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Supporting Educators in Teaching
Healthy Habits Through Gardening

by

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PROJECT ABSTRACT

This paper analyzes the factors contributing to the rise in childhood obesity, and how educators can use gardening as a tool to teach healthy habits to students. Childhood obesity rates have dramatically risen in the past thirty years. There are many factors contributing to this epidemic, but a review of literature revealed three main factors: food deserts and food swamps, quality and marketing of food in public schools, and children not meeting recommended physical activity minutes. After analyzing the factors contributing to childhood obesity, an online resource guide was created for educators to teach children healthy habits through a school garden. School gardens have many positive outcomes including academic, social and behavioral. Teachers should use the resource guide as a supplemental tool, in conjunction with other curriculum and a school garden. The goal is for students to gain a healthy understanding of nutrition and physical activity at a young age, so they can grow into healthy, active adults.

Keywords: Garden-based learning, gardening, nutrition, obesity, school garden, teacher resource

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Chapter One: Definition of the Problem

When people think of individuals affected with a chronic disease, heart disease, cancer or Alzheimer's disease often come to mind. Unfortunately for the families of 12.7 million children, chronic disease means also obesity. According to the Center for Disease Control and Prevention (2017), childhood obesity, also known as pediatric obesity, is the most common chronic disease in children. The problem occurs at an alarming rate across the United States in children ages 2-18, but is most prevalent in school-aged children ages 6-11. Over the past 30 years, the amount of children diagnosed as obese has tripled. Children who are overweight have a higher risk of type-2 diabetes, some cancers, heart failure, depression, and liver disease (Beck, Rayburn and Warren, 2018). Obesity creates immediate health risks, but also many health risks in the child's future should the disease not be addressed at a young age.

Various politicians, educators, and health advocates have implemented programs in an attempt to tackle the childhood obesity issue. The programs target both schools and communities, in an attempt to provide resources for *both* environments in which children spend their days. Has it been enough? Considering the national average of obese children is still around eighteen percent (Obesity Action Coalition, 2018), there is plenty of space for improvement. If children begin healthy habits at a younger age, there is a higher chance of preventing obesity (Jester, Kreider, Ochberg & Meek, 2017). The following questions guided my literature review and provided a foundation for this project:

- Why have the obesity rates dramatically risen in the past thirty years?
- What needs to be done to help decrease the amount of overweight children?

Purpose of Project

As a daughter of two physical education teachers, I grew up hearing my parents express their sadness about extremely overweight students during the California Physical Fitness Testing. They both felt that they were doing their jobs as physical education teachers, but yet these students looked as if they had no physical activity. My parents discussed over dinner how they could better serve their students. I did not think much about it at the time, but now I am working in the elementary schools as an adult and see the abundance of overweight children. Some children do not want to go outside to recess with their peers. Some students fake an illness when it is time for physical education class, so they can make a trip to the nurse instead. My parents' sadness is now my own sadness.

In an effort to decrease the amount of overweight or obese children, I have developed a nutrition and physical activity resource guide for teachers involving a school garden. The project is in the form of an online website. The purpose of this project is to design a supplemental resource that incorporates math, language arts, science and physical activity standards into lessons, in conjunction with a school garden. My hope for this resource guide is to provide teachers with enough nutrition and gardening information to use in their work with elementary students, so they can then transfer the information to their homes and communities.

Preview Literature

Determining the layout of my project started with researching and understanding what factors contribute to childhood obesity. Health experts, politicians, and school administrators all agree that the data shows an extreme increase in overweight and obese children (Jester et. al, 2017). The literature review was conducted to discover why the rates are as high as they are.

Several common themes emerged in the literature review: food deserts, marketing and quality of foods in public schools, and lack of physical activity in school-aged children. The first theme I will discuss in detail in Chapter Two is related to food deserts. The literature provided evidence of food deserts in low-income areas, in which families do not have close access to fresh and nutritious produce (Shafft, Jensen, & Hinrichs, 2009; Dubowitz, Ghosh-Dastidar, Cohen, Beckman, Steiner, Hunter, Florez, Huang, & Vaughan, 2015). Second, studies show that children are not receiving the opportunity to meet the state recommended physical activity minutes (Turgeon, 2013; Institute of Medicine, 2013). Chapter Two will discuss what these recommendations are, and the problems with not meeting them. The third theme that will be examined in detail is the marketing of food in public schools. Schools have contracts with marketing agencies that expose students to unhealthy food. On top of the marketing, the food actually served in the schools lack nutritional benefits that children need for growing bodies (Ohri-Vachaspati, Turner, & Chaloupka, 2012).

After researching the factors contributing to childhood obesity, I then reviewed literature regarding previously implemented programs in schools that address the issues listed above. *Grow It, Try It, Like It!* is a nutrition educational kit funded by the United States Department of Agriculture's Team Nutrition (United States Department of Agriculture Food and Nutrition Service, 2017). This resource provides nutrition education to children and their families through interactive activities. *Growing Healthy Habits* is a program by the University of Maryland Extension, College of Agriculture and Natural Resources. It is a garden based nutrition curriculum that encourages students to eat more fruits and vegetables, and educates them about nutrition guidelines. *Kids Gardening* is a national nonprofit organization that provides kids with opportunities to increase nutritional knowledge, provides teachers with lesson plans and

classroom resources, and brings the community together through nutrition and gardening. To incorporate physical activity into the gardening aspect of the curriculum, I used information from researchers such as Jeff Restuccio, who wrote *Fitness the Dynamic Gardening Way* (1992), as well as information from the Oregon State University Balance Education Physical Activity (BEPA) Toolkit (Oregon State University, 2017). After researching and analyzing the factors contributing to childhood obesity, in addition to reviewing programs already implemented, I formed the basis of my project in the form of an online resource guide for teachers.

Preview Methodology

In order to create this resource guide, I gathered information from the World Health Organization, Center for Disease Control and Prevention, and the California Department of Education regarding the nutrition guidelines, physical activity requirements, and policies in place regarding physical education and dietary guidelines in California public schools. After analyzing these core areas, I designed a website for educators to teach students about nutrition and physical activity, and how the school garden can meet both of those needs. I used the health expert saying, “Eat the rainbow” to arrange the plants by sections according to their color (American Heart Association, 2018). The sections are broken down into red, orange, yellow, green, and blue/indigo/violet. Each color section has multiple plants with fun facts and harvesting information under each of them. I created an additional tab for lesson ideas and various resources for teachers to use, according to which plant they currently are harvesting in their school garden. The website has a plethora of information, yet is user-friendly and easy to navigate.

Significance of Project

This project will affect students, families, and the community as a whole. First, educating the teachers with this curriculum will plant the seed of health education. Not all teachers are aware of the nutrition guidelines and physical activity guidelines for children. Additionally, most people are unaware of the physical benefits a garden can provide for students. Educating teachers means educating the front line of defense; teachers will pass on the knowledge to every student in his or her classroom. If the children are healthier and more active, their bodies are more available for learning.

Secondly, having the school garden can involve not only the students in the classroom but can turn into a school-wide effort. A school garden can even transform into a community effort. The school garden will need to be maintained over the weekend and while the students are on breaks. Opening the doors to community involvement in order to maintain the garden is creating a tighter, healthier community environment. Nutrition, growing organic food, and engaging in physical activity are all positive lifestyle changes. By educating children at a young age, public schools can better prepare them for a more nutritious and active adult lifestyle.

Summary of Chapter

Childhood obesity is a pressing issue in the United States, as the numbers of overweight or obese children have tripled since 1980 (Hales, Carroll, Fryar & Ogden, 2017). Although certain groups have a higher prevalence of obesity, the problem being is exposed across all ethnic and socioeconomic backgrounds. There are many factors that contribute to the rising numbers and expanding waistlines of children. First, there are rural neighborhoods that do not have quick access to fresh fruits and vegetables, so parents are resorting to convenience stores and/or fast food restaurants to feed their children. Secondly, children are not meeting the

recommended physical activity minutes at school or at home. This is due to the lack of physical education in public schools, in conjunction with more time spent behind electronic devices at home. Third, although there has been a change in policy in recent years, the food served in public schools is still unhealthy. When children in low-income schools are provided with free and reduced lunch based on their parents' income, they are often times receiving food that lacks nutritional benefits. This is a double edge sword because the caloric intake is high, while the physical output of calories is low. The Center for Disease Control and United States Department of Agriculture have implemented programs such as *Grow it! Try it! Like it!* and *Growing Healthy Habits* in an attempt to decrease the amount of overweight youth. The purpose for the resource guide I designed is to bring multiple resources together in one place, an online website, for teachers to teach students the importance of healthy eating, physical activity, and how to grow their own produce in a garden.

Definitions

The following key terms are defined to clarify the meanings as used throughout my paper. The meanings of the key terms are specific to the context of this paper.

Body Mass Index is the amount of body fat a person has. It is calculated using a specific formula, and divided into percentiles to determine the possibility of obesity.

Food desert is a region that lacks accessibility to fresh fruits and vegetables due to the absence of farmer's markets, grocery stores, or healthy food providers.

Food swamp is a region with more readily available unhealthy foods than healthy foods. There is typically an overabundance of fast-food establishments in food swamps.

Obese is defined by the Center for Disease Control and Prevention as having a Body Mass index (BMI) at or above the 95th percentile, as compared to the same age and gender.

Overweight is defined by the Center for Disease Control and Prevention as having a Body Mass Index (BMI) between the 85th and 95th percentile, as compared to the same age and gender.

Screen time is the amount of time children are spending in front of the television, cell phone, or any other electronic device.

Chapter Two: Literature Review

Obesity is a worldwide epidemic that currently affects roughly one in five school-age children and adolescents (Center for Disease Control and Prevention, 2018). Becoming overweight or obese is caused when a person consumes more caloric energy from foods and beverages than is exerted. The differences between the two, however, are the percentiles. Health experts measure overweight and obesity using a person's Body Mass Index (BMI), which is their weight in kilograms, divided by the square of height in meters (Center for Disease Control and Prevention, 2018). After BMI is calculated, children are ranked based on their gender. Overweight children have a BMI at or above the 85th percentile, and below the 95th percentile. Obese children are above the 95th percentile. Overweight children do not have the same dire risks as obese children when they are young, but both can lead to unhealthy adult lifestyles. For obese children, their future will contain any combination of serious health problems such as heart disease, stroke, high blood pressure, some cancers, or premature death (Beck, Rayburn & Wallace, 2018).

I conducted a review of the literature to determine some factors leading to the increase of overweight and obese children. The literature review began with research relating to factors in school settings that are affecting children's weight, and then looked at possible factors in the home and community settings affecting children's weight. After determining some factors

leading to childhood obesity, I then reviewed previously implemented garden-based programs attempting to address the obesity issue. The results of the literature review drove the process to create a resource guide for teachers incorporating academics and a school garden.

Food Deserts and Food Swamps

Food deserts are areas, most often in low-income neighborhoods, in which families do not have access to wide arrays of fresh and nutritious produce (Ghosh-Dastidar, Cohen, Hunter, Zenk, Huang, Beckman, & Dubowitz, 2014). The United States Department of Agriculture estimates that more than 23 million Americans live in a low-income area that is more than one mile from the nearest grocery store in urban areas and more than ten miles away in rural areas (Office of Community Services, 2017). Although there are current school-based interventions that could offset weight gain due to food deserts, the lack of supermarkets in some areas offset the changes being taught in the school intervention programs (Thomsen, Nayga, Alviola, & Rouse, 2015). Families cannot choose healthy foods if there is no access.

In addition to the supermarkets being miles away from the low income families' homes, transportation to the fresh produce is also an issue. For some families, they run into problems such as access to a car, safe neighborhoods to walk in, or access to sidewalks (Wright, Donley, Gualtieri, & Strickhouser, 2016). For those that do not have quick access to a grocery store, liquor stores or corner convenience stores are their next option. Nutritional foods are scarce at convenience stores, and fresh produce is almost unheard of. If fresh produce is found at the convenience stores, the cost is often very high (White House Task Force on Childhood Obesity, 2010). Some studies have shown that having new access to a grocery store did not change the fruit and vegetable consumption versus prior to the grocery store being built (Wright et al., 2016; Dubowitz et al., 2015; Reel & Badger, 2014).

High exposure to fast food establishments coupled with a disproportionately lower number of grocery stores in the same areas have led to what researchers call food swamps (Reel & Badger, 2014). Fast food restaurants are more likely to locate in areas where there are higher concentrations of minorities than whites, leading to higher caloric intake in minorities and therefore contributing to higher rates of obesity. Some researchers believe that it is the food swamps, not the food deserts that more accurately predict obesity (Cooksey-Stowers, Shwartz, & Brownell, 2017).

Children who do not have reliable food sources are being affected academically and psychosocially. Children who have food insecurities have lower math scores, are more likely to repeat a grade, and are more likely to receive Special Education Services or mental health counseling than those children without food insecurities (Alaimo, Olson, & Frongillo, 2001). Children experiencing food insecurities are also more likely to be absent or tardy to school than their food-secure peers (Murphy, Wehlet, Pagano, Little, Kleinman & Jellinek, 1997). When children come to school without eating breakfast, their brains are not readily available for learning new information. Many administrators and educators have acknowledged this phenomenon, which is why schools participate in Free or Reduced Price Meals program (United States Department of Education, 2018). Roughly 20 million students in the United States are accessing this program per day (School Nutrition Association, 2018).

Some well-known efforts to address the food desert and food swamp crises are the *Healthy Food Financing Initiative* (Holzman, 2010), *Let's Move!* (White House Task Force on Childhood Obesity, 2010) and *Regional Nutrition Education and Obesity Prevention Centers of Excellence* (USDA National Institute of Food and Agriculture, 2015). There is not sufficient evidence concluding the results of these types of programs and their benefits on obesity, but the

obesity statistics have plateaued in the past eight years (Center for Disease Control and Prevention, 2018).

Quality and Marketing of Food in Public Schools

Almost every child in the United States will go through a public school at some point in their childhood. During school time, children are exposed to a variety of things. Children are seeing pizza, vending machines, soda and candy in their cafeterias and student stores. Children are seeing physical education classes being eliminated (Troost, & van der Mars, 2009). However, the reviewed literature found that schools are starting to eliminate vending machines, reinstitute physical education classes, and provide healthier choices in school cafeterias (Moyers, Bugle, & Jackson 2005).

As of 2006, each school district began implementing a District Wellness Policy (DWP). The DWP has two parts. The first part is regarding nutrition education and physical education. The second, however, is regarding the food served in the school cafeterias. There are specific guidelines about the amount of calories, sugar, fat, sodium and caffeine content in the foods served in schools (United States Department of Agriculture Food and Nutrition Service, 2017). Part of this includes eliminating the marketing of unhealthy food and beverages, because it is contradicting what the children are learning about healthy eating inside classrooms (Turgeon, 2013). It took a while to determine a deadline, but as of June 2017, schools must comply with all requirements of their districts school wellness policy (United States Department of Agriculture Food and Nutrition Service, 2017). However, there is not sufficient evidence to prove that all schools are abiding by these District Wellness Policies. In fact, one study showed that teachers were often not even aware of their district's wellness policy (Turgeon, 2013).

In the 2016-2017 school year, 58.1% of California elementary school students qualified for Free or Reduced Price Meals (California Department of Education, 2018). The United States Department of Agriculture's National School Lunch and Breakfast Programs regulate the nutrition standards for federally reimbursable school meals. Regulations are placed on schools regarding the nutritive contents of food, and include the following requirements: less than 200 calories per portion, less than 35% fat (and zero trans-fat), less than 200mg of sodium per portion, and less than 35% of calories from sugar (Center for Disease Control and Prevention, 2012). Given the regulations, the sale of foods of minimal nutritional value (FMNV) is prohibited where reimbursable school meals are being sold (Center for Disease Control and Prevention, 2012).

Competitive foods and beverages are those that are sold to students at school outside of the federally reimbursable meal programs (California Department of Education, 2017). Some examples include food and beverages sold in vending machines, student stores, fundraisers, snack bars, and a la carte. These competitive foods are high in calories, fat, sodium, and sugar, but are not considered to be foods of minimal nutritional value (FMNV), therefore are not prohibited in schools (Turgeon, 2013).

States have been implementing policies since 2003 that restrict the availability of competitive foods. The most recent attempt to monitor quality of food in schools is the *Healthy, Hunger Free Kids Act* of 2010. Enacted in 2013, the Food and Nutrition Service released proposed standards to limit calories, total, saturated, and trans fats, total sugars, sodium, and portion sizes of competitive food and beverages (Dinour & Pole, 2017). The standards align with the 2010 Dietary Guidelines for Americans. Some studies show the impact of limiting competitive foods were not statistically significant (Fernandes, 2013; Vericker, 2012). Other

studies however, show that in comparison to schools with no policy on unhealthy foods, schools with strong policies are significantly associated with lower BMI rates, lower odds of being overweight or obese, and better dietary outcomes (Datar, 2016). Additionally, children living in states with weak competitive food laws had over 20% higher odds of being overweight or obese than children living in states with no competitive food laws (Hennessy, Oh, Agurs-Collins, Chriqui, Masse, Moser & Perna, 2014).

Aside from the *quality* of food in schools, *marketing* of unhealthy food in schools was a common theme through the literature review. Studies showed that substantial efforts are put forth year after year to expose students to high fat and sodium foods, fast-food, and soda (Merlo, Olsen, Galic & Brener, 2014). Specifically, more than \$149 million is spent on marketing food and beverages in schools annually (Merlo, et al., 2014). Educators and health experts argue that schools should create an environment with consistent messages to students about healthy eating by implementing policies that allow only food and beverages that align with nutrition standards (Merlo et al., 2014). There is evidence that displays an increase of restricting marketing of non-nutritious foods, but still only fourteen percent of school districts have this restriction (Piekarz, Schermbeck, Young, Leider, Ziemann, & Chriqui, 2016).

Children Not Meeting Recommended Physical Activity Minutes

Through the literature review process, it became evident that the physical activity recommendations for children are not being met. This is true for children at home as well as at school (Piekarz, et al., 2016; Dentre, Beals, Crouter, Eisenmann, McKenzie, Pate, Saelens, Sisson, Spruijt-Metz, Sothorn & Katzmarzyk, 2014). As of January 2012, only eleven states had written policies requiring a specific number of minutes of physical education for students (Carlson, Sallis, Chriqui, Schneider, McDermid, & Agron, 2013). Because of this, only 42% of

children ages 6 to 11 years and eight percent of adolescents ages 12 to 19 years are meeting the physical activity guidelines of 60 minutes of moderate-to-vigorous physical activity every day (Carlson et al., 2013). This 60 minute recommendation comes from the California Department of Education and the Center for Disease Control and Prevention. Not only does physical activity address the weight issue, it has also been shown to improve academic and cognitive development (Dentro et al., 2014).

The District Wellness Policies, as mentioned in the previous section, are required to address goals for students' health education and physical education. Schools are writing goals for physical activity requirements, but the wording is ambiguous and the term *physical activity* is being generalized to recess and walking to and from class (Carlson et al., 2013). Although wellness policies are in place, they are not being implemented in schools (Turgeon, 2013). Only 3.8% of elementary schools in the United States have daily PE classes (California Department of Education, 2009). Public elementary schools are also eliminating the quality physical education classes and physical education teachers due to budget cuts, resulting and unqualified general education teachers "teaching" physical education, or students missing out on physical education altogether (Kosa-Postl, 2006). Educational policies such as No Child Left Behind (2001) put pressure on teachers to meet academic standards in order to keep school funding, so other subjects such as art, music, and physical education felt the brunt of the cuts (Carlson et al., 2013; Kim, 2012). Forty-four percent of school districts reported cutting time in areas such as art, music, and PE (Troost & van der Mars, 2010).

In addition to children not reaching the recommended daily physical activity minutes at school, they also have more sedentary lifestyles at home than ever before (Dentro et al., 2014; Werner, Teufel, Holtgrave & Brown, 2012). With the advancing world of technology we are

currently living in, it is common to see children eating dinner in front of the television, playing on their electronic devices until nightfall, or watching television in their bedrooms when they typically should be sleeping (Werner et al., 2012). One study from New York Women, Infant, and Children (WIC) Agencies examined 2,761 adults with children ages one to five, and found that viewing television and videos and having a television in the bedroom were both linked with the prevalence of overweight children (Dennison, Erb, & Jenkins, 2002). Higher screen time results in lower outdoor play and physical activity (Werner et al., 2012; Lindsay, Sussner, Kim & Gortmaker, 2006). If the children are already missing out on physical activity at school and come home and sit around, it is more likely they will have a higher risk of being overweight or obese (Werner et al., 2012; Dennison, Erb & Jenkins, 2002). Another study concluded that children who watched television more hours a day and children who watched television for longer periods of time in one sitting were less likely to engage in physical activity, thus having a higher chance of being overweight (Ariza, Chen, Binns & Chrostoffel, 2004; Lindsay et al., 2006). In concluding this section of the literature review, it was determined that sedentary behavior in children is at an all-time high, while physical activity levels are low.

Reviews on Previous Garden-Based Programs

Williams and Dixon (2013) conducted a synthesis of research between 1990 and 2010 analyzing the impact of garden-based learning on academic outcomes in schools. Through a review of 48 studies, they concluded garden-based learning had an overwhelmingly positive impact on students' grades, knowledge, attitudes, and behavior (Williams & Dixon, 2013). Most garden-based learning programs focus on academics, mainly math and science, but the outcomes are much more than that. The benefits of gardens are academic, behavioral, recreational, social (sense of belonging, compassion), and political (garden as a community effort) (Blair, 2009).

Students learn better with hands-on experiences. In another synthesis of studies, Blair (2009) concluded that gardens showed an increase in students' science achievement and behavioral improvement. Additionally, 9 qualitative studies unanimously reported positive learning and behavior effects after implementing a school garden (Blair, 2009).

At Caroline Elementary School in rural New York, a college student and a professor started a garden to show students where their food comes from, address the problem of food insecurity, and involve the community in harvesting the crops. The students even held a farmer's market to sell the food they grew in their school garden. Some researchers believe if the students have a hand in working the garden and learning about it in classes, they will be more likely to choose its harvest for lunch (Erikson, Barken, & Barken, 2015).

Although reviews of literature show many positive outcomes, it must be noted that the programs have not been analyzed for long-term effects on students' health and nutrition knowledge. Most reviews of garden-based learning are short-term, and all measure different things. The implementation of school gardens are not uniform, therefore the evaluation of garden based learning programs needs to be more rigorous and evaluate long-term effects to be more valid (Blair, 2009). However, because of the overwhelming positive effects reviewed in current literature, garden-based learning will be the foundation for this project.

Summary of Chapter

The literature review of factors influencing childhood obesity focuses primarily on food deserts, quality and marketing of food in schools, and children not meeting recommended physical activity guidelines at home or at school. In school, where children spend more than half their time during the week, marketing strategies are aiming to infiltrate students' minds with ads about junk food, soda, and fast-food. The students are being sent mixed messages while various

programs such as *Healthy Food Financing Initiative* (2010) and *Let's Move!* (2010) are aiming to teach students healthy food and physical activity habits. Aside from the marketing, the quality of food is also up for debate with school administrators (Datar & Nicosia, 2016; Dinour & Pole, 2017; Fernandes, 2013). Competitive foods, those sold outside of the federally reimbursable school meals, are high in sugar, fat, and sodium (Center for Disease Control and Prevention, 2014). These are mostly sold in vending machines, snack bars, student stores, and a la carte. Health professionals, educators, administrators, and parents are pushing for reform relating to the selling of foods of minimal nutritional value. District wellness policies are written to address the quality and marketing of foods in schools, but studies have shown the gap between policy and practice (Turgeon, 2013).

Secondly, research shows the correlation between food deserts or food swamps and childhood obesity (Cooksey-Stowers, Schwartz & Brownell, 2017; Ghosh-Dastidar et al., 2014; Thomsen, 2015). Either the families do not have readily accessible fresh produce, or they are stuck in food swamps- an overabundance of fast food establishments in a small proximity to their homes. Food deserts and food swamps are typically in lower-income areas, therefore often times affecting more minorities than whites (Cooksey-Stowers, Schwartz & Brownell, 2017).

The third factor relating to the obesity issue is children not getting enough physical activity. At school, teachers are being forced to teach more academics to keep school funding, and physical education is one of the first things to be eliminated when there is a time crunch or a budget cut (Kim, 2012; Fernandes, 2013). The benefits of physical activity are often overlooked, but they are plentiful. Not only are kids missing out on physical education at school, but they are then going home and participating in excessive amounts of time behind the television or other electronic devices. Program such as *Let's Move!* (2010), *Regional Nutrition Education and*

Obesity Prevention Centers of Excellence (2015), and *School Lunch and Breakfast* (1975) are attempts to combat the unfortunate health problems our children currently face. There are dozens of attempts to help prevent childhood obesity in the communities today.

Chapter Three: Methodology

Childhood obesity is an epidemic that has gained a lot of attention in the past 8 years. With the average number of obese children remaining at a staggering 18% (Obesity Action Coalition, 2018), it was necessary to first understand the factors contributing to obesity. Studies from the literature review provided a framework for the content within the online resource guide and guided the type of standards-based instructional materials chosen. The resulting themes within the literature review that play an important role in childhood obesity were access to healthy food, lack of physical activity, increased screen time, and exposure to unhealthy food at school and at home. After consideration of these themes, along with reviewing previously implemented school garden curriculums, the online resource guide was created to provide teachers with tools to educate young children towards a long life of being healthy, active adults. The purpose of this project was to create a resource guide to support teachers in combining physical activity and academics with a school garden. A school garden has many academic, physical, and social benefits and is a step in the right direction in an attempt to prevent obesity.

Design

This online resource guide was designed to provide teachers with information and resources on how to incorporate academics and physical activity in a school garden. I wanted to combine nutrition facts, harvesting information, lesson plans, and activity ideas into one easily accessible and user-friendly website. In order to align Common Core State Standards, this resource guide was specifically designed for fifth grade teachers but can be altered for any grade

level. The resource guide can be used daily, weekly, or monthly, depending on the teacher's goals.

Teachers already have many academic and social areas to teach, therefore they may not have extra time to teach gardening. Through a review of previously implemented garden-based learning programs, I discovered that gardening can incorporate math, science, English Language Arts, physical activity, and social skills. This online resource guide brought all of these areas together in one conveniently-located website. Some science themes included in this project were plant parts, water properties, seed varieties, photosynthesis, insects, and pollination. Some math concepts included in the project were measuring, data collection, numbers and operations, and word problems. English language arts concepts included writing, speaking, and listening. The physical activity recommendations included strength, endurance, and flexibility. I brought all of these concepts together through various activities and lesson plans, available based on the type of plant the teacher wishes to focus on. Growing nutritious food and learning about nutrition and healthy eating at a young age puts children on a path towards a healthy adult lifestyle.

After exploring the essential questions in the literature review, I concluded that students need to be taught the benefits of healthy eating and physical activity. Both of these can be combined with a school garden to gain life skills and promote a healthier lifestyle. With the growing technology in today's world, it is important to get children away from electronics and get them interactive outside. Through a school garden, students will be exposed to healthier food, which is essential for children who live in communities without accessible healthy food options (also known as food deserts; Wright, Donley, Gualtieri, & Strickhouser, 2016). Students will also reduce screen time and increase their interactions with nature and their classmates (Institute of Medicine of the National Academies, 2011; Blair, 2009).

As learned in the literature review, some food sold in school cafeterias do not contain the nutrition that growing children need (Datar, 2016). There are bountiful high calorie, high fat foods easily accessible in the student stores for students to purchase. Having the organic food available from the garden will help combat this problem. In addition to the nutritional benefits of the garden, teachers can also strengthen students academics by using the lesson and activity ideas provided in the resource guide.

Intended Audience and Setting

The target audience for this project was teachers of fifth grade students due to its alignment with the fifth grade Common Core State Standards, but the suggested lessons can be modified to fit any grade level. It can be as simple as counting how many seeds the students are planting or as challenging as determining the circumference of the holes being dug. Younger students can simply have conversations with each other about what the plants look like (observation), whereas older students can write scientific hypotheses about what the plants will do without a specific variable. However, the resources listed on the last page of the website are general for any educator to utilize and are not grade specific.

It is understood that the financial responsibilities may lie on the schools or the teachers alone, but there are many resources in which schools can get donations from people of the community and businesses around town. Creating an entire community that values the school garden is very important for the success of the plants. For example, over spring break or summer breaks, having community helpers water and prune the plants will help the garden succeed. The plants will not survive over weekends or holiday breaks without someone watering them, which comes when the community feels committed to the garden.

This resource guide can be used in any geographic location, but the type of plants and environmental factors would need to be examined and possibly modified to fit the climate zone. The United States Department of Agriculture has a map showing the various zones for planting. The map, named the Plant Hardiness Zone Map, is based on the average annual winter temperatures and is divided into ten-degree Fahrenheit zones (United States Department of Agriculture, 2012). It serves to inform gardeners and growers which plants will thrive in which geographic locations. This resource guide was designed around the Southern California climate, specifically San Diego County. All of the plants chosen for the subsections on the website were based on their ability to survive in this climate zone. In order for the gardening to be successful, the plants must be chosen based on zone location. For educators who wish to use this resource guide that live outside of San Diego, the length and time of planting season will be different. The activities and lesson plans can be used in any location.

Instruments

In determining which lessons and activities to compile into the teacher resource guide, I looked at free, pre-existing teacher resources available from legitimate sources. There are many teacher websites where homemade lesson plans can be downloaded and used, often free of cost. The providers of the lesson plans included the California Department of Education, California School Garden Network, American Heart Association, California Foundation for Agriculture, and Occidental Arts and Ecology Center. The garden curriculums and lesson ideas provided by these sources were hundreds of pages long, so I provided a link to each resource for teachers to scan through. All of these organizations support gardening as a way to combat childhood obesity.

With high childhood obesity rates in today's youth, policymakers and teachers have developed programs and curriculums incorporating school gardens. However, not all schools

have adopted the idea of a school garden curriculum because of resource, personnel, or time constraints. Experts believe the most effective way to increase children's intake of fruits and vegetables and encourage lifelong healthful eating habits is to teach them about healthy choices and nutrition in elementary school (Cohen, 2018). Doing this without a curriculum provided by administration, however, can be a challenge. This is why I compiled pre-existing resources into one online website for teachers to access.

Procedures

This resource was created in response to observing school-aged children's weight, and a review of the overabundance of literature pointing towards the need of school-wide efforts to prevent childhood obesity. Teachers spend approximately 35 hours per week with their students, giving them a unique opportunity to tremendously impact their students' lives. Areas of need for promoting a healthy lifestyle that surfaced from the literature review include access to healthy food, physical activity, and less screen time. Providing teachers with a resource guide and a school garden will address each of those areas.

I started this process by researching free, user-friendly website creation programs and came across Wix. I chose the site to build my website because it was free, and it provided the creator with step by step instructions and videos on how to create each page. I chose the website name, Garden of Academics, to link the two ideas of the resource guide: academics and school gardening. Next, I chose a layout provided by Wix and immediately started listing essential elements that I needed to include in the resource guide.

As I started labeling the directory tabs across the top of the home page, I decided to write a small "About the Guide" paragraph explaining to the user what the guide was and why I created it. This serves as a purpose statement to the viewers of the website. I then created

categories in the form of drop-down-menus located across the top of the page. In addition to the “About the Guide” page, I chose the following categories for the website directory tabs: Choose Your Crop, and Resources. Each directory tab has subsections to provide the user with more specific and easily accessible information.

I added two subsections under the “About the Guide” tab: *Introduction to Nutrition* and *Introduction to Gardening*. The *Introduction to Nutrition* tab includes information regarding where you can start your garden, garden tips and safety, and the basic physical requirements of gardening. I used information from various resources and combined it to create appropriate sections that fit together on the website page. The *Introduction to Nutrition* tab contains the American Heart Association’s Nutrition Guidelines, along with specific movements that gardeners perform to maximize the physical activity benefits such as squatting, stretching, and lifting.

The next tab is labeled “Choose Your Crop”. The American Heart Association, along with other health experts, recommends that people eat an assortment of fruits and vegetables ranging across all colors of the rainbow (American Heart Association, 2018). Based on this recommendation, I divided the “Choose Your Crop” section into subsections, each one being a color from the rainbow. I combined blue/ indigo/ violet due to the limited amount of plants aligning to that color being able to survive in the San Diego climate. Each colored plant contains fun facts, harvesting information, and a lesson idea. The lesson idea is not a previously designed lesson, which is why it is brief and without a link. This is simply an idea, with Common Core Standards supporting the lesson suggestion.

The last tab is labeled “Resources”, and has four subsections. The subsections are labeled *Related Resources*, *Lessons*, *Find Your Zone*, and *Planting Calendar*. The *Related Resources* tab

contains twelve prominent resources relating specifically to garden-based learning. Each resource name contains the direct link to the website. The *Lessons* section contains a brief description of the resource, and a direct link to free curriculum and lesson ideas readily available for teachers. Because some of the resources had over one hundred pages of lesson plan ideas, I did not want to pull out each lesson based on the type of plant. It seemed more logical to have the link available, then the teacher can search for a specific plant to align with what plant they are growing in their school garden at that time. The *Find Your Zone* section contains the United States Department of Agriculture's Plant Hardiness Zone map, and a direct link to their website for teachers to search their region and determine which plants will thrive in the school garden, based on location.

Summary of Chapter

The goal of this online resource guide was to provide teachers with information and resources on how to maximize the use of a school garden by incorporating many different academic and social components. The website is divided into colors, to support the American Heart Association's recommendation to eat a variety of fruits and vegetables that span across the colors of the rainbow (American Heart Association, 2018). Each plant in the resource guide contains facts, planting and harvesting information, and activity ideas. The information and resources provided in this project will help in promoting a healthy, active lifestyle and deviate from the unfortunate unhealthy path many children are currently on. My hope for this project is that educators use this resource guide in their classrooms, and that they discover the endless benefits school gardens have on the development of elementary aged children.

Chapter Four: Project

The project designed was created as a website for educators to access facts, harvesting information and garden resources to be able to incorporate garden-based learning into the classroom. The following is the URL for the website:

[Garden of Academics\(https://nowe1001.wixsite.com/gardenofacademics\)](https://nowe1001.wixsite.com/gardenofacademics)

Table of Contents for Website

- Tab 1: Home page
- Tab 2: About the Guide
- Tab 3: Choose Your Crop
- Tab 4: Resources

Tab 1: Home Page

The home page serves as a cover page, with a one sentence clip of what the website is about. Also on the home page is a “Learn More” button, which will direct the user to the “About the Guide” section to learn more about what the website contains.

Tab 2: About the Guide

The tab “About the Guide” serves as the purpose statement and the reasoning behind the creation of the website. As mentioned in Chapter 2, childhood obesity has tripled in the past 30 years (Center for Disease Control and Prevention, 2012). Because children spend a great amount of time in school, garden-based learning programs could potentially have a lasting effect on children and make them into healthy, active adults. The website was created for educators who are not fortunate enough to have a garden-based curriculum already implemented at their school

site. The website can also be used as supplemental resources for an already implemented curriculum.

In addition to the “About the Guide” information, there are two subsections. The subsections are labeled “Introduction to Gardening” and “Introduction to Nutrition”. This serves as a brief section to explain basics about gardening tips and safety, nutrition guidelines, and how physical activity is incorporated into gardening.

Tab 3: Choose Your Crop

The next tab, labeled “Choose Your Crop” is broken down into colored sections. As mentioned in Chapter 2, the American Heart Association recommends that people eat a variety of fruits and vegetables, spanning across all colors of the rainbow (American Heart Association, 2018). I separated the plants by color based on this recommendation. The subsections are as follows: red, orange, yellow, green, blue/indigo/violet. Each of these sections contains fun facts, harvesting information, and one general lesson idea.

Tab 4: Resources

The “Resources” tab was created to have garden-based learning resources readily available for educators to utilize, without having to search multiple websites. The subsections under the “Resources” tab include: related resources, lessons, find your zone, and planting calendar.

The “Related Resources” subsection contains an abundance of resources, ranging from planting information, webinars, lesson plans, recipes, and grant opportunities for educators. Each resource name is a hyperlink to that resource. All the teachers need to do is click on the resource, and the user will be directed to an outside website.

The second subsection under the “Resources” tab is a list of direct links of free lesson plans and outside curriculum, readily available for educators. These websites give explicit permission for educators to use. There are no links to websites that contain purchased material, or material that is not allowed to be used by educators.

The next subsection under the “Resources” tab is labeled “Find Your Zone”. This guide was designed specifically for the San Diego Climate zone. The plants chosen to specifically dissect were based on their ability to thrive in this zone. I provided educators with the link to type in their zip code in order to determine which hardiness zone they live in, based on the United States Department of Agriculture’s Plant Hardiness Zone Map. The plant hardiness zone map provides information about which plants will grow best, based on geographic location.

The last tab on the website under the “Resources” tab is labeled “Planting Calendar”. This section provides a link to the Farmer’s Almanac, a periodical in the form of a website. The Farmer’s Almanac website contains an abundance of information ranging from full moon information to weather forecast, but the specific links provided on my website are for educators to find the correct times of the year to plant crops, based on their location. This is also known as the planting calendar (Farmer’s Almanac, 2018). Knowing the most accurate planting seasons will help set a garden up for success!

Chapter Five: Discussion

The amount of overweight and obese children in the United States has skyrocketed in the past forty years. Data show that the rate of obese children has tripled since the 1970s (Center for Disease Control and Prevention, 2018). There are many factors contributing to this health epidemic including, but not limited to, food deserts and food swamps, the quality and marketing

of food and public schools, and the amount of physical activity in children. Because children spend a majority of the day at school, I believe it is important for teachers to have appropriate information and resources in an attempt to help decrease a portion of the overweight and obese population. I believe health nutrition, in conjunction with a school garden, is a promising tool to assist in this movement to get kids to a healthier weight.

The purpose of this project was to design a supplemental resource incorporating math, language arts, science and physical activity standards into lessons, in conjunction with a school garden. The resource focuses specifically on gardening, and lesson ideas to incorporate in the classroom to align with what plant is growing in the school garden. Teachers can access the website to gather facts about certain plants, harvesting information, and lesson ideas with links to other resources. There are other existing websites that provide teachers with gardening information, but I wanted the website to be a convenient location of facts, harvesting information, *and* resources to alleviate the need to run three different online searches per plant. Through learning of nutritious eating and growing their own food, students can enjoy the health benefits of a school garden.

This chapter discusses what I learned about overweight and obese children and gardening, the positive outcomes that can result from gardening, and how educators might use the information I have posted on my website. Additionally, I will discuss the limitations of my project and suggestions for teachers who wish to utilize my website as a resource in their classrooms.

Project Implementation Plans

This project provides resources and information for teachers who wish to incorporate a school garden into their classrooms. My hope is that teachers who do not have a garden

curriculum already implemented in their school can use this website to guide instruction. The website can be used as in-depth as one teacher wishes. It can be used for plant information only, or all the way to lesson ideas and standards to support their teaching. There are multiple pieces of information that the website can deliver.

The school at which I taught during the creation of this project already had a school garden, so unfortunately I could not pilot this. However the website I have created is a great supplemental resource for the teachers. I plan to supply my school with my website address, and explain the benefits it can bring to instruction. I hope that teachers find my website easily accessible and a valuable addition to their teaching practices.

Educational Implementations

Based on what I have learned, I recommend that this be used as a supplemental resource. Because it was created based on the Southern California climate zone, all of the harvesting information will not be accurate should my project reach teachers in different parts of the country. The lesson ideas and links to outside resources are conveniently located on one tab of the website for anyone to use, no matter their location and climate zone. It is possible that someone could create a similar project to mine but align it to a different climate zone with some additional research about region-specific plants. My recommendation would be to combine harvesting information based on that location, but allow the resources to be universal. By allowing the resources to be more general, educators can modify the lessons to fit their specific grade level.

Lessons Learned and Project Limitations

In creating this project, the main lesson I learned was that there are many factors contributing to obesity that health experts do not talk about. The experts say that obesity is a result of too much caloric intake and not enough burning of calories. Although this is very much true, there are so many other factors that contribute to a child being overweight. I learned that communities are set up in ways that prevent access to healthy food (Reel & Badger, 2014; Wright, Gualtieri, & Strickhouser, 2016). I learned that schools have contracts with marketing agencies to promote unhealthy foods, instead of the healthy choices (Ohri-Vachaspati, Turner, & Chaloupka, 2012). With that in mind, I could have added more sections to the methodology section in discussing factors contributing to obesity but found that the topics I chose had more concrete evidence.

Another lesson I learned during the research phase of this project was that there are dozens of resources for teachers and parents regarding nutrition education and school gardening. When I thought I had a project idea, I would discover that there is already something published similar to that idea. I had to change my project idea multiple times after discovering the abundance of resources already produced. I was determined to create a resource with facts, harvesting information, and resources all in one place, instead of needing three different websites to gather that same information. In other words, this project was developed to fill a gap in and enhance the existing resources.

As I started researching information about the actual gardening process, I discovered how difficult gardening really is. Some plants can grow in one part of the state and not the other. The acidity of the soil changes the growth of the plant. The dates of the first and last frost strongly effects when you can plant a new vegetable. There are heirloom plants, and many cross breeds of

each plant, all of which grow differently. Some plants cannot be planted next to each other due to their similar nutrient needs. I had to take all of these things into consideration when determining which plants to include in my project website.

With that being said, there were a few limitations of this project. To start, the fruits and vegetables I chose to include in my website are based on their ability to grow in the Southern California climate. There were many plants I would have liked to include based on my personal interest, but I limited the choices to make this project accessible to as many teachers as possible. In addition to limiting the plants to the Southern California climate, I had to think about the plants being grown in a school garden. Some plants take a year to start while others take up an abundance of space. Typically, a school garden will have minimal spacing in which students can grow food. Because of this, I chose the vegetables accordingly.

Another limitation of this project is school funding. I created this project as if a school administration board has already approved funding a school garden, or there is already a school garden in place. The reality is, some teachers may need to get approval from Administration. After that is complete, some teachers would then need to get the appropriate funding through donations and grants. This is a whole process that would need another project to explain. Therefore, I created the project as if there was already a school garden being funded.

Future Research

I believe that all people in power should do research on obesity as I have done for this project. I have discovered startling statistics and factors relating to obesity, but I have also developed a tool to try to decrease the obesity statistics. Hopefully as more people discover the truth about the health crisis, curriculums will be implemented in schools, and websites like mine

can be used for a supplemental resource for teachers. There are so many positive health and social outcomes to school gardens; I just hope effective instruction will prove that.

This project could be extended tremendously by continuously adding vegetables and harvesting information. In addition to adding different vegetables, I could continue to add resources as I come across them in my future research. As of right now, I have created only a *foundation* in which teachers can begin their instruction relating to their school garden.

Conclusion

In chapter one, I asked the reader to think about what “chronic disease” means, and proceed to explain the startling statistics of childhood obesity. I also explain the purpose of my project, how I will conduct my research, and explain the significance of the project.

In Chapter 2, I provide a detailed review of published literature and research relating to childhood obesity and previously implemented school garden programs. To organize my findings, I broke this chapter into four sections: 1) food deserts and food swamps, 2) quality and marketing of food in public schools, 3) children not meeting recommended physical activity minutes, and 4) review on previous Garden based programs. The review of literature focuses on Research supporting factors contributing to childhood obesity, and programs that have been previously created to help the issue.

Chapter 3 is an explanation of who my intended audience is, and what methods I chose to develop my project website. I wanted the website to be a supplemental resource for teachers who already have a school garden implemented. The website is organized in a unique way but is easily understood and easy to navigate.

Chapter 4 contains the actual project, a website I named “Garden of Academics”. I provide a brief overview of each section on the website, as it relates to incorporating a school

garden into the classroom. This is one small attempt to decrease the amount of overweight children in our communities, starting in a very important setting.

There are so many problems that obese people face, whether it is social, physical, or financial. Interventions to obesity can start in school, but they must spread through every domain in a child's life if we, as a community, wish to make an impact.

“If the childhood obesity epidemic remains unchecked, it will condemn many of our kids to shorter lives, as well as the emotional and financial burdens of poor health”. - Richard Carmona

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