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**ADDRESSING ISSUES SURROUNDING FOOD INSECURITY AND
PROMOTE ENVIRONMENTALISM IN URBAN SETTINGS USING
COMMUNITY GARDENS**

Tucker Jensen

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ADDRESSING ISSUES SURROUNDING FOOD INSECURITY AND PROMOTE
ENVIRONMENTALISM IN URBAN SETTINGS USING COMMUNITY GARDENS

by

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A capstone submitted in partial fulfillment of the requirements for the degree of Master
of Arts in Education: Natural Science and Environmental Education.

Hamline University

Saint Paul, Minnesota

August 2020

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ABSTRACT

This capstone project reviews the effect community gardens have on the low-income, urban population. After reviewing the history of racism in America, disproportionalities of food insecurity, how poverty correlates to health, and various environmental impacts specific to urban communities, this project was an effort to expand on that research and provide a solution. Food deserts exist in many of today's American cities, which lead to food insecurity and negative health outcomes. A community garden is a low-cost, effective way to obtain healthy food and simultaneously benefit the environment. This five-day unit of study takes place at an established community garden. It teaches middle school students about the benefits of gardening using STEM lessons activities. Students will design their own garden and be able to explain why a community garden is important to the success of their own neighborhood.

DEDICATION

To my friends and family who supported me throughout this journey. To my capstone committee for your guidance and commitment to me. To my students for inspiring me to do this work. To Emily, for your encouragement and grace during this entire process.

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Chapter One

Introduction

Introduction

This project explores the question: *How can community gardens address issues surrounding food insecurity and promote environmentalism in urban settings?* Its purpose is to guide students to an understanding of the benefits of community gardens and urban agriculture by implementing a week-long curriculum. My hope is that after students participate in this unit of study, they understand the history of food security in urban settings, how community gardens can promote healthy eating, and what it means to be environmentally friendly. This project is designed to meaningfully address the disparities surrounding socioeconomic class and build urban students' appreciation of the Earth's resources by using interactive learning, intentionally designed lessons, and relatable activities. I believe that when a student is able to experience learning in a meaningful way, they are more likely to internalize that information and practice it in their daily lives. In chapter one, I will elaborate on my reasoning for deciding upon this topic, my personal and professional story of environmental learning, and provide historical information regarding why food insecurity exists.

Personal Rationale

I grew up near Minneapolis. I have a strong connection to the city and have gained an immense appreciation for the culture, people, and history throughout my 29 years of life. As a child, I watched my mom spend countless summer mornings in the garden; weeding, planting, or tending to her already grown fruits. I saw it as a chore, and

she saw it as a hobby. Sometimes we would have dinner with vegetables straight from her garden which I, as a child, did not value as much as she did. For me, food was a right and something that just appeared on your plate. I, like many other children, was not aware of the labor and time put into what I ate, but it was always there. Later in my life, I developed a relationship with food that was gluttonous, to say the least. I ate what I wanted, when I wanted, and found myself staring a lifetime of obesity and poor self-image in the face. Upon reflecting on my unhealthy lifestyle, I decided to make a change, one that I was blessed to be able to do. A few years after that, I fully realized the scope of my decisions. Upon starting a relationship with the woman who is, at the time of writing this, soon to be my wife I learned how to have a healthy relationship with food. A relationship that is built on caring for what goes into my body, one that “counts ingredients, not calories,” and one that appreciates the people who have helped my food get to my plate. I am forever grateful for the shift I made in my life and believe many people struggle with, but do not address similar issues. Thus, I decided to build this project as a tribute and response to the food crisis I see every day.

Professional Rationale

In 2015, I began my career as a teacher in Minneapolis as a middle school science teacher. There I learned about social justice, inequities in the field of education, and what it means to teach in an urban environment. The passion and devotion for helping students succeed are never as strong as they are inside the urban school. Quickly into my career I realized that for me, teaching is more than a job, it is a calling to serve. I fell in love with it right away and, like any teacher would, worked many extra hours to make sure my

students felt loved and cared for. However, one part of my job breaks my heart: hunger. Thus, this project came to light.

Generally, teachers can hear something described and instantly think of one particular student. From the student who shows every attention-seeking behavior known to man, to the student who they *know* is smart but will not put forth the effort, there is always a trigger that makes a teacher think of “that one student.” This phenomenon has happened to me consistently throughout my career and it is usually these students who inspire teachers to continue. Throughout the time of this project’s writing, one of my students kept me going. This particular student would sometimes come to school with a breakfast of chips and an hour later complain they were hungry. This student was constantly on the move and had a very hard time concentrating. While reading articles describing the difficulty of food security in urban families and its health effects, the metaphorical light bulb went off in my head. This student struggles with many things, but it is a shame that they have the added struggle of food insecurity. I know they are not the only ones.

Often when I walk the halls of my school, I see countless kids empty chip bags, kids drinking a can of pop with lunch, or getting their energy from those bottled Frappuccino drinks. Over the years, my school has implemented a “no chip, no pop” policy, but upon conversations with my students, I received a lot of pushback. It is normal for children to have a bit of a sweet tooth, but the sweet tooth I see is one that is not educated about the chemicals and preservatives entering their body. The input is sugar, fat, and highly processed food, and the output is sluggish, apathetic, unfocused

teenagers. Now, to be fair this is not true of every student, but the times it happens make me deeply sad.

A few years into my career I used a book called *Seedfolks* by Paul Fleischman as part of an English unit. The characters in the book unite in a community garden, but throughout the story, each character unveils parts of their history as to why gardening is important to them. I found this to be a wonderful metaphor for my work. My students come from many different backgrounds but being at school is one thing they all have in common. It is where connections happen, and I see community gardens as that sort of place as well. Uniting for whatever reasons necessary, people living in the same neighborhood can come to build community. This was the first time I had considered a community garden to be valuable. I had thought it to be something solely as a hobby, however, upon researching for this project and discussing with colleagues, I have come to realize that while community gardens can be used for hobbies, they are for so much more.

This project is an effort to apply community gardening to address issues of food insecurity, nutrition, and environmentalism. First, it is important to provide context as to why they are needed. The rest of this chapter will outline how we became food insecure as a country and why it is important to address this issue.

The Rise of American Suburbs

Post-World War II, the United States saw dramatic changes in the demographics of American cities (Eisenhauer, 2001). With overcrowded cities and poor living conditions being the norm following the Great Depression, America would see a housing

boom during the 20th century that led to opportunity and excitement for some, but oppression for others. A construction and housing report by the U.S. Census (1975) found that during the 1930s and early 1940s, the development of residential buildings stalled in order to allocate money towards World War II. Spending on housing projects dropped to a mere 1 to 3 million dollars a year. In 1946, right after the war ended, housing projects boomed to 10 million dollars annually, and even tripled by 1955. What resulted was a new style of living that allowed for more space, larger houses, and easy transportation to and from the city via car, bus, or train. Cities were abandoned by those with means and this resulted in a separation of American citizens by race and class as middle- and upper-class white families were able to easily access suburban living (Crowe et al., 2018).

By this time, racial segregation was standard and some neighborhoods with the slightest African American population were deemed too risky for banks to support business and home loans (2018). Racially restrictive policies were put into place to further separate whites and people of color (2018). This practice, termed “redlining”, brought little opportunity for homeownership among ethnic minorities, limited residential investment and racially isolated neighborhoods (Eisenhauer, 2001). These disparities can be mirrored in the supermarket industry as well. As many poor, minority families were forced to stay in large cities, the white and wealthy suburbs were attractive to chain supermarkets because of their market power and locations (Pothukuchi, 2005). This approach taken by the grocery industry has been similarly termed as “supermarket redlining” by the United States Conference of Mayors, and the result was low-income

urban shoppers cut off from easy access to nutritious, competitively priced food (Newsweek, 1992). Since then, these areas have been renamed as “food deserts,” a concept that still exists in many of American cities today.

Food Deserts

A food desert is an area that lacks access to healthy, fresh, and affordable food (Vaughan et al., 2016). In these areas, residents typically pay more for groceries, spend more time traveling to distant supermarkets, and incur other costs related to poor food habits (Whelan et al., 2002). Residents are often economically-disadvantaged (Battersby & Crush, 2014) and have inadequate access to transportation (Dutko et al., 2012). In 2010, the USDA concluded that about 23.5 million Americans lived in low-income areas that are further than one mile from the closest grocery store. Dutko (2012) found that areas with higher levels of poverty are more likely to be classified as food deserts and that in most cases, an area is more likely to be deemed a food desert if it has a high percentage of minority residents.

The term “desert” might indicate the lack of *any* food, but residents who reside in food deserts are still able to purchase some food from places like corner stores or bodegas. However, this food is often high-energy, low nutrition, and processed for a longer shelf life (U.S. Department of Agriculture, 2010). While the setting of this project is urban, it is important to note that rural food deserts exist as well. However, the criteria are different. In an urban area, a resident must live “more than one mile” from a supermarket while in rural areas, a resident must live “more than ten miles” from one (2010). This demonstrates that food scarcity can manifest in a variety of communities.

Although widespread across the United States, an unhealthy diet is more common among urban, low-income populations (Robinson, 2008). For many people living in these areas, it is easier to buy a cheeseburger at a local fast food restaurant than it is to travel to a grocery store, which may be farther away, to buy an apple. The closest stores often sell food that lacks the nutrients needed to support a healthy lifestyle. As a result, many residents settle for foods that may lead to negative health outcomes including heart disease, Type II diabetes, obesity and more. These health conditions are mostly avoidable with proper nutrition and an active lifestyle.

Food as a Human Right

Following World War II, the United Nations assembled in Paris, France to sign the Universal Declaration of Human Rights. Originally, the right to food was included under the realm of *The Right to an Adequate Standard of Living*, but has since been added as a separate entity. In 2015, the United Nations introduced 17 goals that provide a shared blueprint for peace and prosperity for people and the planet, now and into the future (UN, 2020). This set, called the Sustainable Development Goals are powerful. Some examples are eliminating poverty, cleaning water, and taking action on climate. However, one goal matches this project entirely. The second listed Sustainable Development Goal is to “end hunger, achieve food security and improved nutrition, and promote sustainable agriculture.” This project is an effort to help the world achieve that goal.

Conclusion

Upon brainstorming what I wanted to focus on as a capstone project, I knew I wanted to focus on advocacy and social justice. Being a white male, I am privileged beyond what I deserve. I believe it would be a disservice to my community if I was not advocating for others. The unfortunate reality of today is that my voice sometimes carries different weight just because of what I look like. For those reasons and the ones mentioned above, this project is a combination of many different topics I am passionate about: sustainability, food, and social justice. The question *How can community gardens solve issues surrounding food insecurity and promote environmentalism in urban settings?* is one that will be answered throughout this project.

CHAPTER TWO

Literature Review

Introduction

This chapter will discuss the relevant literature related to the research question *How can community gardens address issues surrounding food insecurity and promote environmentalism in urban settings?* Four crucial aspects of this research question will be elaborated upon. First, this chapter will evaluate the current barriers surrounding food security in urban settings and describe some ways the United States government is addressing the problem. Second, this chapter will define healthy food, assess the negative consequences of an unhealthy diet, and discuss common diseases that can develop as a result. Next, this chapter will discuss how community gardens fit within the field of environmental education.. Finally, this chapter concludes with a commentary regarding why community gardens are a potential solution to issues surrounding food security, health, and environmentalism.

Food Insecurity

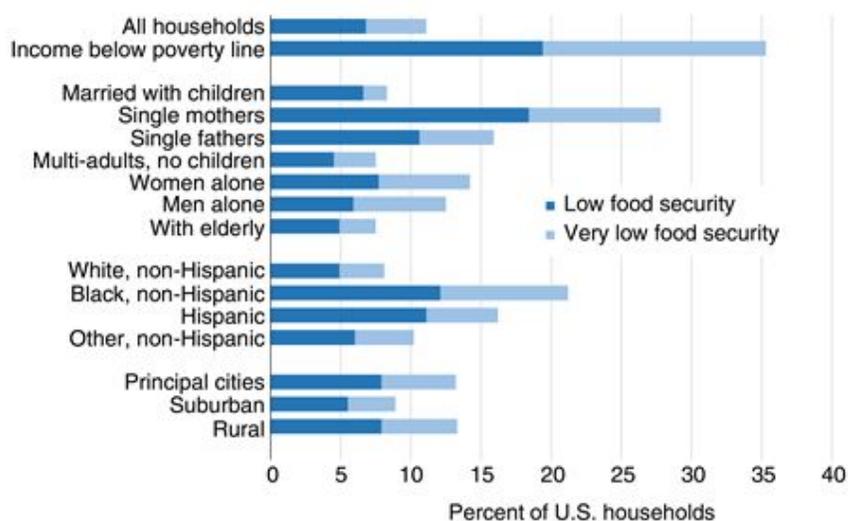
Chapter one discussed food as a human right, but food insecurity is still a major issue when understanding public health in the United States today. How a country that grows enough food to feed all of its citizens, but struggles to do so, should shock and disappoint anyone. When discussing food insecurity in the United States, it is vital to

understand who is most affected, where it is most likely to occur, and the effect it has on individuals. While food insecurity can happen anywhere in the US, in most cases it is concentrated in highly populated, low-income settings. In 2010, nearly 15 percent of American households were food insecure at some point during the year. For those families, food intake and eating patterns were disrupted at times because the household lacked money and other resources for food (Crowe et al., 2015). Since then, the rate of food insecurity has lowered to 11.1 percent (USDA, 2018). This change is encouraging overall, however the rate of food insecurity tripled (35.3 percent) for families living below the poverty line (2018). Furthermore, the likelihood of a household experiencing food insecurity is significantly higher for certain demographics including: single-parent households, African-American and Hispanic families, residents of large cities, and residents of rural areas (see Figure 1).

Figure 1

Prevalence of food insecurity by household characteristics

Prevalence of food insecurity by selected household characteristics, 2018



Note: Food-insecure households include those with low food security and very low food security.

Source: USDA, Economic Research Service using data from the 2018 Current Population Survey Food Security Supplement, U.S. Census Bureau.

Poverty is a determining factor of food insecurity. The poverty level varies with how many people are living in a specific family or household. Figure 2, produced by the United States Department of Health and Human Services (2020), shows the income threshold to determine poverty level per number of people in each household.

Figure 2

2020 poverty guidelines for the 48 contiguous states and Washington DC

2020 POVERTY GUIDELINES FOR THE 48 CONTIGUOUS STATES AND THE DISTRICT OF COLUMBIA	
PERSONS IN FAMILY/HOUSEHOLD	POVERTY GUIDELINE
For families/households with more than 8 persons, add \$4,480 for each additional person.	
1	\$12,760
2	\$17,240
3	\$21,720
4	\$26,200
5	\$30,680
6	\$35,160
7	\$39,640
8	\$44,120

In most states in the United States, poverty is disproportionately represented by black people and people of color. A report by the US Census (2012) found that in Minnesota, though white people make up 83 percent of the state population, the

percentage of white people living in poverty from 2007-2011 was 8 percent. During that same time, the percent of black people living in poverty was 21.3 percent, even though black people only make up 6 percent of the state population. Living in poverty restricts an individual's access to nutritious food. Because people of color are more likely to be living in poverty in Minnesota, they're thus more likely to lack access to nutritious food. Based on a 2009 report by the USDA, fresh produce and fresh seafood were less available in large grocers located in high-poverty areas. This shows a person in poverty is less likely to have access to a healthy, nutritious diet at the supermarket nearest to them. However, if a person living in poverty were to attempt to shop at a corner store closer to where they live, they would find higher prices, as these stores typically charge more for the same food (USDA, 2009). Oftentimes, these stores do not even carry fresh produce. Ultimately, if a person living in poverty wanted to purchase affordable, healthy food, it would require traveling to a far away supermarket. This solution is not perfect because public transportation is unreliable and can cost too much (2009). In addition, people in poverty are less likely to own a car according to the National Highway Administration's National Household Travel Survey (2014). A solution is needed.

Government assistance programs. One option food-insecure families have is to participate in a government assistance program, of which 61 percent did in 2014 (Coleman-Jensen et al., 2015). The United States government has initiated different programs to address the issue of food insecurity. Supplemental Nutrition Assistance Program (SNAP), Special Nutrition Program for Women, Infants, and Children (WIC) are two that are intended to act as a "safety net" for American families living in poverty.

In 2013, 15 percent of the US population received some sort of benefit program (Izzo, 2013). The US used poverty and income level to determine eligibility for different assistance programs.

Supplemental Nutrition Assistance Program. The goal of Supplemental Nutrition Assistance Program (SNAP) is to increase the purchasing power of American household, thus improving the diet and health of participants. SNAP allows a household to purchase fresh fruits and vegetables, meat and fish, dairy products, bread, and cereal at a cheaper cost. A report by Nord and Golla (2009) found that the months prior to entering SNAP, the prevalence of very low food security among participants grew by 12 percent and in the months following enrollment, the prevalence of very low food security dropped slightly.

Special Nutrition Program for Women, Infants, and Children. Special Nutrition Program for Women, Infants, and Children (WIC) provides supplemental foods, health care referrals, and nutrition education for low-income pregnant women, new mothers and infants and children up to age five who are found to be at nutritional risk (USDA, 2020). It provides a package of food deemed healthy and aimed to supplement the nutritional deficiencies of a low-income diet. WIC plays an important role for mothers and their young children living in poverty, serving as many people as funding allows (Feeding America, 2020). A study by Gai and Feng (2011) found WIC participants to have fewer years of education, lower household incomes, more likely to reside in single-adult households, and are likely to make unhealthy choices during pregnancy like smoking or

drinking. Despite these risk factors, the study found WIC to have a significant effect on birth, claiming that the program reduced the likelihood of a low birth weight.

National School Lunch Program. The National School Lunch Program (NSLP) is a program operating in public and nonprofit private schools across the United States. It works to provide “nutritionally balanced low-cost or free lunches to children each school day.” Sometimes a lunch is entirely free or provided at a reduced cost, depending on family income level. In 2016, 30.4 million children received benefits from NSLP (USDA, 2020). To determine eligibility, a family’s income must be 130 percent of the poverty level. Any family already receiving SNAP benefits qualifies for NSLP (Feeding America, 2020). According to Feeding America (2020), a school is required to provide children with one-third of their daily recommended intake of calories, protein, calcium, iron, vitamin A, and vitamin E.

Analysis of Government Assistance Programs. While SNAP, WIC, and NSLP have shown to promote healthy diets in low-income neighborhoods and ease financial burden on families, the programs do not always have the intended results. SNAP claims to promote health by allowing families to purchase healthy food and move towards self-sufficiency (USDA, 2020), but does nothing to address the fact that grocery stores are too far away from residents in low-income neighborhoods. Critics argue that the program actually increases the likelihood of obesity because it does nothing but subsidize the cost of unhealthy food. One study (Chaparro et al., 2017) actually found SNAP participants’ risk of obesity to double in Los Angeles. Furthermore, SNAP does not have a food counseling program that could point individuals in the right direction when

choosing healthy food. WIC, on the other hand, offers more in terms of counseling services but it is designed specifically intended for mothers and their children, which creates access barriers for other types of families. A study by Hofferth and Curtin (2005) found that participation in NSLP does little to address obesity and has been criticized for providing lunches too high in fat. Additionally, these programs cost the US government a lot of money. A large portion of the USDA budget goes toward subsidies for low-income families. In 2018, the US government spent \$68 billion for SNAP (CBPP, 2019), \$5.3 billion for WIC (USDA, 2020), and \$13.8 billion for NSLP. These programs, although a necessary solution to the financial needs of families, do little to address health risks of low-income families and cost US taxpayers billions of dollars while not solving food insecurity.

Summary

It is clear there are major problems in the United States regarding food security. Low-income families are affected most and, while the government has specific programs in place to aid affected families, there are downfalls. When food insecurity exists, in many cases, so do unhealthy eating habits. Oftentimes, problems are perpetuated when a family is born into poverty as poor diet can turn into life-altering illnesses. One example (Melchior et al., 2012) found that food insecurity of families with young children is a reliable predictor of obesity later in life. The link between food insecurity and poor nutrition is one that needs to be addressed. The next section will discuss the most prevalent issues regarding poverty and health issues.

Healthy Eating

When discussing a healthy diet, it is important to identify its contents and their values. Multiple studies (Bowman, 2007; Galal et al., 2010; Melchior et al., 2012; Robles et al., 2014) have found that as the absence of healthy food options grows, so does the risk of undernutrition, obesity, heart disease and other lifestyle-related illnesses. This section will discuss what the United States suggests as a healthy diet and outline the potential physiological and mental consequences of disregarding those suggestions.

Consistent fruit and vegetable intake is a large part of a healthy diet and plays an important role in lowering an individual's risk of chronic disease (CDC, 2004). In order to reduce the risk of these health concerns, it is recommended that an individual consumes five servings of vegetables, four servings of fruit, maintains a diet low in saturated and trans fats, and consumes "moderate" amounts of sodium, sugar, and alcohol (United States Department of Health and Human Services, 2005). It is worth noting that, per this recommendation, a serving is $\frac{1}{2}$ of a cup. Despite the CDC recommendation of daily fruit and vegetable intake, only about 10 percent (CDC, 2017) of American adults heed these suggestions. It is no surprise then, that in the United States dietary factors are associated with four of the ten leading causes of death – Type II diabetes, stroke, coronary heart disease, and some types of cancers (Robinson, 2008). Even more, diet is linked to other health issues like high blood pressure, obesity, osteoporosis, among others (United States Department of Health and Human Services, 2005). According to the CDC (2020), a healthy diet requires an emphasis on fruits and vegetables and must avoid saturated and trans fats, high cholesterol, and added sugars. Failure to maintain a healthy diet can lead to one of the many interconnected health risks (see Figure 3). In addition,

when speaking of high-income countries (based on GDP per capita), like the United States, people who struggle with food security also are at a higher risk of eating disorders, stress-related metabolic responses, and health-related illnesses (WHO, 2017).

Figure 3

Vitamins and minerals, benefits, location, and recommended daily value

VITAMIN	WHAT IT DOES	WHERE IT IS FOUND	DAILY VALUE*
Biotin	<ul style="list-style-type: none"> • Energy storage • Protein, carbohydrate, and fat metabolism 	<ul style="list-style-type: none"> • Avocados • Cauliflower • Eggs • Fruits (e.g., raspberries) • Liver • Pork • Salmon • Whole grains 	30 mcg
Choline	<ul style="list-style-type: none"> • Brain development • Cell signaling • Lipid (fat) transport and metabolism • Liver function • Muscle movement • Nerve function • Normal metabolism 	<ul style="list-style-type: none"> • Beans and peas • Egg yolks • Fish (e.g., cod and salmon) • Liver (e.g., beef and chicken) • Milk • Nuts • Salmon • Soy foods • Vegetables (e.g., broccoli, cauliflower, spinach) 	550 mg
Folate/Folic Acid	<ul style="list-style-type: none"> • Prevention of birth defects • Protein metabolism • Red blood cell formation 	<ul style="list-style-type: none"> • Asparagus • Avocados • Beans and peas • Enriched grain products (e.g., bread, cereal, pasta, rice) • Green leafy vegetables (e.g., spinach) • Oranges and orange juice 	400 mcg DFE**

Figure 3 continued

VITAMIN	WHAT IT DOES	WHERE IT IS FOUND	DAILY VALUE*
Niacin	<ul style="list-style-type: none"> • Cholesterol production • Conversion of food into energy • Digestion • Nervous system function 	<ul style="list-style-type: none"> • Beans • Beef • Enriched grain products (e.g., bread, cereal, pasta, rice) • Nuts • Pork • Poultry • Seafood • Whole grains 	16 mg**
Pantothenic Acid	<ul style="list-style-type: none"> • Conversion of food into energy • Fat metabolism • Hormone production • Nervous system function • Red blood cell formation 	<ul style="list-style-type: none"> • Avocados • Beans and peas • Broccoli • Eggs • Milk • Mushrooms • Poultry • Seafood • Sweet potatoes • Whole grains • Yogurt 	5 mg
Riboflavin	<ul style="list-style-type: none"> • Conversion of food into energy • Growth and development • Red blood cell formation 	<ul style="list-style-type: none"> • Eggs • Enriched grain products (e.g., bread, cereal, pasta, rice) • Meat • Milk • Mushrooms • Poultry • Seafood (e.g., oysters) • Spinach 	1.3 mg
Vitamin A	<ul style="list-style-type: none"> • Growth and development • Immune function • Red blood cell formation • Reproduction • Skin and bone formation • Vision 	<ul style="list-style-type: none"> • Cantaloupe • Carrots • Dairy products • Eggs • Fortified cereals • Green leafy vegetables (e.g., spinach and broccoli) • Pumpkin • Red peppers • Sweet potatoes 	900 mcg**
Vitamin B₅	<ul style="list-style-type: none"> • Immune function • Nervous system function • Protein, carbohydrate, and fat metabolism • Red blood cell formation 	<ul style="list-style-type: none"> • Chickpeas • Fruits (other than citrus) • Potatoes • Salmon • Tuna 	1.7 mg
Vitamin B₁₂	<ul style="list-style-type: none"> • Conversion of food into energy • Nervous system function • Red blood cell formation 	<ul style="list-style-type: none"> • Dairy products • Eggs • Fortified cereals • Meat 	2.4 mcg

Undernutrition and Malnutrition. Often, these two terms are associated with third-world countries or extreme poverty, but this is not the case everywhere. Although related, they have different meanings. Undernutrition occurs when not enough essential nutrients are consumed or when they are excreted more rapidly than they can be replaced while malnutrition occurs in people who are either undernourished or over nourished (Johns Hopkins, 2020). The Latin root mal- means “bad” or “poor”, so literally malnourished means poorly nourished. Therefore, it is entirely possible for a person with any body type to be malnourished. For example, a person with a diet that consists mainly of fast food or junk food could be considered malnourished because their body lacks the nutrients it requires to maintain healthy life. An individual who is malnourished may see reduced muscle function, a reduction in cardiac muscle mass, changes in pancreatic function, diarrhea, delayed wound healing, and a diminished immune system (Saunders & Smith, 2010). Additionally, malnourishment may cause an increase in the prevalence of depression and anxiety (2010). Again, since healthy food options are absent in urban, low-income populations, it is no shock that the people who live in that setting would be susceptible to either malnutrition or undernutrition. Additionally, this problem can be inherited. Residents in low-income neighborhoods are often caught in a cycle of malnourishment as infants are born into it. Children are often vulnerable to inadequate

prenatal and infant nutrition (WHO, 2020), thus, creating a pathway to a range of negative health outcomes later in life.

Obesity. In 2018, 42.4 percent of people in the United States were obese (CDC, 2018), a twenty percent increase from 1998 (Hill, 1998). Some scientists argue that molecular genetic factors play an important part in predisposition to obesity. Many others in the scientific community (Galal et al., 2010, Hill, 1998) argued that obesity is attributed to overconsumption of high-fat and high-sugar foods combined with lack of physical exercise. These environmental factors impact a person's body weight or composition because, at its most basic understanding, obesity is when energy input is greater than energy output. People who are obese are at a higher risk for other comorbidities like stroke, Type II diabetes, coronary heart disease, hypertension, and many types of cancer (NHLBI, 2013). Additionally, obesity is also linked to mental health issues like depression, anxiety, self-esteem issues, and can lead to other eating disorders like anorexia or bulimia (Sahoo et al., 2015).

The main tool to identify obesity in the United States is the Body Mass Index (BMI) (seen in figure four), which is the calculation of a person's weight in kilograms divided by the square of height in meters, or kg/m^2 (CDC, 2020). Figure four shows the range of BMI and measured classifications (CDC, 2020). It is also important to add that, while BMI does not directly measure body fat, research has found strong correlation linking it to other, more accurate measures of body fat (Freedman et al, 2013, Steinberger et al., 2005).

Figure 4*Body Mass Index*

BMI	Considered
Below 18.5	Underweight
18.5 to 24.9	Healthy weight
25.0 to 29.9	Overweight
30 or higher	Obese
40 or higher	Morbidly Obese

Obesity is even more exacerbated in low-income families and the food insecure. As mentioned earlier, many urban American cities have more corner stores, bodegas, and convenience stores than grocery stores and do not carry many fresh, healthy food options. A study by Rogers et al. (2015) at the University of Michigan found that among school districts across Massachusetts, for every one percent increase in low-income status, the obesity rate also increases by 1.17 percent. Another study (Robles et al., 2014) found that low socioeconomic status is strongly associated with obesity and obesity related chronic diseases. Two adjustments that can be made to address the obesity problem across the world are related to the environment in which people live (Hill, 1998). The first of Hill's

arguments to address the obesity problem around the world is to increase the availability of healthy foods. This theory suggests that if a person has more access to healthy food, they will eat it. The second is to foster a preference for less energy-dense foods in young children. Educating children early in their lives can help prevent them from falling into a pattern of over-indulgence and unhealthy eating habits later in life.

Type II Diabetes. In a healthy body, the pancreas produces insulin, which is a hormone that plays a key role in allowing our body to use glucose. Glucose is a type of sugar that provides energy for the cells and organs in our bodies to function properly. If an individual has Type II diabetes, their body either resists the effects of insulin or does not produce enough of it, causing damaged organs and in many cases, death (Mayo Clinic, 2020). In 2017, the CDC reported diabetes to be the seventh leading cause of death in the United States (83,564 people). Similar to obesity, Type II diabetes is a risk factor for cardiovascular disease and can be prevented by a healthy lifestyle. The Mayo Clinic (2020) recommends eating foods low in calories, high in nutrients, with a focus on fruits and vegetables. What's more, Type II diabetes is found more commonly among people living in poverty. Multiple studies (Beckles & Chou, 2016; Cheng et. al, 2012; Gaskin et al., 2014) found an inverse relationship between income and the risk of developing Type II diabetes. In each study, individuals who lived in poverty had the highest rate of Type II diabetes.

Heart Disease. Often used interchangeably with the term “cardiovascular disease,” heart disease is the leading cause of death in the United States, killing almost 647,000 people in 2017, or 25% of all American deaths (Center for Disease Control,

2017). According to the Mayo Clinic (2020), heart disease refers to conditions that “involve narrowed or blocked blood vessels” and can be caused by a diet high in fat, salt, sugar, and cholesterol. Additionally, other risk factors like Type II diabetes, obesity, or high blood pressure can contribute to heart disease (2020). For many in America, this disease is entirely preventable with the right diet and a healthy lifestyle. However, for a family stuck in a cycle of low-income status, heart disease can be quite common.

Mental Health. Eating healthy food has obvious effects on physical health. However there are indications that mental health is also impacted with a proper, or lack thereof, diet. Recent studies (Davidson et al., 2017; Melchior et al., 2012) imply that mental health is correlated with both food security and diet. As already discussed, families who experience poverty are likely to experience food insecurity, and thus are likely to have health problems at some point during their life. Children who experience food insecurity are twice as likely to experience a variety of behavioral and mental problems like anxiety, depression, hyperactivity, or inattention (Melchior et al., 2012). In order to address mental health and negative behavior in children, it is crucial to address issues of food security and how it relates to proper nutrition.

Current Solutions

It is easy to see why a healthy diet is such an important part of living a healthy life. However, when access to healthy food is denied, health risks and deaths follow. This is a major issue, specifically for those disproportionately affected by poverty, including people of color and those living in populous urban environments. As the health issues above show, low-income residents are at a higher risk for lifestyle-related illnesses. It is

not necessarily because they have chosen an unhealthy lifestyle, but because it has been chosen for them with the systematic removal of healthy food options. Some programs have been developed to solve this problem.

In 2010, First Lady Michelle Obama launched a campaign called “Let’s Move” in order to address issues surrounding childhood obesity. Her goal was to cut the childhood obesity rate by 5 percent by 2030 and eliminate all American food deserts. During this initiative, the United States passed the “Healthy, Hunger Free Kids Act” which “authorized funding and set policy for the USDA’s core child nutrition programs” (USDA, 2020). During that administration, American schools saw their first school lunch and breakfast reform in thirty years (2020). School cafeterias were expected to increase the availability of fruits, vegetables, and whole grains while simultaneously reducing the levels of sodium, saturated and trans fats. Additionally, schools were to meet the nutritional needs of students per the USDA guidelines (2020).

While Obama’s program expected all United States schools to adhere to these standards, she specifically tackled food deserts as well. Knowing the brevity of people living in a food desert, Obama allocated \$400 million towards bringing healthy food options to rural and inner-city areas with no or little access to fresh food (Let’s Move, 2011). Through this initiative, American companies like Disney, Nike, Walgreens, Blue Cross Blue Shield, and many others responded either by financial contributions or commitments to their communities (Let’s Move, 2017).

Another program is called The Sheridan Story. This program works to reduce the risk of hunger in Minnesota children. The program supplies students and families with

healthy food items during “gaps to food access” (Sheridan Story, 2020) like weekends, holiday breaks, or summer break. The Sheridan Story currently serves close to 250 schools around Minnesota (2020).

Summary

There are a number of health risks associated with poor nutrition. As outlined in this section, the lack of a healthy diet contributes to diseases that lead to an unhealthy lifestyle or death. Low-income families are often affected by improper diet, thus we see many inverse relationships between income and health. While there are current efforts to address this problem, community gardens are a good option for providing families with low-cost, nearby, healthy food. Urban, low-income neighborhoods are also affected by specific environmental issues that can impact their way of life. The next section will discuss various environmental problems that exist and how community gardens could mitigate them.

Environmental Sustainability

Thus far, this chapter has discussed how community gardens address issues of equity and human health. According to Greenleaf Communities, community gardens are not only important to the health and well-being of community members, but also to the environment. This section will discuss the environmental impact community gardens can make regarding the environment. Beginning with a description and the relevance of community gardens, this section describes some of the related environmental issues that can be mitigated with the addition of community gardens in an urban area.

What is a Community Garden?

A community garden is a piece of land gardened by a group of people (ACGA, 2007). Motivations vary, but ultimately a community garden connects people to each other and the environment. There is an increasing number of people who desire to be more environmentally friendly. These days, companies are commended for “going green” or being “sustainable”. In other words, there is a push for people to be better stewards of the environment. Being sustainable refers to the “actions taken by individuals, groups or networks of actors, with various motivations and levels of capacity, to protect, care for or responsibly use the environment in pursuit of environmental and/or social outcomes” (Bennet, 2018). In doing so, those who chose to engage in stewardship might engage in activities like creating or restoring protected areas, replanting trees, limiting harvests, reducing harmful activities or pollution, carefully purchasing sustainable products, and creating community gardens (2018). An individual’s motivation can be intrinsic (ethics, morals, values, self-determination) or extrinsic (cost/benefit related, natural, economic, social, legal. (Bramston et al., 2011). It may be assumed that an individual living in an urban setting may not have much context surrounding the environment, but in fact, an urban citizen has many opportunities to connect with the environment. A community garden is one connection that can mitigate detrimental human impacts, reduce dangerous pollutants, and return to a style of life before rapid urbanization of today’s cities. The following issues are some of the ways today’s cities are struggling in terms of the environment.

Urbanization

Urbanization is a growing concern for many around the world; many are concerned the world is urbanizing too quickly for food production to keep up. Simply put, there are too many mouths to feed where growing food is harder (Garau, 2004). Urbanization can either be classified as people moving from rural to urban areas or the physical expanse of a city (Satterthwaite et al., 2010). In 2008, the World's urban population exceeded its rural population for the first time in history (2010). In the United States, 80.73 percent of the population lives in urban areas as opposed to their rural counterpart (US Census Bureau, 2010). Additionally, the United Nations (2018) projects there to be 6.7 billion people living in urban areas by 2050 with little to no growth in rural areas as all (United Nations, 2008). As a result of this shift, agricultural productivity will continue to fall with less land allocated for farming. (Satterthwaite et al., 2010). In response, urban agriculture, like community gardens, is trending around the world as a potential solution.

Air Quality. According to Nowak and Heisler of the National Recreation and Park Association (2010), green spaces can help reduce air pollution. They estimate the annual removal of pollution done by vegetation to be 75,000 tons across the US. That is equal to \$500 million of economic benefit (2010). Cities often produce pollution from various human activities like vehicle operation or industrial waste. One type of pollution, Nitrogen Dioxide exceeds public health standards in many US cities (Pugh et al., 2012). Pugh et al. (2012) found that planting vegetation in urban areas can reduce street level nitrogen dioxide by up to 40%, finding that concentrations of dangerous pollutants in urban areas can be reduced with the help of different types of vegetation.

Urban Heat Islands. It is no secret that current human activities are detrimental to the environment. Much attention is given to carbon emissions and climate change, whose consequences will last generations. One phenomenon, called Urban Heat Island, is when an urban or metropolitan area is warmer than surrounding rural areas. In cities across the United States, urban areas can see temperatures as much as 16 degrees Fahrenheit difference (Voiland, 2010). Poor, inner-city neighborhoods show the greatest potential of being negatively affected by Urban Heat Islands (Solecki, 2011). There are several factors that cause a city to be warmer than surrounding areas. First, many cities use dark surfaces like asphalt, concrete, or roofing materials which absorb more solar radiation. While other places use these materials, urban areas simply use more than rural areas. Second, an increase in emissions from cars, air conditioners, and industrial activities (Li and Zhao, 2012) adds additional heat into the area. Third, a report by the United States Environmental Protection Agency (2008) suggests the removal of green spaces as a key contributor to urban heat islands. Agriculture is an incredibly useful mitigation strategy when addressing Urban Heat Islands (Kumar et al., 2017). Evapotranspiration, which cools the air by using heat from the air to evaporate water, and shading are two of the most powerful ways to mitigate Urban Heat Islands (EPA, 2018). Shading reduces the amount of solar radiation that is actually absorbed by dark surfaces and can block radiant heat from entering buildings if there are trees or larger plants blocking them (2018).

Food Mile. A food mile is the distance one food item travels from where it is grown or raised to where it is ultimately purchased by the consumer. For example, an

avocado grown in Mexico must travel almost 2000 miles to reach its destination of a bowl of guacamole in Minnesota. All the while, the vehicle that transports various pollutants onto the ground or into the atmosphere. A study by Rich Pirog (2001), of Iowa State University, found that the average piece of produce travels about 1,500 miles before it is consumed. In 2018, the EPA estimated Agriculture activities to be responsible for 9.9 percent of the total greenhouse gases. Community gardens present a way to lower these emissions as growing fruits and vegetables close to a consumer ensures the food is fresh and maintains minimal food miles.

Water Runoff. Polluted water runoff is a problem in today's cities. When water flows over a surface, it will either seep into the ground or flow to the nearest waterway. When stormwater, snowmelt, or floods flow over an impermeable surface like a road or roof, it can pick up anything from sediment, bacteria (from human or animal waste), pesticides (from lawn chemicals), chemicals from leaking vehicles, or nutrients from lawn fertilizers (USGS, 2020). As a result of climate change, storms and floods are likely to increase (EPA, 2017), adding an extra challenge. In response, many cities implemented "green infrastructure" to decrease the amount of pollutants that reach larger waterways. Community gardens are included in these efforts. Various cities in the US have found stormwater runoff to be more manageable in areas that have community gardens (Heather, 2012). A study by Kevin Levy (2009) at the University of Pennsylvania found community gardens to have a lower runoff rate when compared to vacant lots or housing developments.

Summary

A community garden decidedly increases urban vegetation. Though small, these green spaces can positively impact the environment of an urban setting. There are many issues related to human activities, but a community garden is one way for humans to start trending in a different direction regarding environmental detriment. “Community gardens themselves minimize detrimental environmental impacts by integrating their designs with living processes and encourage nature, learning, and environmental behaviors in urban settings” (Clavin, 2011). Adding a community garden to the urban landscape will improve air quality, mitigate the effects of urban heat islands, reduce fossil fuel emissions, and absorb and filter potentially polluted stormwater from reaching larger reservoirs.

Why Community Gardens?

According to the American Community Garden Association (2007), community gardens have a number of benefits that include: improving quality of life, being a catalyst for neighborhood change, producing nutritious food, preserving green space, reducing city heat from streets and parking lots, and providing opportunities for cross-cultural connections. There are many different types of community gardens. They can exist in vacant lots, rooftops, rural pastures, next to bike paths, among many other places. Motivations and reasons for gardening also vary. Some common motivators for participation in a community garden are honoring cultural heritage, growing food, and relaxing/leisure time (Pearsall et al., 2016). An African American individual is likely to garden in order to clean up or stabilize their neighborhoods while a Latino person might design their gardens to serve as a meeting place for the community (2016). A white

person may be there to clean up and stabilize vacant lots and Asian gardeners report using a community garden as a place to meet with family (2016). These reports, combined with data regarding food insecurity, health issues, and environmentalism should act as an inspiration for the support of community gardens.

In Minneapolis, the number of community gardens has tripled since 2013 (Star Tribune, 2016). In 2016, the city agreed to make close to 40 vacant lots available for community gardens, many of them on the North-side of Minneapolis, a low-income neighborhood with many residing in a food desert. A Star Tribune article (2016) about community gardens reports people changing their diets to include more fruits and vegetables and consider gardening as a legitimate way to sustain a healthy life. Minneapolis is intentionally creating a space for low-income residents to access cheap, healthy food. It is a decision that will continue to impact the neighborhood for years to come. A community garden makes healthy food more accessible to low-income families and can be a resource for community members to learn more about how to act more environmentally sustainable.

Summary

This chapter reviewed relevant literature in order to answer the question *How can community gardens solve issues surrounding food insecurity and promote environmentalism in urban settings?* The detail and information included in this chapter is crucial to understanding why community gardens are an important tool for creating equity and environmentalism in urban communities. The next chapter will provide

information regarding what this capstone project hopes to accomplish and how it will answer the research question as previously stated.

CHAPTER THREE

Project Description

Overview

This project is a curriculum designed to educate students in middle school about the benefits of urban community gardens. Community gardens are an option for city-dwellers to grow their own healthy, low-cost food. Minneapolis, Minnesota has multiple community garden programs, and I believe this curriculum can be adapted to take place at any established community garden. I intend to develop a unit of study that will facilitate students' understanding of the following learning outcomes: 1) How to set up and maintain a garden, 2) Why community gardens are important to urban neighborhoods, and 3) Why gardens are important to the environment.

Process and Outcomes

While designing this curriculum I will use the Understanding by Design (Wiggins & McTighe, 2012) framework. This process has three steps in which instructors should consider when building a lesson or unit. First, an instructor must identify the desired results, asking themselves questions like "What do I want my students to know?" or "What big ideas are important?" Next, it is important to determine acceptable evidence.

In other words, what will students show to demonstrate they have learned the intended outcomes? These should be authentic assessments that align closely with the learning goals from step one. Assessments that do not match the learning goals can lead to a frustrating experience for teachers and students. Step three of Understanding by Design is for an instructor to plan learning experiences the students will participate in. This final stage is when instructors develop lessons from which means students will receive the required information. Doing this well makes the two previous steps easier for students to access information and demonstrate understanding of a given subject.

This curriculum design process allows for teachers to critically think about what students need to know. In environmental education, there are countless topics that interact with each other that it can sometimes be overwhelming to think about. In addition, when teaching environmental education, I believe it would be a disservice to students to present them with a set of facts to memorize. This is not how to change attitudes and actions. Students must participate in activities that cause them to critically think about how they interact with the environment. It is for these reasons I chose Understanding by Design. I found the design process especially helpful when narrowing down which parts of the environment I want to focus on. During the early stages of this project, I kept thinking of different learning themes I could incorporate. While it was exciting to imagine the creative ways to incorporate different environmental components to my curriculum, I realized I needed to take a proverbial chill pill and critically think about what I want my students to learn. After, I landed on the following outcomes: 1) Learn how to start and

keep a garden 2) Learn why plants are essential to life on Earth 3) Learn how and why to choose healthier food options.

Setting and Participants

Minneapolis, Minnesota is the state's largest city by population with an estimated 425,000 people living within its border (U.S. Census Bureau, 2020). Like much of the United States, Minneapolis saw the grocery store industry change as suburbs grew around it, causing food security issues (Larson & Moseley, 2010). For this reason, I think the city is a great option for this unit of study.

This project is intended to be a "day camp" style in which middle school participants would register for a week-long course during late July or August. Choosing this time of year allows for many plants to be ready to harvest as the mid to late summer is the best to harvest fruits and vegetables in Minnesota (University of Minnesota, 2018). It is also important for the unit of study to take place at an already established community garden. Doing so allows each lesson to run smoothly and learning objectives to be met.

As mentioned in the introduction, I am a middle school science teacher for Minneapolis Public Schools. As I worked simultaneously as a teacher and on this project, I kept returning to the idea that I wanted to do something meaningful for myself and my students. Therefore, this project is designed for seventh and eighth grade students. My hope was to build something that could be used for everyone in a community, and I think it still can, but my desire to target specific learning standards I was familiar with was strong. Thus, I believe this project is one that can be used specifically to learn the identified standards (see Appendix)

Outline

Each day of this curriculum will include physical activity in the form of tending to the garden and structured play time at a nearby park, community building with the other participants, and a STEM lesson to help with the day's learning surrounding environmentalism. Each lesson should take approximately one hour to an hour and a half and explicitly teaches the themes from the environmental issues described in chapter two. The project also includes directions for activities that relate to the different themes throughout the week. These were intentionally designed to reinforce scientific concepts outside of lessons. Upon registration, participants take a survey to assess prior knowledge regarding community gardens and environmental issues (alternatively, participants could take the survey when they arrive the first day).

Assessment

Throughout this curriculum, student learning should be assessed constantly. The easiest way is through non-formal check-ins. For example, a facilitator can ask a student doing a STEM experiment, "tell me what's going on here" or "how does this relate to your life?" These formative assessments should be rather light and encourage students to consider new ideas and continue to grow in their scientific reasoning. They are also meant for teachers to be able to gauge how much students know and plan accordingly. In terms of summative assessment, the same survey will be given before and after to assess growth and curriculum effectiveness. The survey was created intentionally to gauge the value participants place on community gardens and their components, both before and after completion of the unit. Additionally, the end of the unit project, in which students

design their own community garden, is made to allow students to take what they learned throughout the week and put it together in a creative, culminating way.

Conclusion

This chapter discussed the methods for implementing a week long curriculum to take place at a community garden in Minneapolis. It included the rationale, participants, setting, project outline, and the curriculum framework. Chapter four will reflect upon the process of creating this project. It will review literature from chapter two, identify policy implications and limitations, make suggestions for future research, and explain why it is impactful to the environmental education profession.

CHAPTER FOUR

Reflections and Conclusion

Introduction

This capstone project is an attempt to make environmental education accessible and relevant to urban learners using community gardens. In doing so, I have created a 5-day curriculum, founded in STEM education, that provides students with valuable learning opportunities. In this chapter, I will reflect upon my journey in answering the question: *How can community gardens address issues surrounding food insecurity and promote environmentalism in urban settings?* I will review relevant literature that guided me during this project, then I will discuss the implications this work makes on policy. Next, I will comment on the limitations and barriers I encountered while working, make suggestions to future researchers, and provide details on how I intend to communicate my results. Last, I will touch on what sort of benefit this project has to my professional colleagues in the field of Environmental Education.

At the beginning of this project, I had a lot of trouble identifying what exactly I wanted to focus on. I was interested in sustainability and issues surrounding the environment, but also wanted to focus on advocacy for low-income, urban students. After much deliberation and discussion with those close to me, I found the prospect of this project and research question fascinating. Throughout the process, I have learned more about the history of food insecurity in the United States, issues regarding health and nutrition in low-income families, and environmental issues specific to urban

communities. It has been an incredibly eye opening experience. This chapter will summarize and synthesize my most important conclusions.

Major Learnings and Literature Revisited

In chapter two, I reviewed many different sources that applied to the topic of food insecurity, health effects of poor nutrition, and environmentalism. I found these three themes challenging, but fascinating, as I made connections between the variety of information available. Of the literature I reviewed, my most important conclusions are that poverty is directly correlated to food insecurity *and* poor nutrition, government assistance programs do little to address problems related to food insecurity, and the lack of green space in urban settings greatly impacts the quality of the natural environment. Upon making these conclusions, I decided my goal was to emphasize how a simple community garden can address a history of oppression in America and mitigate environmental issues specific to urban communities. In many cases, I was simultaneously surprised, and not, during my research.

Poverty, Food Insecurity, and Nutrition. According to the USDA (USDA, 2018) over one-third of families that live in poverty are also food insecure. Poverty also restricts access to nutritious, healthy food, as grocery stores in high-poverty areas do not always have fresh produce available (USDA, 2009). The absence of cheap, healthy food directly correlates to health issues within low-income families. Many diseases and detrimental health conditions, like cardiovascular disease, obesity, and Type II diabetes, can all be prevented by a healthy diet. Thus, in areas that lack healthy food options, or where cheaper, unhealthy options are more readily available, these conditions are likely

to manifest. While I was not surprised that my research supported the correlation between income level and health, I was surprised that such extreme disparities exist in the United States. As mentioned in chapter two, malnourishment is often associated with third-world or developing nations, but to be so close to these issues brought to my attention that there is much work to be done in terms of advocating for families living in poverty in our own neighborhoods.

Government Assistance Programs. Prior to this project, I had little knowledge of the variety of government assistance programs available for citizens. At its core it seems these programs, especially the ones mentioned in chapter two, seem to be designed to help those in need. Upon the conclusion of my research, I believe that restructuring needs to take place. My main criticism is that while programs do address issues of food insecurity, they do little to promote or educate its recipients about the benefits of eating healthy. One study (Chaparro et al., 2017) from Los Angeles, California found Special Nutrition Assistance Program (SNAP) participants' risk of obesity to double upon participation in the program. I think it is fantastic that food is made available to those in need. However, in order to support healthy citizens there needs to be education or guidelines for its use. I realize this suggestion may seem like it takes away the freedom for those who rely on government assistance programs, but to return to my goal of addressing issues of oppression, I believe education would be powerful means for change.

Impacts to the Natural Environment. As mentioned in chapter one, my students were one of my main inspirations for this project. I desire to advocate for my students in

my personal and professional life, as many come from low-income households. As a part of this project, I searched for ways to merge that desire with environmental education. Thus, I researched various environmental impacts that could relate to an urban student. Chapter two described some of the urban-specific issues surrounding the environment that would be taught during my unit of study. For example, water runoff is a serious issue in regards to the amount of pollution that reaches water reservoirs. When stormwater, snowmelt, or floods flow over an impermeable surface like a road or roof, it can pick up anything from sediment, bacteria (from human or animal waste), pesticides (from lawn chemicals), chemicals from leaking vehicles, or nutrients from lawn fertilizers (USGS, 2020). Another example that I wanted to touch on during my project was the benefit of acquiring food locally. A large portion of carbon emissions per year comes from agricultural activities (EPA, 2018). My hope is that students who participate in my unit of study would be inspired to make conscious decisions about where their food comes from and consider what they can do to improve environmental conditions.

Implications

As discussed in chapter one, there is no way to take back the history of racism and prejudice in the United States. The advent of American suburbs essentially sent affluent white people out of the city while low-income, people of color stayed. Little was done to ensure people of color were given the opportunity to succeed. Today, that segregation and income disparity continues to exist. In reflecting on my research, I believe a community garden can be an equitable tool to “level the playing field”. Though definitely not the only solution, the implementation of community gardens in urban communities

can help with problems of food insecurity and negative health problems caused by poor nutrition.

At the time of this writing, the Minneapolis City Council is in the early stages of attempting to defund the Minneapolis Police Department, redistribute money into the community, and establish a holistic approach to public safety and community safety. After discussions with a community garden organizer, I learned there is an inherent relational aspect to community gardens. When people gather together peacefully, they are likely to build community. Therefore, I suggest reallocation of money from the police budget towards resources in order to develop community gardens within urban neighborhoods. I believe doing so will foster a sense of community and empower residents to access a healthy lifestyle.

Limitations

There were a few limitations that made the creation of this project difficult, whether it be cost, time, location, or resources. My hope was to create a unit of study that would build upon students' science content knowledge. With this in mind, I was also careful not to "go overboard" with materials required. I believe the materials used in each lesson are quite reasonable and attainable. My project focuses on the "urban setting", not just Minneapolis, so I wanted to make it possible for another educator to pick it up and create meaningful instruction for their students. While creating this unit of study, I operated under the assumption that the community garden where we worked would already be well outfitted for this project. For example, I imagined a compost bin and a rain collection bucket in which students could see different ways in which a garden could

work. My goal was to create instruction with the ideal structures in place, knowing that some gardens have the capability and resources for these projects. After some reflection, I recognize that not every community garden has the same resources.

After I had decided to create a “day-camp” style project, I had five days to work with. In my experience, it is not logical to keep students in a lesson all day. I decided the best amount of time would be about an hour to an hour and a half, which gave me about five to seven and a half hours of direct instruction to plan for. My background in STEM education gave me the opportunity to plan effective lessons that would give students practice in science and engineering. However, I know that not every instructor is knowledgeable in STEM education. To gain best results, it is important an instructor is experienced and teaching STEM and can plan accordingly.

Another limitation of this project is the window of time given to complete this unit. The best time in Minnesota for growing and harvesting plants is mid- to late-summer. Thus it is likely that, should this unit ever be taught, there would only be four or five weeks to work with.

Future Considerations

To continue this research, it would be most beneficial for other researchers to test the effectiveness of my unit of study. While I did not have the opportunity to teach this curriculum, I would love to see how students learn intended learning objectives. While creating this project, I became incredibly excited about the prospect of actually teaching it, so it would be very satisfying to see it through. With that being said, if that were to

happen, I recommend to any educator with the intention of teaching this unit to read and review it in full.

One feature of this project I am proud of is that it can be adapted to any community garden. As mentioned earlier, the project itself is built with Minneapolis, Minnesota in mind, but could be modified to any urban setting. Additionally, a planful educator will be required to set up all lessons in advance, and even earlier in the case of lesson three.

Communicating Results

In putting together this project I have linked all relevant documents to my unit along with this capstone. I intend to share this project with my friends and family, but most importantly I intend to communicate results with my professional learning community. In my current school, I work closely with another science teacher who I have worked with along this journey. As our school's science department head, I hope I can educate her about my research, outcomes, and reflections.

Professional Benefit

This project has an enormous benefit to my professional development. As my career as an urban teacher continues, I intend to reflect upon my research and use the lessons I have created as part of my curriculum when I see fit. Since each lesson was based on Minnesota State Science Standards, I see no problem finding ways to teach these lessons in my own classroom. Additionally, I believe this work can be beneficial to my middle school science teacher colleague when teaching relevant environmental education.

Conclusion

In this chapter I reflected on the completion of my project and its attempt to answer the question *How can community gardens address issues surrounding food insecurity and promote environmentalism in urban settings?* I reviewed relevant literature, gave implications of this project, explained limitations, provided considerations to future research, told how I would present my project, and explained how my work benefits me and my profession. Throughout this work, I have found the marriage of advocacy and environmentalism inspiring and challenging. My hope is that this project can be beneficial to my colleagues in the field of environmental education and a product that can be a catalyst for change within urban communities.

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APPENDIX

The learning students gain during this unit of study meets the following Minnesota State Science Standards (Minnesota Department of Education, 2009):

- **7.4.2.1.1 Populations and Communities**

Identify a variety of populations and communities in an ecosystem and describe the relationships among the populations and communities in a stable ecosystem.

- **7.4.2.1.3 Populations and Resources**

Explain how the number of populations an ecosystem can support depends on the biotic resources available as well as abiotic factors such as amount of light and water, temperature range and soil composition.

- **7.4.2.2.1 Photosynthesis**

Recognize that producers use the energy from sunlight to make sugars from carbon dioxide and water through a process called photosynthesis. This food can be used immediately, stored for later use, or used by other organisms.

- **7.4.2.2.2 Food Webs**

Describe the roles and relationships among producers, consumers and decomposers in changing energy from one form to another in a food web within an ecosystem.

- **7.4.2.2.3 Matter Transfer in Ecosystems**

Explain that the total amount of matter in an ecosystem remains the same as it is transferred between organisms and their physical environment, even though its form and location change.

- **7.4.4.1.2 Humans Changing Ecosystems**

Describe ways that human activities can change the populations and communities in an ecosystem.

- **8.1.3.3.3 Impacts of Technology**

Provide examples of how advances in technology have impacted the ways in which people live, work and interact.

- **8.3.4.1.2 Land & Water Uses**

Recognize that land and water use practices can affect natural processes and that natural processes interfere and interact with human systems.

- **9.1.3.3.3 Multi-disciplinary Efforts**

Describe how scientific investigations and engineering processes require multidisciplinary contributions and efforts.

- **9.3.2.3.1 Cycling of C, O and N**

Trace the cyclical movement of carbon, oxygen and nitrogen through the lithosphere, hydrosphere, atmosphere and biosphere.

- **9.3.4.1.2 Human Alterations of Earth**

Explain how human activity and natural processes are altering the hydrosphere, biosphere, lithosphere and atmosphere, including pollution, topography and climate.