bound Expeditionary Learning Schools organization (Expeditionary Learning, 2014), and liked what we saw. We are using this as a jumping-off point, though we know that we will be modifying, tweaking, and maybe even completely abandoning the unit to follow where our students are going, and where we want to go with the larger project. As a teacher, I'm definitely of the opinion that you don't need to create everything from scratch. There are a lot of groups out there (Outward Bound

being one of them), that are doing great work around project-based learning.

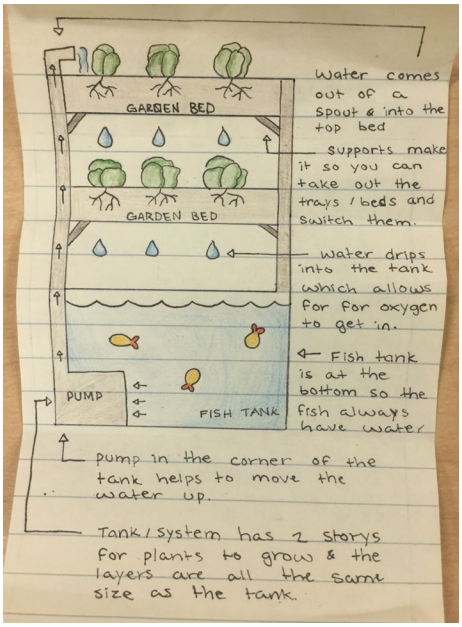
In the first phase of the unit, students will engage in a close reading of *The Omnivore's Dilemma* as a springboard into concepts around sustainability as it relates to food and food systems. They will simultaneously begin an in-depth STEM project focused on aquaponic gardening and farming systems.

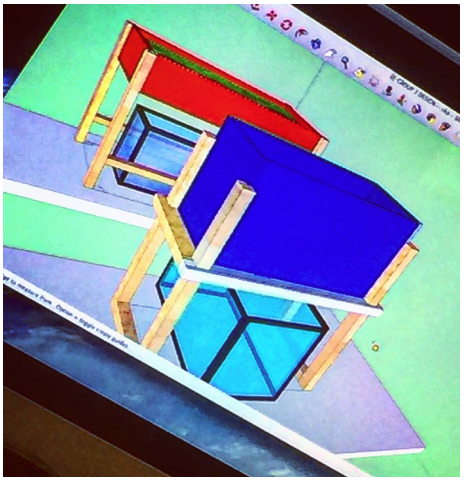
As readers, students will be introduced to strategies for close reading of challenging, nonfiction text, and given time to practice those strategies. In addition to *The Omnivore's Dilemma*, students will be exposed to other nonfiction texts that either share or oppose Pollan's position. Students will analyze Pollan's argument, looking for specific techniques he employs as a writer to prove his points, and to what extent he is effective in doing so. As writers, students will employ these same techniques, along with others, to construct their own arguments on related subject matter. The core literacy content is understanding and being able to demonstrate the ability to analyze and construct a sound and persuasive argument using all the tools and strategies good readers and writers use.

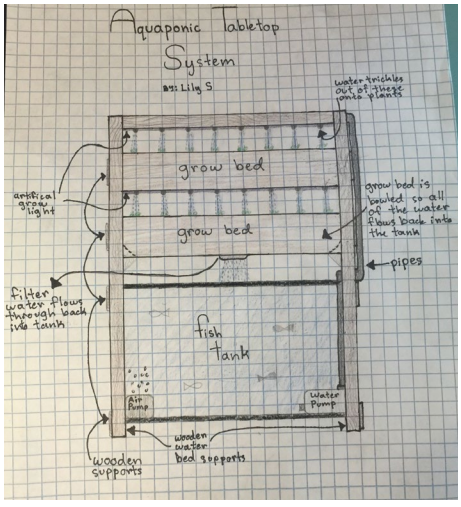
Additionally, students will engage in a two-part, mini-research project of one specific problem connected to food systems. First, each student will research the history and root causes of their chosen problem. Then, she or he will take a peer's research and investigate multiple solutions to *that* problem. Ultimately, this all will loop back to our study of aquaponic farming as a potential solution to global food supply chains and systems.

For the STEM portion of the project, students will be introduced to the concept of aquaponic gardening and asked to compare and contrast it to more traditional methods of farming. In concert with *The Omnivore's Dilemma*, students will analyze the effect food choices have on the environment, as well as how to mitigate those effects. In teams of six, students will design an aquaponic farming system and begin producing vegetables (and potentially fish, as a protein source). They'll learn the basics of selective breeding, as well as the different ways that materials are transformed into usable power and the environmental impacts of each of those methods.

The entire P3 experience is conceived using the lens of sustainability. Shelburne Farms, through its Sustainable Schools Project, has generally defined sustainability as the condition that exists, "when the environmental, economic and social needs of a society are met in the present without compromising the ability of future generations to meet their needs." In the initial

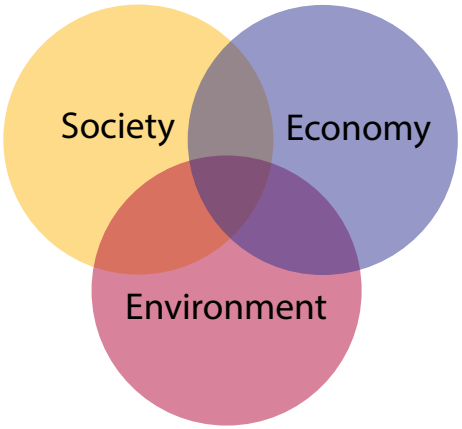





Utilizing the design thinking process, students made detailed working drawings of the aquaponics systems.

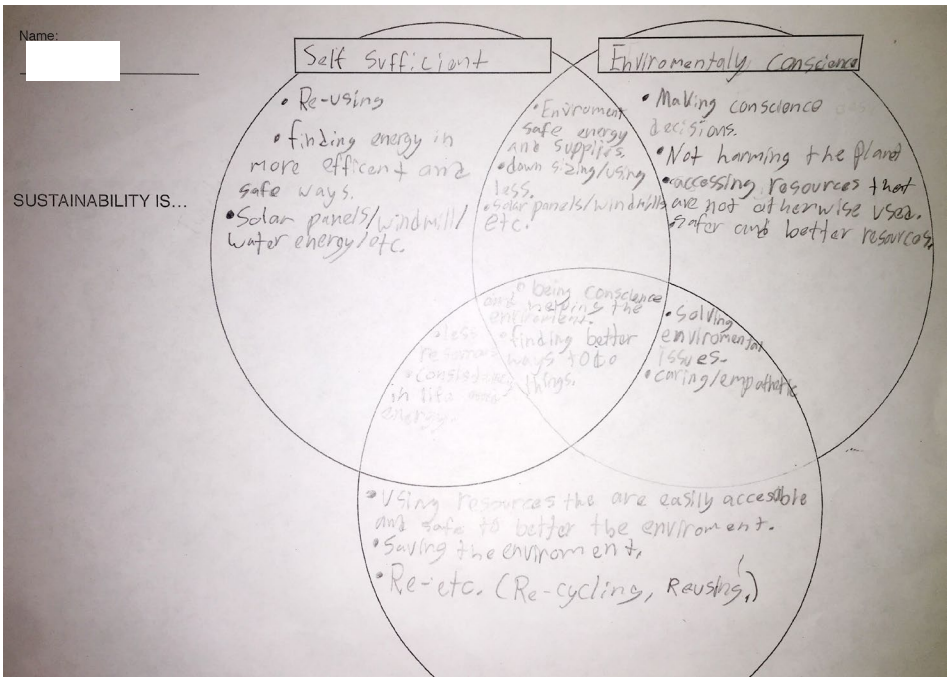
phases of the project, students will be introduced to some common definitions of sustainability, including the one above, as well as the triple bottom line diagram that makes appearances in multiple

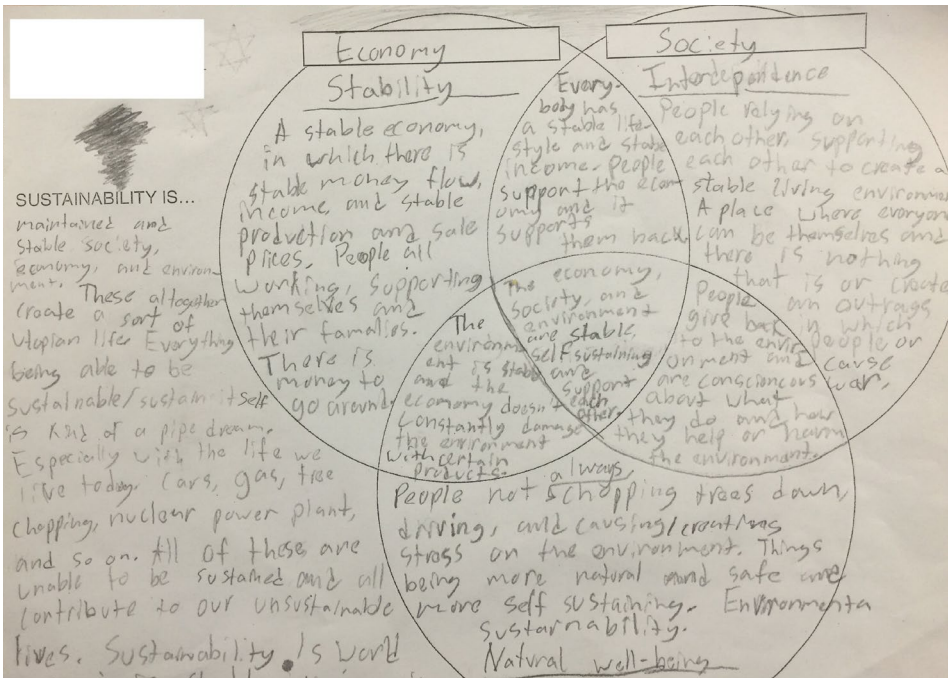



What is Sustainability?

forms, but ultimately depicts the social, economic, and environmental components of sustainability as being intertwined and connected in a Venn diagram-type relationship *(see above)*.

Additionally, the students will be introduced to the four root causes of unsustainability: relatively large flows of material from the Earth's crust, accumulation of substances created by society, physically inhibiting nature's ability to run cycles, and creating barriers to people meeting their basic needs worldwide. This idea of unsustainability comes from a series of videos called Sustainability Illustrated (Sustainability Illustrated, 2015). As teachers, we will be continually using these principles and concepts of sustainability to link to the concepts in our curriculum. All students will be given a pre- and post-assessment on sustainability, as well as ongoing work and assessments throughout the year.




To assess knowledge transfer, students were given a formative and summative assessment on the sustainability triple bottom line.

One way we are gauging the impact of this project is by periodically using the sustainability triple bottom line Venn diagram as a graphic organizer throughout the project. Students were each

given a completely blank copy of the graphic organizer before we did any instruction or even began talking about the project. They were simply asked to fill in the graphic and write their answer to "what is sustainability?" Recently we asked them to do this same exercise again, and we plan to do so a couple more times throughout the project. Looking at one student's before and after graphics *(see photos, p.4)*, it is clear that there has been tremendous growth in this student's knowledge and understanding around sustainability principles and concepts since the beginning of the project. This holds true for the majority of our students. Of note is that I am currently doing an in-depth case study of six students from our classroom during this experience as the basis for my dissertation for Prescott College. This study will be completed and published in the spring of 2016.

I am a progressive, constructivist, experiential educator with a deep belief that when students are engaged in authentic experiences centered around the complex issues that we, as humans, are toiling with, they will construct knowledge, meaning, and understanding that will stay with them as they become adults. My belief is that while human knowledge is acquired through a multitude of experiences, and reflection upon those experiences, the school experience is one that should be structured around authentic, experiential, multidisciplinary learning. Furthermore, I believe that the human need to search for truth and understanding is driven by our need to construct and answer complex, open-ended questions that matter to us. The philosophy and method that most closely aligns with my theoretical framework and epistemology is contemporary, project-based learning that is focused on issues of societal, economic, and environmental sustainability in the anthropocene era. Put simply, I believe that there are no more important questions, problems, and projects for our students to be working with and on than those centered around the relationship of humans with the earth, all its living systems, and each other. My experience tells me that when students are given a properly structured project, what they can come up with is nothing short of inspiring. I feel most alive as a teacher when I'm helping my students struggle through problems that matter.

# RESOURCES


**Expeditionary Learning** (2014). Analyzing Author's Purpose: Industrial Food Chain http://commoncoresuccess.eleducation.org/curriculum/ela/grade-8/module-4/unit-1/lesson-3

Building Background Knowledge: What IS the Omnivore's Dilemma Anyway? http://commoncoresuccess.eleducation.org/curriculum/ela/grade-8/module-4/unit-1/lesson-1

Determining Cascading Consequences Using The Omnivore's Dilemma: Industrial Food Chain http://commoncoresuccess.eleducation.org/curriculum/ela/grade-8/module-4/unit-2/lesson-1

**Setting the Standard for Project-Based Learning: A Proven Approach to Rigorous Classroom Instruction.** Larmer, J., & Mergendoller, J., Boss, S. (2015). Alexandria, VA: ASCD.

**The Omnivore's Dilemma: A Natural History of Four Meals.** Pollan, M. (2006). New York: Penguin Press.

**Sustainability Illustrated (2015). The 4 Root Causes of Unsustainability** sustainabilityillustrated.com/en/portfolio/4-root-causes-of-unsustainability/



**Contact the Author:**
Tarrance Banks
bankst54@theprojectschool.org