USE OF A NOVEL APPROACH TO ASSESS CHANGES IN LOCAL FOOD SOURCING IN A SAMPLE OF OKLAHOMA SCHOOL DISTRICTS

By

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Title of Study: USE OF A NOVEL APPROACH TO ASSESS THE CHANGES IN LOCAL FOOD SOURCING IN A SAMPLE OF OKLAHOMA SCHOOL DISTRICTS

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Abstract: The purpose of this study was to identify changes in the extent to which Oklahoma schools were using locally grown foods, what specific foods they were purchasing and by what methods they were making the purchases. Barriers to local food sourcing were also identified. Two concept maps and a demographic survey were used to collect data from 25 school districts. Questions for each concept map were: 1) types of procurement methods used to purchase locally grown foods and items purchased; and 2) barriers to local purchasing. School representatives were recruited and pre-intervention data collected at various training and professional meetings in Summer 2018. Post-intervention data was collected in Fall 2019 after multiple farm-to-school promotional materials and communications were disseminated. Hierarchical Structure Scores (HSS) were calculated for each data set by adding the different levels of participants' responses. Types of procurement methods and types of food items were coded for frequency analysis. Descriptive statistics were used to characterize responding schools and paired t-tests were used to compare pre- and post-intervention HSS. There was a significant increase in HSS and the number of food types purchased. Overall, this study showed improvement in Oklahoma schools purchasing more local food items following dissemination of farm-to-school promotional material and communications, however more steps need to be taken to overcome the barriers that are experienced in local food procurement.

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CHAPTER I

INTRODUCTION

Childhood obesity affects approximately 1 in 5 children ages 2 to 19 years of age in the United States. This serious condition increases risk for both physical and mental health conditions, placing a large burden on the healthcare system (CDC, 2017). In an effort to diminish the childhood obesity issue, the Healthy Hunger Free Kids Act, 2010, provided new guidelines for school nutrition professionals to follow to provide healthier options for school-aged children (Lee, 2010). Some of these guidelines include increasing whole grains, fruits, and vegetable consumption, and limiting sodium and trans-fat intake (Lee, 2010). In an effort to more easily achieve these new nutrition guidelines, there has been elevated emphasis on local food sourcing. School's procurement of fresh foods from local farmers and producers not only provides healthy options for students, it also assists in bettering the local economy (Gregoire & Strohbehn, 2002). There are various methods in which a school nutrition program can incorporate local foods into their program. These methods include using United States Department Agriculture's Department of Defense (DoD) Fresh program, directly purchasing from a local farmer, having school gardens, participating in cooperative purchasing with another school district, buying through distributors that sell local foods, and providing nutrition education to students (Tomas, et. al, 2018).

Although there are many benefits to buying local foods, school nutrition directors also encounter barriers to purchasing locally grown foods. These barriers include, but are not limited to, lack of availability, state and federal regulations, and lack of time (Gregoire & Strohbehn, 2002). Different school sizes also experience different kinds of barriers due to availability of funds and personnel resources (Stokes & Arendt, 2018).

Problem Statement

While some studies have identified barriers and benefits perceived by school nutrition professionals, information is lacking in Oklahoma in regards to the extent school nutrition programs are purchasing locally grown foods, what methods they are using, what specific foods they are buying, and what prevents school nutrition programs from purchasing locally grown or produced foods in Oklahoma.

Purpose and Objectives

The purpose of this study was to identify the extent to which Oklahoma schools are using locally grown foods, what specific foods they are purchasing and by what methods they are making the purchases. Barriers making it difficult for school nutrition professionals to purchase locally grown foods were also of interest. A post-assessment was conducted approximately 15 months after the baseline assessment to determine if there were changes resulting from multiple communication and training efforts with school nutrition professionals related to local food purchasing. Specific objectives included:

1) Identify and compare number and types of methods used by school districts purchasing local foods before and after promotion of local food purchasing.

2) Identify and compare number and types of specific food items that are being purchased by the school districts before and after promotion of local food purchasing.
3) Identify and compare barriers to local food purchasing experienced by school districts before and after promotion of local food purchasing.

Hypothesis 1:

Null 1.1: There will be no change in the extent of local purchasing Hierarchal Structural Score after various forms of promotion (such as the fact sheet titled *Growing Farm to School at the Local School Level* and an email reminding the schools of their local food buying options) have been disseminated compared to before dissemination of information.

Alternative 1.1: There will be an increase in the extent of local purchasing Hierarchal Structural Score after various forms of promotion have been disseminated compared to before dissemination of information.

Null 1.2: There will be no change in the number of methods used by school nutrition programs to purchase local foods after various forms of promotion have been disseminated compared to before dissemination of information.

Alternative 1.2: There will be an increase in the number of methods used by school nutrition programs to purchase local foods after various forms of promotion have been disseminated compared to before dissemination of information.

Null 1.3: There will be no change in the number of food types purchased locally after various forms of promotion have been disseminated compared to before dissemination of information.

Alternative 1.3: There will be an increase in the number of food types purchased locally by schools after various forms of promotion have been disseminated compared to before dissemination of information.

Null 1.4: There will be no change in the number of barriers related to schools purchasing local foods after various forms of promotion have been disseminated compared to before dissemination of information.

Alternative 1.4: There will be fewer barriers related to schools purchasing local foods after various forms of promotion have been disseminated compared to before dissemination of information.

CHAPTER II

REVIEW OF LITERATURE

Childhood Obesity

Over the last four decades, childhood obesity has gained attention as a national concern. Obesity is defined as excess body fat, measured by body mass index as a ratio of weight to height (kg/m^2), at the 95^{th} percentile or above in children (CDC, 2018). Since the 1970s, the rate of obesity among children and adolescents has tripled (CDC, 2018). According to the Center for Disease Control and Prevention (CDC), one in every five children is obese (2018). The CDC National Center for Health Statistics (NCHS) found that in 2015-2016, about 13.9% of two to five-year olds, 18.4% of six to eleven year-olds, and 20.6% of twelve to nineteen year-olds were considered to be obese in the United States (CDC, 2018).

Childhood obesity can lead to many health issues including mental, physical, and emotional conditions (CDC, 2018). Children who are obese are being diagnosed with chronic health conditions, many of which occur primarily among adults. These conditions can include type 2 diabetes, fatty liver disease, cardiovascular disease, sleep apnea, cholelithiasis, glucose intolerance, and insulin resistance (Sahoo, et. al., 2015). These diseases have the potential to

follow children into adulthood, which will create a large burden on the U.S. health care system (CDC, 2017). In 2008, it was estimated that medical care costs for obesity in the United States were $147 billion (CDC, 2017). Being obese also impacts children academically. It has been found that overweight and obese children are four times more likely to have problems in the classroom when compared to their peers that are of normal weight (Sahoo, et. al., 2015). Obese children are more likely to be bullied and suffer from low self-esteem, depression, and social isolation (CDC, 2017). They are also more likely to be absent from school, especially if they have a chronic disease, such as type 2 diabetes (Sahoo, et. al., 2015).

Dietary Quality

A contributing factor in childhood obesity is poor dietary quality. Dietary quality is a method of measuring overall nutritional quality of a diet rather than individual nutrient content of a specific food (Joyce et. al., 2018). The Healthy Eating Index is one way to measure dietary quality in that it assesses how a diet compares with the Dietary Guidelines for Americans (USDA, 2015). The Healthy Eating Index is based on a score of 1-100, with a higher score indicating a healthier diet (USDA, 2015). In 2013-2014, children ages 6-17 years old had an average Healthy Eating Index Score of 53 out of 100 (USDA, 2015). This score was lower than all other age groups in the American population. Children tended to score lower in categories, such as intake of total vegetables, especially greens and beans; total protein, particularly seafood and plant proteins; and essential fatty acids when compared to adults 18-64 years old (USDA, 2015). This is an issue because these foods are high in essential nutrients needed for children to grow properly. School-aged children also tended to score higher in sodium intake when compared to the other age categories (USDA, 2015). The high sodium score is a concern because excess sodium in the diet has been shown to increase the risk of high blood pressure, heart attack, stroke,

and kidney disease (Harvard School of Public Health, 2019). In addition, excess dietary sodium may be a factor in the development of stomach cancer (Harvard School of Public Health, 2019). As expected, high sodium intake contributes to lower dietary quality scores.

The low dietary quality scores come as no surprise, considering the increase of processed and fast food consumption. According to Fryar and colleagues, in 2013-2016, 36.6% of adults ate fast food on any given day (2018). In today's society, both parents are employed in 61.1% of families, and these parents are trying to balance work life and family life (United States Department of Labor, 2017). Since this way of life can be busy, parents don't always cook at home and often use fast food drive-thru on the way home (University of Connecticut, 2018). Foods from fast food restaurants are often energy dense, meaning they have a large number of calories and often are low in nutrients (University of Connecticut, 2018).

Unfortunately, school lunches can also contribute to youth's low dietary quality if the meals served are comprised primarily of ultra-processed foods. Sodium is especially of concern in ultra-processed foods because 75% of sodium intake in school meals is from processed foods (Cullen, 2011). This is of concern because school meals can affect millions of students. There are 100,000 schools that participate in the National School Lunch Program (NSLP), serving 30 million students every day, resulting in 4.9 billion lunches served every year (School Nutrition Association, 2019).

Joyce et. al (2018) conducted a study to determine if there was a significant difference in nutrient content and dietary quality between two different meal patterns, both of which met the National School Lunch Program (NSLP) requirements. For this study the researchers compared a typical school lunch menu that met baseline NSLP standards and a best practice school lunch menu that was developed by a registered dietitian to greatly exceed standards. The Healthy Eating Index (HEI) was used to analyze the nutritional quality of each meal plan, and a nutrient analysis

software was used to determine nutrient content. They found the best practice menu was lower in calories, saturated fat, and sodium, and higher in protein, carbohydrates, and fiber compared to the typical school lunch menu. The best practice menu also had higher levels of vitamin A, vitamin D, phosphorus, and magnesium. From this study, the researchers also concluded the best practice menu had a 22% higher HEI score than the typical menu. The typical menu had an average HEI score of 75.1 and the best practice menu had an average score of 91.8. This study is relevant to the proposed project because it can be expected that dietary quality will improve with an increase of purchasing and including fresh fruits and vegetables on the menu and subsequent decrease in processed foods with high sodium content. One way to do this is through procurement of local foods.

Healthy, Hunger-Free Kids Act (HHFKA)

Children spend the majority of their time at school and could possibly eat two out of three of their daily meals at school (Story, 2006). As such, the school nutrition program plays an important public health role in addressing the childhood obesity epidemic (Story, 2006). To help improve children's health, the HHFKA was enacted in 2010. This act focuses on reducing childhood obesity, improving nutrition, increasing access to food, and increasing program monitoring and integrity (Lee, 2010). This act gave the U.S. Department of Agriculture (USDA) the authority to update nutrition standard regulations to align more closely with the updated 2010 Dietary Guidelines for Americans. In part, the regulations included offering whole grain-rich foods, offering fruits and vegetables as separate meal components at lunch, offering fruit daily at breakfast, increasing variety of vegetables by requiring different subgroups (red-orange, legumes, dark green, starch and other), reducing sodium, and preparing foods that contain no trans-fat (Department of Agriculture, 2012). To meet these requirements, school nutrition professionals

needed to use less processed foods and increase fruit, vegetable, and whole grains served. They also needed to serve meals with less sugar, fat, and salt. With these new requirements from the HHFKA, the dietary quality of school meals has potential to improve compared to meals under previous standards.

Locally Sourced Foods

One strategy for making these menu changes is to source more foods locally, thus having a positive impact on dietary quality. In a study performed in Minnesota, Pelletier and colleagues (2013) evaluated students' value of alternative food production (i.e. locally grown foods) in relation to their dietary quality. Through a survey the researchers inquired about the participants' diet, physical activity, and dieting behaviors, as well as social, environmental, and personal factors (Pelletier et. al., 2013). They found that people who valued alternative food production practices had a higher dietary quality compared to those who had a lower perception of alternative food production (Pelletier, et. al., 2013). People who thought local food sourcing was important had 4.4 servings more of fruits and vegetables each day, consumed more dietary fiber, and also consumed fewer added sugar and less fat (Pelletier, et. al., 2013). From this, it is implied that people who eat locally sourced food have better dietary quality. If schools were to incorporate locally grown foods into their menus, it is possible that dietary quality could be improved, as suggested by the growing body of evidence (Joyce et. al., 2018; Pelletier et al., 2013).

According to USDA, local food can be defined as the direct or intermediate marketing of food that is produced and sold in a limited geographic area (USDA, 2019). The term "local" can be defined differently by school districts depending on the unique situation of the school (Connel, 2015). For example, a school might consider local foods to be grown in the same town, another in

the same county, and another within the same state depending on the availability of local farmers, location of the school, and climate (Connel, 2015). A school's definition of local might also change throughout the seasons with different products and special events (Connel, 2015).

Farm to School

The federal farm to school initiative encouraged local food purchasing in schools. Since passage of the HHFKA, farm to school has expanded to about 42,000 schools participating in the United States from just a handful in the 1990s (National Farm to School Network, 2019). Farm to school includes procurement of local foods, nutrition education, and school gardens. Procurement is defined as the buying of goods and services (Connel, 2015). Procurement regulations were put in place to make sure program benefits are received by the eligible schools with little fiscal waste or abuse of the program and that the food service account expenditures are necessary and reasonable (Connel, 2015). School garden and farm to school expenses can be allowable under the food service account, but they must be used to improve and support the Child Nutrition Program (Connel, 2015). Federal procurement regulations also require schools to purchase domestic products that are produced in the United States by the enforcement of the Buy American Provision in the NSLP (Connel, 2015). The only exceptions to this rule are if a product is not produced or manufactured in the U.S. in sufficient quantities or of a satisfactory quality, or if competitive bids show that the U.S. product is significantly higher priced than the non-domestic product (USDA, 2017), such as bananas and pineapples.

The farm to school program has many benefits including improving public health, nutrition education about local foods, environment and community engagement. Not only do farm to school programs expose students to locally grown foods to eat, but they also increase students' understanding of the food system and encourage development of a healthy lifestyle (Harris et. al,

2012). Farm to school can include offering of local foods on the school lunch menu or cafeteria salad bars, and activities such as farm tours, cooking classes, composting, etc. (Harris et. al, 2012).

There is evidence that the farm to school initiative increased students' fruit and vegetable consumption, willingness to try new foods, and school meal participation, as well as lowering program costs (National Farm to School Network, 2017). According to the USDA, grantees receiving farm to school funds reported a 45% increase in school meal participation, 20% decrease in school meal program costs, and 18% decrease in food waste in 2015 and 2016 (USDA, 2018). A study conducted with 3rd grade students in a rural Illinois town had positive effects when the school participated in a farm to school program and included a nutrition education component. Researchers conducted a survey on the students' knowledge of nutrition; farms; "go", "slow", "whoa" foods; and consumption of fruits and vegetables at school and at home (Moss et. al., 2013). Based on survey results, lesson plans were developed to improve their knowledge of the subjects. The students also participated in a farm tour. After the intervention, children demonstrated greater knowledge of dietary fiber, as well as increased intake of vegetables (Moss et. al, 2013). Joshni et. al (2008) conducted a meta-analysis that included 15 studies related to the farm to school programs. This study found that when salad bars incorporated fresh and locally grown food, total calories, cholesterol, and total fat were reduced in students' diets (Joshni et. al, 2008). On average, the studies that included locally grown foods on salad bars found an increase of 25%-84% more fruit and vegetable servings consumed by students (Joshni et. al, 2008). This meta-analysis also found that when schools participated in a farm to school program, school meal participation tended to increase an average of 9.3% (Joshni et. al, 2008).

*Local Food Purchasing Method*s

There are five different methods in which school nutrition professionals can source local foods: utilize the USDA Department of Defense (DoD) Fresh program, make direct purchases from local farmers, participate in cooperative purchasing with other school districts, implement school gardens, and purchase from local distributors that sell locally grown food. The USDA DoD Fresh program was started in 1996 as a way to get more fruits and vegetables into schools. The program was piloted in eight states and has now grown to 45 states, as well as Washington D.C., Puerto Rico, Virgin Islands, and Guam. Some advantages of USDA DoD Fresh include better buying power, consistent deliveries, high quality, large variety of produce items (which can be locally grown), and an easy ordering website (USDA, 2018). This program allows schools to spend their USDA allocated funds for commodities on locally grown foods, rather than commodity canned fruits and vegetables. At the federal level, regional USDA offices contract with produce distributors in each state. Each spring, schools complete a USDA Foods Survey to designate a dollar amount for each commodity food item they forecast using in the upcoming school year, including DoD Fresh. Ten percent of the commodity funds is the recommended amount to allocate (Tomas et. al, 2018). The Fresh Fruit and Vegetables Order/Receipt System is the weekly order mechanism. Locally sourced foods are identified and the school nutrition director orders the amount and variety of local fruits and vegetables needed for school menus. The fresh produce is delivered to schools weekly at a competitive price and established quality (Tomas et. al, 2018).

Another way to get involved with local food sourcing is direct purchasing of food from farmers. In this case, the school nutrition director is responsible for finding and contracting with the farmer. The school nutrition director must write product specifications to communicate with the farmers. Specifications include, but are not limited to, storage procedures, packaging, quality, and agricultural practices. Depending on the dollar value of purchases, school nutrition directors

generally follow small purchase procedures and ask for quotes on a monthly basis in order to find the best prices for the food being considered (Tomas et. al, 2018). An advantage of this method is contribution to the local economy. It can also be a learning experience for the students. Some schools have the farmers come and interact with the students and arrange for students to actually visit the farms. This can increase students' interest in new foods and they could be more likely to increase school meal participation if students know from whom their food is coming (Joshni et al., 2008).

A third method is cooperative purchasing, where school districts form a purchasing group to purchase foods from local sources. In order to participate in a purchasing cooperative, the school nutrition director should research existing cooperative programs operating in their geographical area and if the items being purchased by the cooperative meet the district's needs. If there is not a cooperative purchasing program occurring in the area, the director must take lead in recruiting schools that might want to form a cooperative for purchasing local foods. Once schools are identified, local farmers need to be found, and a person needs to be designated to coordinate and communicate with local farmers. The person designated for this position will work out the details such as specifications, methods of distribution, etc. (Tomas et. al, 2018). This can be a great way to get multiple schools involved, and farmers can benefit from the scale of multiple schools purchasing similar product.

Schools can also utilize food distributors that purchase foods from local farmers. In this situation, the distributor is typically responsible for finding and purchasing the local food items. School nutrition directors communicate with the distributor their interest in purchasing local foods. Sometimes distributors are already working with local farmers. The school nutrition director can adjust their ordering to purchase more local products (Tomas et. al, 2018). Using a distributor can be a great opportunity for a school because the distributor serves as the middleman

to work out all of the details, limiting the burden of the school nutrition director and making a feasible option for smaller school districts.

Schools can also start a school garden and use the produce harvested in their school meal program. According to the USDA, in 2015-2016, 693 school gardens were started and 78,178 students participated in school garden activities (USDA, 2018). School gardens may be more feasible for larger schools because of the availability of needed manpower and funds.

Benefits of Purchasing Local Foods

There are many benefits of local food sourcing. Some of these benefits include aiding the local economy, being able to purchase small quantities, and having fresher food (Gregoire & Strohbehn, 2002). There can also be an increased awareness of food production, which students might not be exposed to without participating in a farm to school program (Gregoire & Strohbehn, 2001).

School gardens offer multiple learning experiences for students in the areas of science, technology, engineering, and mathematics (STEM); agriculture; and nutrition (Tomas et. al, 2018). By engaging in gardening activities, students are less reluctant to try new foods that they might have never tried before; therefore, increasing potential for the increased consumption of vegetables (Langellotto & Gupta, 2012). In a study conducted by Langellotto and Gupta (2012), students who participated in school gardening programs demonstrated an increase in nutrition knowledge, preference for vegetables, and fruit and vegetable consumption. Although school gardens do not usually produce enough food to be used for all meals served in a cafeteria, they can definitely be used to supplement meals and serve as education tools (Tomas et. al, 2018). For example, produce from school gardens can be used in taste testing, providing students with opportunities to try a new vegetable or fruit that they have not tasted before. As students become

more familiar with and accepting of new foods, then the school nutrition director can include the foods on the menu as part of a reimbursable meal.

In the meta-analysis mentioned earlier, researchers found that farm to school programs resulted in students eating more fruits and vegetables at school and at home. Students demonstrated increased knowledge about healthy eating and agriculture and tended to make better lifestyle choices (Joshni et. al, 2008). School meal participation increases because students are more likely to eat fruits and vegetables when they are fresh and locally grown (Joshni et. al, 2008).

Teachers and other staff tend to participate more often in school meals when farm to school programs are in place. In one study, teacher and staff participation increased to 28.8% from just 1.9% before the farm to school program implementation (Joshni et. al, 2008). The USDA reported that teachers gain experience with important education and skills, such as nutrition education, gardening skills, agricultural education, and cooking skills, when their school is participating in a farm to school program (USDA, 2018).

Students and parents of students who participate in a farm to school program reported positive lifestyle changes. Students report being more physically active, and their parents have noticed changes in behaviors, such as work ethic and responsibility (Joshni et. al, 2008). Parents' behaviors also tend to change for the positive when a farm to school program is implemented in their child's school. They tend to improve their grocery shopping habits, cook at home more, and have conversations about making better food choices with their children (Joshni et. al, 2008). All these improvements are most likely due to increased modeling of healthier behaviors.

Changes in the nutrition professionals have also been observed because they are now required to increase their knowledge and kitchen skills, and they might also have to get creative with new fresh produce (USDA, 2018). School nutrition professionals participating in farm to

school programs reported training on many topics regarding farm to school. According to Cultivating Opportunity farm to school report, 84% of school nutrition professionals were trained in promoting local foods, 77% learned new skills about prepping whole fruits and vegetables, 73% reported training on food handling and safety, 69% reported training on storage of fresh fruits and vegetables, 60% reported training on participation in farm to school curricular activities, and 58% were trained on menu and recipe development (USDA, 2018). Without participating in a farm to school program, these school nutrition professionals might never have developed these important skills for their job.

Barriers to Local Food Sourcing

Although there are many benefits to local food sourcing, many schools do not participate because of perceived or real barriers. Being a school nutrition director can be an extremely demanding job. There are many details to take into consideration and regulations that must be followed in order to offer reimbursable meals and in making sure the correct type and amount of food is ordered and delivered. Reimbursable meals are meals that meet federal meal pattern requirements (Kansas State Department of Education, 2013). School nutrition directors are required to maintain documentation that meals served meet federal regulations. The time allocated to record keeping may limit the time or means to implement local food sourcing, especially in smaller schools with limited staff. Gregoire and Strohbehn (2012) conducted a study with school nutrition directors in four Midwestern states (Iowa, Kansas, Nebraska, and Minnesota). These school nutrition directors worked in a variety of different environments, such as public schools and private schools, and with enrollments ranging from 400 to 10,000 students. The researchers surveyed the school nutrition directors about the perceived barriers and benefits of purchasing local foods. Reported barriers included lack of year-round availability of local

foods, local and state regulations, and time needed to work with more vendors (Gregoire & Strohbehn, 2002). These results are consistent with a previous study conducted by the same research team reporting lack of time, being short staffed, and schools requiring vendor insurance as other issues that school nutrition professionals encounter (Gregoire and Strohbehn, 2001). As reported, seasonality of produce due to climate, growing season, and geographical area is an issue in Oklahoma. The growing and harvest seasons are during months when schools are typically not in session (May through July), making it difficult to find foods that the school might need when school is in session. Providing schools with information related to preservation of seasonal produce for use during the school year may be beneficial in overcoming this barrier.

Different school sizes might experience different barriers. In a study conducted by Stokes and Arendt (2018), school nutrition staff members were asked to complete a questionnaire about types and frequency of locally grown foods being purchased. From the data gathered through the questionnaire, they found large schools purchased more local foods on a daily basis when compared to medium or small schools, however smaller schools tended to purchase more local foods on a weekly basis (Stokes & Arendt, 2018). It was concluded that small and medium schools might not have adequate equipment for storage and also smaller schools' economies might prevent the frequency of local food purchasing from occurring more often than large schools, since it was found that larger schools tend to purchase local foods more frequently than smaller schools (Stokes & Arendt, 2018).

Behavior Change Model

Health programs have higher potential for success when development is guided by a behavior change model (National Institute of Health, 2019). This study is conducted with the long-term aim of expanding the practice of local food purchasing as an accepted social norm

among school nutrition programs. It is based on the Diffusion of Innovation Theory, which explains how an idea gains momentum through a specific population or social system (LaMorte, 2018). The end result of this is that people adopt a new idea or behavior (LaMorte, 2018). This diffusion does not happen automatically, but it takes time because some people are more apt to adopt new things and others are not. There are five levels of adopters in the Diffusion of Innovation Theory. These include the innovators, early adopters, early majority, late majority, and the laggards. The innovators are willing to take risks and are the first to try something new. In this case, they are the people that are already buying or are willing to purchase locally grown foods without any evidence that it is going to be successful. The early adopters are comfortable with making changes and enjoy being in leadership. These people don't need information about how local foods are beneficial; they just need to know how to implement it. The early majority are not necessarily leaders, but they will typically adopt new ideas if they have seen evidence that a new idea will work. In this study, the early majority are those that have seen evidence that purchasing locally grown schools can have a positive effect and then will start to incorporate it into their menus. The people in the late majority category are very skeptical of changing to a new behavior. These people will only incorporate locally grown foods after they have seen the majority try it and be successful. The laggards do not like change at all. They find it hard to change even if they have seen that a new change can be successful (LaMorte, 2018). For a given change initiative, innovators comprise 2.5 % of people targeted for making the change, 13.5% are early adopters, 34% are in the early majority, 34% are in the late majority, and the laggards make up 16% of people as seen in Figure 1 (Robinson, 2009).

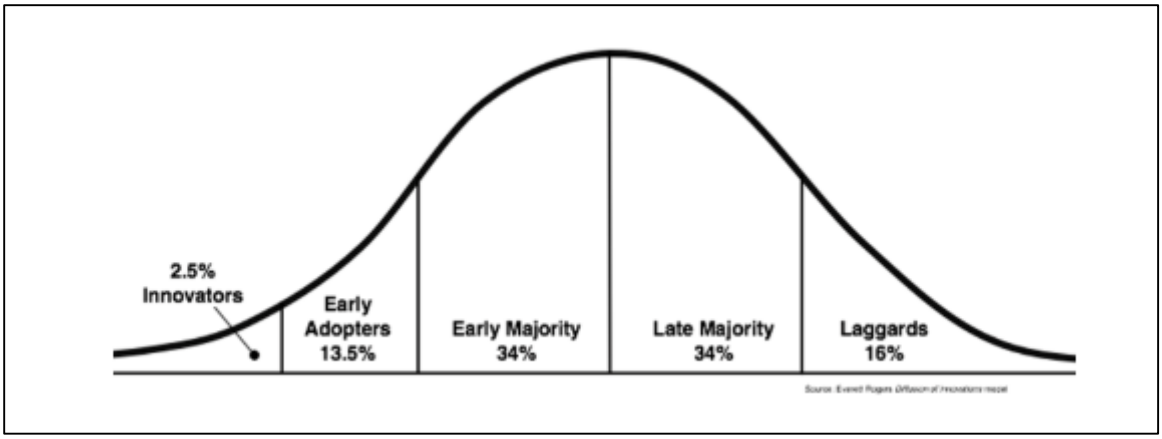

Figure 1: Diffusion of Innovation Theory

LaMorte, W. (2018). Diffusion of Innovation Theory. Boston University School of Public Health. Retrieved from http://sphweb.bumc.bu.edu/otlt/MPH-Modules/SB/BehavioralChangeTheories/BehavioralChangeTheories4.html

This study focuses on increasing schools' participation in local food purchasing by using the Diffusion of Innovation Theory to better understand the extent to which schools are using farm to school programs and to guide future expansion efforts. This project aims to increase the number of schools adopting the innovation by providing education about purchasing local foods. There is evidence to show that implementing innovations in school nutrition programs may be slow. A study conducted by Turner et al., (2012) examined the extent to which schools change their food environment to better meet nutrition standards. A sample of elementary schools were surveyed in 2006-2007 and again in 2009-2010. The survey asked about topics such as school meals, competitive foods, school gardens, and nutrition education. The researchers created a scoring system from 0 to 100, indicating least healthy to healthiest on the scale. They found that there was only a small change with a score of 50.1 in 2006-2007 increasing to 53.5 in 2009-2010. From this study it can be concluded that new ideas and programs being implemented can take quite a bit of time to catch on. The idea of using Diffusion of Innovation Theory for this research study, is if a handful of people get involved in local food purchasing, then others will begin to as

well, acknowledging that for some districts the barriers will persistently be perceived as outweighing the benefits.

CHAPTER III

METHODS

The purpose was to evaluate the extent to which school nutrition programs were purchasing locally grown or produced foods before and after a one-year period in which multiple formal and informal trainings were provided. Specifically, questions included: 1) what methods were being used to make purchases, 2) what specific foods were being purchased, and 3) what barriers prevented school nutrition programs from purchasing locally grown or produced foods? It was hypothesized that by providing communication and training related to the benefits, instruction for procurement method options and best practices, there would be an increase in the number of procurement methods used, an increase in the number of types of foods purchased, and a decrease in the barriers that prevent purchases of local foods. The study was reviewed by the Oklahoma State University Institutional Review Board and determined to not be human research (Appendix A).

Participants

School districts served as the subjects in this qualitative research study, and were selected by convenience sampling. School districts were represented by the school nutrition directors or

kitchen managers who had food purchasing responsibilities within their school nutrition program. School district representatives were recruited at the 1) Oklahoma School Nutrition Association conference on June 13, 2018, in Norman, OK, 2) at Cooking for Kids Management Training on July 16, 2018 in Stillwater, OK, and 3) from those participating in a chef consult program through Cooking for Kids for the 2018-2019 school year. School districts were excluded if the survey respondent was not involved in the purchasing for their school nutrition program. At baseline, 38 school districts completed the concept maps. All school districts were contacted by the trained research assistant at the end of the study period (Fall 2019) to complete a post-project concept map, resulting in 25 matched surveys and response rate of 66%. Attrition was due to the graduate assistant not receiving a response from the school district or refusal of the school representative to participate in follow up data collection.

Description of Intervention

The intervention focused on increasing the amount of locally grown foods procured by the school nutrition program. A fact sheet, titled *Growing Farm to School at the Local School Level* (Appendix B) was developed to facilitate the communication of consistent and accurate information. The fact sheet defined farm to school and presented the benefits of participating in farm to school. It also identified the five methods of purchasing local foods for school nutrition programs. These methods include utilizing the USDA DoD Fresh, direct purchasing from farmers, participating in a cooperative purchasing group, implementing school gardens, and purchasing form local distributors that sell locally produced foods. To assist in meeting federal procurement regulations, example procurement language and tips for writing specifications were included. During the summer of 2018, the fact sheet was utilized at multiple training and communication activities targeting school nutrition professionals. The events included Cooking

for Kids Management Training (Summer 2018), the Oklahoma School Nutrition Association (SNA) conference (Summer 2018) and Cooking for Kids chef consults during school year 2018-2019. The Cooking for Kids leadership training emphasized local food sourcing, and local food sourcing was added to the training agenda for schools working with an on-site consulting chef in school year 2018-2019. The 2018 Oklahoma SNA annual conference offered a session co-presented by the Oklahoma State Department of Human Services Commodity Distribution office and the USDA Regional Department of Defense office with an emphasis on the DoD Fresh Program.

An email was sent in late February 2019 to all school districts who completed the pre-survey as a reminder of the opportunity to allocate commodity funds to the DoD Fresh Program when completing the USDA Commodity Foods Survey for the 2020 school year (Appendix D). This email included a link at the bottom for the participants to follow for more detailed guide on purchasing local foods.

Data Collection

Concept maps were utilized to collect data. The aim of the concept maps was to assess the methods used for local food sourcing, the types of foods sourced, and the barriers faced in regard to local food sourcing (Appendix C). According to a study conducted by J. Atiles (2014), concept maps are an easy way to assess if a treatment, lesson, or participation in a workshop is successful. A concept map is developed by the researcher using a central, or root, question that needs to be answered (Atiles, 2014). The root question is placed in the middle of the concept map. Respondents are asked to record their answers in a circular map fashion around the central question (Atiles, 2014).

For baseline, one practice and two research concept maps were distributed at the previously described events. The purpose of the practice map was to familiarize respondents with how the concept map worked. The practice questions were, “the food groups your students like best are…” for the first level and “for each group, what are the specific food items?” for the second level (Appendix C). This practice is consistent with previous use of concept maps to assess behaviors and knowledge (Atiles, 2014). After completing the practice page and receiving feedback, respondents were then asked to complete the pre-intervention concept maps using the research root questions.

For this study, the research questions were 1) how many and what methods are used to purchase locally grown foods, 2) how many and what types of locally grown food items are purchased, and 3) what barriers prevent the schools from purchasing local foods? The root question for the first concept map was: “What method/s does your school nutrition program use to purchase locally grown or produced foods?” The methods used were written around the root question and created Level 1. The follow-up question “for each method, what foods were purchased?” were written around the respective method and created the second level of responses, or a chain of related responses extending from the root question. Figure 2 and Figure 3 illustrate sample responses.

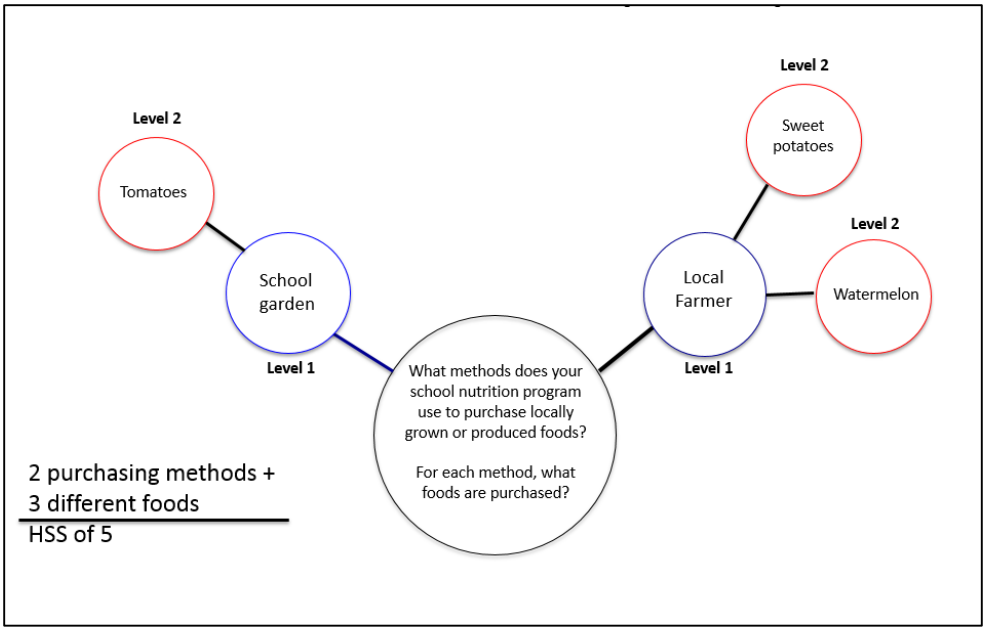

Figure 2: Concept map #1 sample response

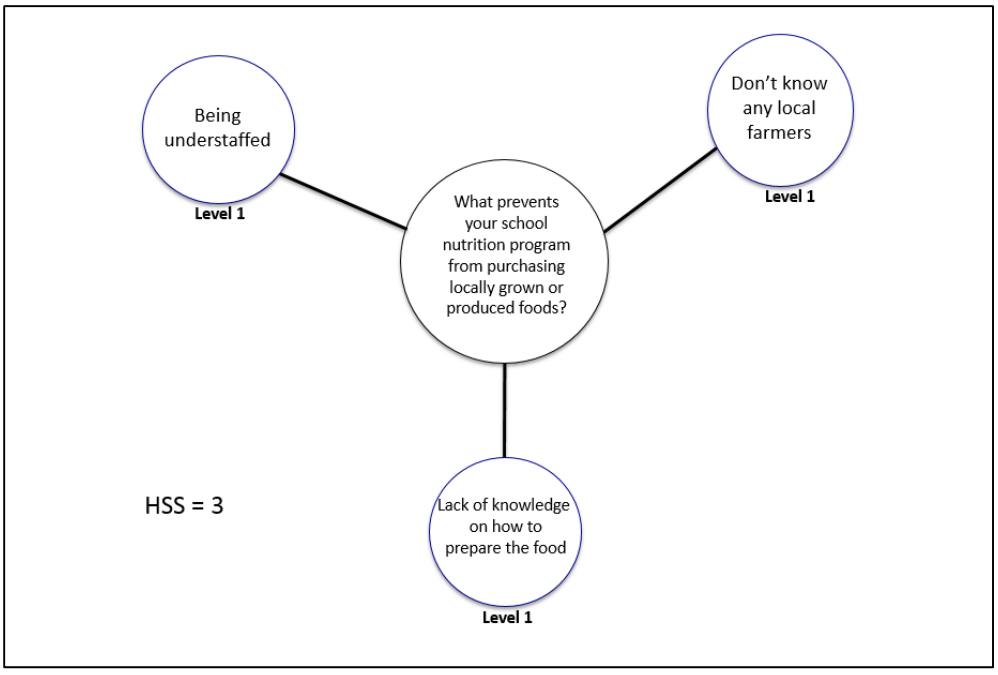

Figure 3: Concept map #2 sample response

In the fall of 2019, post-intervention concept maps were completed by conducting telephone interviews with the school nutrition directors or kitchen managers who completed a pre-intervention concept map. The same questions were asked, and the trained research assistant completed the concept map based on the question responses. This method was selected to assure maximum participation at post-intervention due to limited resources to travel or make face-to-face contact. In addition to the concept map, additional questions were added at post intervention to assess participation in the training events. The participants were asked if they attended SNA conference or Cooking for Kids management training, had a chef consult and if they received the reminder email about using DoD Fresh as a means of local food purchasing. Participants were also asked if they watched any webinars about farm to school, if they attended any local trainings, what trainings were most useful, if they have received any grants or donations related to farm to school or school gardening, how many years of work experience they have, if their cafeteria is self-operated or if they have a contracted food service management company, and what grade levels their cafeterias serve. The percentage of students in the schools qualifying for free and reduced-price lunches were obtained from the Oklahoma State Department of Education (OSDE)'s website (OSDE, 2019), and information was also collected on whether school districts were located in urban or rural areas from OSDE (OSDE, 2014).

Scoring Concept Maps

To score the pre- and post-intervention concept maps, methods described in a study conducted by J. Atiles (2014) were used (see Figures 2 and 3) To determine the number of procurement methods used, items in level 1 of the first concept map were counted and recorded. Each method was coded for frequency analysis. To determine the number of different foods purchased, items in level 2 of the first map were counted and recorded. Each type of food item

was coded for frequency analysis. To get the Hierarchal Structural Score (HSS), Level 1 and Level 2 scores were summed.

The root question for the second concept map was: "What prevents your school nutrition program from purchasing locally grown or produced foods?" The number of barriers was determined by counting and recording items in level 1 of the 2nd concept map. Barriers were categorized based on similarity and coded for analysis. Responses were put into four separate categories previously reported in the literature with subcategories such as lack of distribution system and seasonality among others.

Statistical Analysis

Statistical analysis was conducted using Statistical Package for Social Sciences (SPSS) (IBM SPSS Statistics, Version 20; Copyright ©). Descriptive statistics were used to characterize school size by enrollment, the respondents' job position within the school nutrition program, number of years work experience, rural or urban location of the school, grade levels being served, what type of operation they had (self-operation or a food service management company), what type of training or promotion about local food sourcing they had experienced over the period of intervention, what trainings were most helpful. Percentage of students in each school district were eligible for free and reduced price lunch during the 2018-2019 school year was obtained from OSDE low-income school report (Oklahoma State Department of Education, 2019).

A paired sample t-test was used to compare the HSS for each question, level 1 for both questions (number of methods and number of barriers) and level 2 for question 1 (number of food types) to assess change from the beginning to the end of the 1-year period. Cohen's d effect size was calculated for each paired sample t-test. Chi-square was used to assess changes in the proportion of various procurement methods used from pre to post. Frequency analysis was used

to assess the most common methods of procurement and types of foods purchased. A qualitative theme analysis was used to identify common barriers and categorized into four groups. Using an independent t-test, comparisons were made of the number of food items purchased through local sources by rural versus urban schools. Statistical significance for all tests was set at $P < 0.05$.

CHAPTER IV

FINDINGS

As shown in Table 1, the majority of respondents were Child Nutrition Directors (n=20, 80%). Respondents also included kitchen managers (n=4, 16%), and a district chef (n=1, 4%). These participants exhibited varied years of work experience in child nutrition, ranging from less than 1 to 33 years. Enrollment numbers of schools ranged from 115 to 25,281 students. Sixty percent of schools were considered to be in a rural area and forty percent were considered to be in urban areas (Oklahoma State Department of Education, 2014). Eighteen percent of the schools reported receiving a grant or donations related to farm to school or school gardening over the year of intervention. Participants reported grants from Farm to School, Tobacco Settlement Endowment Trust (TSET), Lowe's, Jimmy Johnson Foundation, and USDA. One school also reported the donation of tractor tires to be used as garden beds from a community member. There was a wide range of percentage of students eligible for free and reduced-price meals, from 23.2% to 93.4%. Using National Center for Education Statistics' criteria, one school was classified as low-poverty school, seven schools as mid-low poverty, twelve schools as mid-high poverty and five schools as high poverty (U.S. Department of Education, National Center for Education Statistics, 2019). Ninety-two percent of schools participating were self-operated and 8% were contracted with a food service management company. When asked about grade levels, 96% served grades kindergarten through 12th grade and 4% served grades kindergarten through

8th grade.

The independent t-test comparison of rural vs. urban schools and the number of food items purchased through local means indicated schools in both geographical locations were purchasing similar number of items. For this reason, further analyses to compare rural and urban schools were not conducted. This data was not reported.

Table 1: Demographic Characteristics of School Sites (n = 25)

Job Position	Frequency	Percent of All Included Schools
Child Nutrition Director	20	80.0
Kitchen Manager	4	16.0
District Chef	1	4.0
Total	25	100.0
Years of Work Experience		
< 1 year	1	4.0
1-9 years	13	52.0
10-20 years	4	16.0
>20 years	7	28.0
Total	25	100.0
Enrollment		
<1000 students	8	32.0
1000-10,000 students	16	64.0
>10,000 students	1	4.0
Total	25	100.0
Area		
Rural	15	60.0
Urban	10	40.0

Number of Schools who received grants over period of intervention	**9**	**18.0**
% Students Eligible Free and Reduced Lunch		
≤ 25% (low poverty level)	1	4.0
25.1 – 50% (mid-low poverty level)	7	28.0
50.1 – 75% (mid-high poverty level)	12	48.0
> 75% (high poverty level)	5	20.0
Total	25	100.0
Type of Operation		
Self-operation	23	92.0
Food service management company	2	8.0
Total	25	100.0
Grade Levels Served		
Kindergarten – 12^{th} grade	24	96.0
Kindergarten – 8^{th} grade	1	4.0
Total	25	100

As seen in Table 2, there was a significant increase in the local food purchasing HSS from pre to post intervention ($p < 0.05$) with Cohen's d for effect size calculated to be 0.84, indicating a large effect size. There was also a significant increase in the types of foods being utilized from pre- to post-intervention ($p = 0.32$), again with a large effect size ($d = 0.89$); however, there was not a significant change in the number of local food procurement methods from pre- to post-intervention ($p = 0.148$). Contrary to our hypothesis, a significant decrease in barriers to procuring food locally from pre- to post-intervention was not found ($p = 0.56$).

Table 2: Mean pre- and post-intervention scores for HSS for extent of local purchasing and for barriers, number of local food procurement methods, and number of food types purchased locally

Variables	Pre-Intervention Mean Score (sd)	Post-Intervention Mean Score (sd)	*p*-value	*Cohen's d*
HSS: Extent of local food purchasing	1.76 (2.891)	4.20 (4.708)	0.032*	0.84
Number of Methods Used (level 1)	0.56 (0.821)	0.88 (0.881)	0.148	0.38
Number of Food Types Purchased (level 2)	1.04 (2.169)	2.96 (3.942)	0.043*	0.89
HSS: Barriers	2.12 (1.092)	2.64 (0.757)	0.056	0.69

*Statistical significance set at p-value <0.05

Table 3 reports changes in the types of local procurement methods used by schools. Because of multiple cells with values < 5, a chi-square analysis was not reported. From pre- to post-intervention, the number of schools in this sample not purchasing local foods decreased from 15 (60%) to 10 (40%), respectively. At pre-intervention, local distributors were used most often by school districts with an increase of 1 count at post intervention (5 and 6 respectively). The method with the largest increase was directly purchasing from farmers (4 schools pre-intervention to 7 schools post-intervention). Other methods showing positive changes include cooperative purchasing and use of school gardens. In contrast, use of DoD to purchase local foods decreased from 4 to 3 schools pre- to post-intervention, respectively.

Table 3: Change in number of local–sourcing procurement methods used from pre- to post-intervention.

Method of Purchasing	Frequency Pre-Intervention	Percent Pre-Intervention*	Frequency Post-Intervention	Percent Post-Intervention*
DoD	4	16.0	3	12.0
Direct Purchase from Farmer	4	16.0	7	28.0
Cooperative with other School	0	0.0	1	4.0
Garden	1	4.0	3	12.0
Local Distributor	5	20.0	6	24.0
Not participating in local food sourcing	15	60.0	10	40.0

*Percentages may not equal to 100 percent as some schools used multiple forms of procurement

Table 4 depicts the types of food items purchased grouped by school lunch program component: fruits, vegetables, dairy, protein, and non-creditable items. Items in the fruit category included apples, berries, citrus, melons, and other miscellaneous fruits. Items in the vegetable category included items in 4 of the 5 vegetable sub-groups: dark green, red/orange, starch, and others. The dairy category was limited to liquid cow's milk. The protein category included beef and chicken. There were also non-creditable items that were being locally processed or grown. These included frozen custard, gravy mix, and herbs. There was an increase seen in number of items locally purchased from pre- to post-intervention for all NSLP meal component categories: fruits, vegetables, dairy, protein, and non-creditable items.

Table 4: Number of schools purchasing locally-sourced foods by food type at pre and post intervention

	Food Type	Pre	Post
I.	Fruit		
	A. Apples	Total: 3	Total: 10
	1) Apples	3	5
	2) Gala	0	1
	3) Fuji	0	1
	4) Golden Delicious	0	1
	5) Pink Lady	0	1
	6) Arkansas Black	0	1
	B. Berries	Total: 2	Total: 3
	1) Strawberries	1	2
	2) Berries	1	1
	C. Citrus	Total: 1	Total: 1
	1) Orange	1	1
	D. Melons	Total: 2	Total: 6
	1) Watermelon	2	4
	2) Melon	0	2
	E. Misc.	Total: 4	Total: 7
	1) Plum	1	0
	2) Grapes	1	3
	3) Banana	1	0
	4) Pear	0	1
	5) Peach	0	2
	6) Flame Peach	0	1
	7) Juice	1	0
II.	Vegetables		
	A. Dark Green	Total: 2	Total: 6
	1) Spinach	1	0
	2) Broccoli	0	2
	3) Kale	0	1
	4) Greens/Salad Mix	1	3
	B. Red/Orange	Total: 3	Total: 10
	1) Grape Tomato	1	0
	2) Carrots	1	2
	3) Tomato	1	5
	4) Sweet potato	0	2
	5) Cherry Tomato	0	1
	C. Starch	Total: 0	Total: 2

	1) Potato	0	2
	D. Other	Total: 4	Total: 16
	1) Cauliflower	0	1
	2) Cucumber	1	3
	3) Squash	0	2
	4) Onion	0	3
	5) Pepper	0	1
	6) Mushroom	0	1
	7) Radish	2	1
	8) Zucchini	0	1
	9) Green onion	0	1
	10) Lettuce	1	2
III.	Dairy	Total: 2	Total: 4
	A. Milk	2	4
IV.	Protein	Total: 1	Total: 2
	A. Beef	1	1
	B. Chicken	0	1
V.	Non-Creditable Items	Total: 0	Total: 6
	A. Frozen Custard	0	1
	B. Gravy Mix	0	1
	C. Herbs		
	1) Thyme	0	1
	2) Chives	0	1
	3) Basil	0	1
	4) Dill	0	1

Table 5 depicts the number and type of barriers by general category reported by school districts pre and post intervention. Responses were put into four separate categories previously reported in the literature (lack of availability, lack of knowledge, regulations and time) with subcategories such as lack of distribution system and seasonality among others. There was an increase in barriers related to availability, regulations, and time. APPENDIX F shows the barrier themes derived from previous literature along with the specific barriers reported by the school districts that were included under each barrier theme.

Table 5: Number of barriers by category reported by school districts for locally-sourcing food items, pre- and post-intervention

Barrier Theme	Pre-intervention Number of Schools Reporting Barrier	Post-intervention Number of Schools Reporting Barrier
Total Availability, lack of	16	22
• Lack of product	12	16
• Lack of distribution system	2	0
• Seasonality	1	1
• Quality	1	3
• Food Service Management Company	0	2
Total Knowledge, lack of	12	15
• General knowledge	6	6
• Process	1	1
• Network, lack of	3	7
• Finances	2	1
Regulations	2	3
Time	1	2

In order to discover what types of information about local food sourcing school districts were experiencing, in the post-intervention follow-up, the participants were asked about multiple different trainings and promotions that occurred throughout the intervention period. Table 6 shows that 72% of participants attended Cooking for Kids Management Training, 20% attended SNA's Farm to School session, 36% had a Cooking for Kids chef consult visit their school site throughout the school year, 40% received an email reminding them of their option to utilize DoD Fresh to incorporate local foods, 60% received the fact sheet that can be seen in Appendix B, 20% watched webinars about local foods, and 32% percent attended trainings local to their area. Participants were also asked which of these promotions were most helpful to them. In-person educational sessions, such as Cooking for Kids Management Training were the most useful compared to electronic forms, such as the email.

Table 6: Local food sourcing promotions experienced by participants and usefulness

Type of Promotion	# participating in promotion (Percent*)	# reporting promotion as useful (Percent*)
Cooking for Kids Management Training	18 (72.0)	6 (24.0)
SNA Farm to School session	5 (20.0)	2 (8.0)
Cooking for Kids Chef Consult	9 (36.0)	2 (8.0)
Email about DoD Fresh Program	10 (40.0)	1 (4.0)
Fact Sheet	15 (60.0)	3 (12.0)
Webinar	5 (20.0)	2 (8.0)
Local Training	8 (32.0)	5 (20.0)

*Percentages may not equal to 100 percent as some schools participated in multiple promotions.

CHAPTER V

DISCUSSION

The purpose of this study was to identify the extent to which a sample of Oklahoma public school districts were purchasing locally grown and processed foods, which procurement methods were most commonly used, the barriers to local food sourcing, and if an education and training intervention would impact practices and barriers. The information will be used in guiding development of future training and technical assistance resources.

Schools participating in the study represented both rural (60%) and urban (40%) geographic areas. These demographics are similar to the state of Oklahoma where the majority of schools are in rural counties (77%) (Oklahoma State Department of Education, 2014). More than two-thirds were categorized as mid-high or high poverty school districts. This is similar to the state of Oklahoma where 60.78% of students are eligible for free and reduced-price lunches (Oklahoma State Department of Education, 2019). These similarities between income and geography indicate that although this study had a small sample size, the sample was representative of the state. A large majority (80%) of the respondents were child nutrition directors, a position responsible for procuring foods for school nutrition programs.

After delivery of the intervention including multiple trainings and communications related to local food sourcing, 20% more schools in the sample reported using one or more methods to purchase local foods compared to the beginning of the yearlong study period. Based on the Diffusion of Innovation Theory, it is plausible the 10 schools participating in local food sourcing at pre-intervention were innovators – those willing to take risks and try new approaches (LaMorte, 2018). Those that started using local foods during the study period could be characterized as the early adopters – those that needed information on how to implement local food sourcing, which was the overall aim of the project. The 10 participants in the study that were not participating at post intervention could be characterized as early, or even late, adopters, and some may never integrate the practice into the child nutrition program. Diffusion of Innovation theorists suggest when a new approach calls for a disruption in practice, there is a chasm between early adopters and the majority (LaMorte, 2018; Moore, 1991). For the majority to adopt local food sourcing, they will need evidence of the benefits and to identify the practice as a social norm (LaMorte, 2018; Moore, 1991). In other words, they will need to see other child nutrition professionals successfully adopting the local food sourcing practice into their program. This could be achieved by highlighting success stories and additional training related to overcoming barriers, such as increasing efficacy related to regulations and procurement and increasing knowledge related to access to farmers, foods available and improved distribution systems.

After a yearlong intervention including various promotions of local food sourcing, the extent of local food purchasing increased among the sample, and the large effect size suggests practical implications of the intervention for a larger population. The increase was driven by the types of items purchased rather than an increase in additional procurement methods. In this study, schools were primarily purchasing locally grown fruits and vegetables rather than dairy and protein-rich food items. This compares to a study conducted by Stokes and Arendt where they found that the majority of child nutrition programs fruits and vegetables were the most frequently

purchased local foods, and dairy and meat items were locally purchased less frequently (2018). Previous literature on specific local food items being purchased by schools is limited. The food items reportedly being purchased or grown by participants in the current study were similar to what is available to harvest in fall in Oklahoma when post-intervention data was collected (Pick Your Own, 2020). The fruits and vegetables that were reported by participants that were similar to Oklahoma's fall harvest season included apples, grapes, peaches, spinach, broccoli, kale, salad mix, lettuce, tomatoes, carrots, potatoes, greens, cauliflower, cucumber, squash, onion, and peppers. Perhaps if these cannot be grown all year long it is an opportunity to educate on preservation of these food items, so that they can be used throughout the school year.

Because the existing published literature discussing frequency of different procurement methods of local foods is limited, it is difficult to compare results to other studies. However, it should be noted that 349 out of 537 school districts in Oklahoma participate in USDA DoD. For this reason, the fact that less than 20% of schools at pre- and post-intervention reporting using USDA DoD Fresh program was not expected. It is possible, despite the intervention, school representatives responsible for school food purchases may not recognize the DoD program as a method of local food sourcing. This is supported by the finding that a barrier to using DoD was not knowing which foods were locally sourced. As such, more promotion and trainings are needed related to the DoD Fresh Program and how the program integrates locally sourced foods. Perhaps promotion of DoD Fresh through in-person training would be most beneficial as participants reported email promotions were not as helpful as in-person trainings. Although DoD Fresh participation seemed to decrease, other methods of procurement showed an increase in frequency, however it is unknown if change in methods was caused by an increase in participation or if those who were already participating in local food sourcing began or changed to different types of procurement methods.

This study found similar barriers when compared to previous literature, including lack of year-round availability, local and state regulations, lack of time, and being short staffed (Gregoire

& Strohbehn, 2002). Other barriers identified included being contracted with a food service management company, lack of network or support, general lack of knowledge, lack of knowledge on the process of purchasing local foods, perceived issues with quality of local foods, and finances.

Overcoming the barriers

Contrary to the hypothesis, there was no change in the number of barriers. While there was a small increase in the number of types of food items purchased, the barriers to increasing locally sourced food continues to inhibit diffusion of the innovation. The primary barriers are those related to infrastructure and availability. It is possible that the lack of a decrease in barriers was caused by learning more about the farm to school process as well as promotional materials alone not being enough. Once school representatives learned more about the local purchasing options, more/new barriers were identified causing no decrease in the number of perceived barriers by participants.

Lack of knowledge also seems to be a hurdle to overcome. School nutrition professionals are not sure where to locate farmers or even what is available to buy because there is a lack of networking between the farmers/producers and school districts. From this study, researchers found that a common need for school nutrition professionals was a resource (perhaps a frequently updated website) that includes farmers that they could contact as well as foods that are available for purchase. For the future, it would be beneficial to utilize partnerships with programs such as Farm to School and Oklahoma Department of Agriculture, Food and Forestry to create a resource with this information, so that schools can have easier access to farmers and their products and to help build the infrastructure of the innovation.

One potential reason for the perceived increase in lack of available foods is the new law legalizing marijuana cultivation for medicinal use in Oklahoma. This change did have a negative impact on one school district that was shared in the post data collection. The school district reported that they lost their farmer who was previously growing vegetables for them because the farmer switched to marijuana growing, limiting the school district's access to locally grown foods.

Looking further into the barriers, it was observed that most of the school districts participating in local food procurement were more commonly located in central and eastern Oklahoma compared to western Oklahoma. A visual of this can be found in Appendix G. There could be multiple factors causing this. This could be related to the Diffusion of Innovation Theory as discussed in the Literature Review section. This theory indicates that there must be somebody that starts a concept successfully for others to follow along. There is a large school district in eastern Oklahoma, which has been a champion in local food sourcing and has built cooperatives with other schools to provide local foods. They have shown that local food sourcing is possible, so more child nutrition program leaders might be willing to bring local foods into their program. Another factor that could contribute to the differences in local food purchasing in eastern versus western Oklahoma could be due to the climate and geology differences that are seen across Oklahoma's diverse landscape. Oklahoma's panhandle only receives an average of 17 inches of rain every year, whereas the southeast part of the state receives an average of 56 inches yearly (Ag in the Classroom, 2017). These differences cause a wide range in growing season across the state where the southeast part of Oklahoma has a growing season of 238 days and the panhandle only has 168 days (Ag in the Classroom, 2017). Again, this could be an opportunity for the schools to utilize a type of indoor gardening such a green house or hydroponics and fresh food preservation methods. Building a team is important, especially if schools are wanting to implement some type of school garden. Support is necessary to make these changes. For example,

a support team could include administration, agriculture teacher and class, and other teachers to incorporate farm to school curriculum in the classroom. Having a supportive team could help to address the lack of year-round availability through indoor gardening within the school district. Perhaps to overcome this barrier it would be beneficial to educate schools on the use of indoor gardening options such as greenhouses or hydroponics. Overcoming all these barriers will be an easier feat now that barriers have been identified by this study in regards to school nutrition programs incorporating farm to school.

Future Research and Actions

Based on the Diffusion of Innovation Theory and the lack of participation from some school districts in local food sourcing in this study, it is apparent that some school representatives responsible for procuring foods may need more information and research to incorporate the practice of local food sourcing into their school districts. Further research and literature could be most helpful for those in the early majority category because they need to see evidence that the practice is beneficial and can be done successfully. Looking at dietary quality and school meal participation would be a beneficial area for future research. Research is needed to observe if schools participating in some form of farm to school are seeing an increase in meal participation from students, as well as faculty and staff. Research is also needed to observe if those schools participating in farm to school have better school lunch dietary quality than schools that are not participating. A resource of success stories told by fellow child nutrition professionals could also be beneficial to those in the early majority group. If the early majority group begins the practice of local food sourcing when further research is done showing benefits, then the late majority will most likely join the practice as well.

Based on the barrier findings in this study, the infrastructure of local food sourcing is lacking and more steps need to be taken to improve the network between school districts, and local farmers and producers and distributors. Actions should be taken to strengthen partnerships with those in the community (such as Farm to School as mentioned above) and to develop resources to help grow the farm to school practice.

Strengths and Limitations

A strength of this study was the unique approach using concept maps to gather responses. Although this was a unique strategy, it has been previously utilized for research purposes. It is a good way to get more involvement from participants as it is not a typical survey and it allows the participants to form their own thoughts. Another strength is that the study design allowed for a paired analysis, which allowed us to see involvement of schools using farm to school at two different time points. Effect size was calculated for the paired analyses, which provides evidence of the practical implications of the intervention for a broader population. In addition, this study identified specific local food items and methods that schools are using, which is limited in previous literature. Despite a small sample size, school characteristics matched closely to state averages.

A limitation of this project was the small, convenience sample; however, a 66% response rate from original responders was achieved at post-intervention. With the small sample size, further analysis by chi square was not possible and data could not be adequately split into tertiles, to compare between school size as measured by enrollment. Another limitation is that those recruited by convenience sampling were already attending educational sessions and conferences,

which may reflect their interest in innovative ideas and could be more willing than the average person to make changes.

Conclusion

These findings support the hypotheses that an intervention using multiple methods of training and communication to promote local food sourcing resulted in an increase in the number of sampled schools procuring local foods. Oklahoma school districts that participated in this study increased usage of direct purchasing from farmers, cooperative purchasing collaboratives, school gardens, and local distributors to include local foods into their programs. No change in barriers, such as lack of availability of local foods, strict regulations, and lack of time, was observed contrary to our hypothesis. This indicates that more steps need to be made to overcome these barriers. This project showed that Oklahoma child nutrition program employees are making an effort and have successfully incorporated local foods into their cafeterias, however further and continuing efforts are needed to address barriers, improve the infrastructure of local food sourcing, and broaden the diffusion of the practice.

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APPENDICES

APPENDIX A

Oklahoma State University Institutional Review Board

Date:	05/18/2018
Application Number:	HS-18-26
Proposal Title:	Evaluation of Growing Farm to School in Oklahoma
Principal Investigator:	Deana Hildebrand
Co-Investigator(s):	Cass Ring, Jennie Till
Faculty Adviser:	
Project Coordinator:	
Research Assistant(s):	
Processed as:	Not Human Subjects Research

Status Recommended by Reviewer(s): Closed

Based on the information provided in this application, the OSU-Stillwater IRB has determined that your project does not qualify as human subject research as defined in 45 CFR 46.102 (d) and (f) and is not subject to oversight by the OSU IRB. Should you have any questions or concerns, please do not hesitate to contact the IRB office at 405-744-3377 or irb@okstate.edu.

Sincerely,

Hugh Crethar, Chair Institutional Review Board

APPENDIX B

Growing Farm to School at the Local School Level

A Guide for Child Nutrition Directors and Managers

What is farm to school?

Farm to school allows schools to feature and expose students to a variety of locally produced foods in the school nutrition program. The program looks slightly different in every school site, but always includes one or more of three core components.

- Procurement, or purchasing, of local foods that are promoted and served in the school meal, in taste-tests with students or as a snack in the classroom. More information on defining local foods is available at Geographic Preference: What It Is and How to Use It, https://fns-prod.azureedge.net/sites/default/files/f2s/GeoPreference.pdf.
- Educational activities related to agriculture, food, health and nutrition. Resources related to educational activities are available at Oklahoma Ag in the Classroom (www.agclassroom.org/ok) and Farm to You (https://humansciences.okstate.edu/fcs/cnep/farm-toyou/).
- School gardens that provide students with hands-on, experiential learning experiences.

This fact sheet focuses on procurement of local foods, including school gardens, for use in school nutrition programs.

Why should my school participate in farm to school?

Farm to school emphasizes the use of local foods. When local foods are featured in school nutrition programs, everyone benefits!

- Students have increased access to high-quality, fresh foods and tend to choose these foods more often. Students who have healthier diets tend to do better in school.
- Schools tend to see an increase in students' participation in the school meal program.

Because students prefer fresh foods, there is less food waste.

- Farmers and local producers gain a significant revenue source by opening doors to food service markets. This has potential to create new jobs and strengthen the local economy.

To learn more about the benefits of Farm to school, go to Research Shows Farm to School Works, https://fns-prod.azureedge.net/sites/default/files/f2s/ResearchShows.pdf.

Oklahoma Cooperative Extension Service
Division of Agricultural Sciences and Natural Resources
Oklahoma Sate University

How does my school purchase local foods for the school nutrition program?

While sourcing local foods can seem like a confusing and time-consuming process, there are five basic ways to incorporate fresh and local produce into schools. Schools can use one or a combination of all five approaches to meet the needs of the school. The five ways to incorporate fresh produce into schools include the following:

1. USDA DoD Fresh
2. Direct purchase through farmers
3. Cooperative purchasing
4. School gardens
5. Local distributors that sell locally

Any of the above methods can be used, as long as a description is included in the school districts' procurement plan. Descriptions of each method and the corresponding procurement plan clause are provided below.

1. USDA DoD Fresh

USDA DoD Fresh is a partnership between the U.S. Department of Agriculture and the U.S. Department of Defense. Schools that participate in federally funded Child Nutrition Programs can purchase a variety of fresh, high-quality produce using part of their USDA Foods entitlement dollars. This method allows schools to manage and utilize money effectively.

How do I use DoD Fresh?

1. The USDA Regional DoD Fresh office coordinates with local farmers to offer fresh produce as part of the USDA Foods Program.
2. In March of every year, schools complete the USDA Foods Survey to allocate entitlement dollars for the next school year. A line item on the survey is designated for DoD Fresh. Enter the dollar amount you would like to spend on fresh produce. It is recommended to designate at least 10 percent of the school's total allocation. For smaller schools with less options to purchase fresh fruits and vegetables, it is recommended to allocate more than 10 percent. Allocate fewer dollars to canned fruits and vegetables. Submit the survey as usual.
3. USDA DoD Fresh contracts with a local distributor to coordinate the school's weekly ordering and receipt of the produce. This is called the Fresh Fruit and Vegetable Order/Receipt System (FFAVORS). Each week, the distributor provides the school with a list of fruits and vegetables available. Items locally grown or produced are marked with an asterisk. Order the amount and variety of fruits and vegetables needed to prepare the menu. Schools can also contact their USDA DoD Fresh produce vendor to learn what local products they plan to carry.
4. The fresh produce is delivered to the school on a weekly basis. Most schools report receiving quality produce at a good price.

Learn more about using DoD Fresh at Using DoD Fresh to Purchase Local Produce: https://fns-prod.azureedge.net/sites/default/files/f2s/DoDFresh.pdf.

Example Procurement Plan Language

The District may purchase local produce through the DoD program using the allotted dollars set aside from the Planned Assistance Level (PAL) funds allocated for commodities on the USDA Foods Survey. The SFA may utilize the DoD Fresh Fruit and Vegetable Program vendor without conducting a procurement process, only for items that utilize the Planned Assistance Level funds. Anything purchased over the DoD PAL funds will be procured according to federal procurement regulations.

2. Direct Purchase from Farmers

Schools using this method purchase foods directly from local farmers, ranchers and farmer's markets. It provides flexibility to meet the mutual needs of both the school and local producer.

How do I make direct purchases from farmers?

1. School nutrition personnel responsible for purchasing need to know the local producers and what foods are offered. To help identify local producers, use webpages such as the Oklahoma Farm to School at https://okfarmtoschool.com/schools/participating-schools/ or Oklahoma Grown webpage at http://www.okgrown.com/markets.
2. Decide how much money will be used to purchase from a local farmer – this will determine the procurement methods to use. The USDA "Decision Tree: How Will You Bring Local Foods into the Cafeteria with Your Next Food Purchase?" provides useful information (https://fns-prod.azureedge.net/sites/default/files/f2s/DecisionTree.pdf).
3. Clearly communicate the school's expectations by having product specifications. The specifications may include requirements for safe growing, harvesting and storage practices. Tips for writing specifications for locally sourced foods are provided below.
4. Schools solicit quotes for produce on a month-to-month basis, depending on what is affordable and available.
5. Delivery details can often be worked out with the farmers. For example, it may be possible for the farmer to deliver straight to the schools or a central warehouse, or schools may choose to pick up the produce from the farm or farmer's market.

Example Procurement Plan Language

The District may purchase produce from local farmers or farmer's markets, from cooperative local farm procurement/bids, from school gardens and from local distributors selling local products. Pricing for farm to school produce should be obtained in manner consistent with the District procurement plan, using the correct method of procurement- informal methods include:

- Micropurchasing for purchases less than $3,500 distributed equitably among qualified suppliers.
- Small purchase procedures for purchases more than $3,500, but less than $150,000. Verbal phone quotes are allowed and all qualified suppliers are given the same information.
- Formal methods using competitive sealed bids or competitive proposals for purchases equal to or more than $150,000, using the RFP/IFB option.

The SFA is permitted under USDA regulations to purchase locally grown or locally raised agricultural products and apply a geographic preference when awarding and purchasing locally grown or raised products. Under federal law, school districts will apply a "local" geographic preference to minimally processed foods and determine what is "local" for purpose of the USDA programs such as National School Lunch and School Breakfast Programs. The school district(s) defines "locally grown products" eligible for this geographic preference at two levels:

1. foods grown within the state of Oklahoma as first preference, and
2. within 400 miles of of your school district as the second preference.

If the SFA's annual procurement of a particular product will be less than the school district's sealed bid threshold, the SFA may use a simplified process in sourcing local produce, provided that the sourcing method meets the school district bid-

ding threshold requirements not to exceed $150,000.

The SFA will follow the OSDE Compliance guidelines when sourcing locally grown and raised agricultural products.

3. Cooperative Purchasing

Cooperative purchasing occurs when school districts come together to purchase local products. Sometimes, these arrangements are informal, while others are more formal and governed through bylaws. The benefits of joining together to procure local foods are: reduced food costs, administrative burdens and accessing markets or producers they may not be able to access alone. A benefit for the local producers is larger purchases establish a significant market.

How do I purchase through a local foods cooperative group?

1. First, determine if a purchasing cooperative already exists and if it meets the school district's needs. Collect basic information, such as how they operate, the types of products they offer and their reputation. The Oklahoma School Nutrition Association, neighboring school districts or the state agency may know of existing cooperatives your school can join.
2. If there is not an existing cooperative in the school's area, identify schools that would like to form a local foods cooperative.
    a. Convene a meeting of interested schools and come to consensus on how the cooperative will be governed (i.e., informally or formally) and on the types and quantity of foods to purchase.
    b. Designate an individual from the cooperative to coordinate activities and communicate with the local producers. This will take some time, so someone from a larger district with a staff is best.
    c. Identify farmers and local producers who are interested in producing for the cooperative. Learn what they produce and in what quantity. Use product specifications to communicate the cooperative's expectations.
    d. The individual designated coordinator for the coop will develop and solicit a bid for local produce based on the needs of the cooperative, with specifications, amounts needed for each item, methods of distribution, food safety requirements, packaging and insurance requirements.
3. For more information on purchasing cooperatives, the Institute for Child Nutrition (ICN) has prepared detailed guidelines in Procurement in the 21st Century. (http://www.nfsmi.org/documentlibraryfiles/PDF/20151009032855.pdf).

Example Procurement Plan Language

The School Food Authority may utilize other school districts' local foods contracts or enter into an informal cooperative (a group of school districts/schools agreeing to cooperatively procure together to take advantage of volume pricing for products or services procured in one contract) as permitted by the contract, solicitation agreement and as agreed to by the supplier. Cooperatives, at a minimum, must follow Federal procurement regulations when procuring goods and services for its members.

4. School Gardens

School gardens come in many varieties, including acres of produce, greenhouses, tower gardens and indoor containers. School

gardens are a great way to creatively teach students about nutrition, healthy eating habits, agriculture, STEM and can serve as experiential education opportunities for all disciplines. The USDA does not prohibit schools from using produce grown in school gardens, so produce from school gardens can be used in a variety of ways. While school gardens rarely produce enough food to make up a large portion of the school meals, using the produce can increase school meal acceptance, enhance learning, supplement meals and serve as a nutrition education tool.

How do I use foods grown in a school garden?

1. Schools can use funds from their non-profit food service account to purchase garden needs such as seeds, fertilizer, rakes and watering cans, as long as the garden is used within the context of the program. For example, the produce may be used as a taste test for students or as part of a school meal. Produce from the school garden can be donated back to the school, purchased through an intergovernmental agreement or purchased through micro-purchase methods (purchases less than $3,500).
2. Food safety is often a concern when considering school gardens. If safe growing, harvesting and storage practices are followed, produce from school gardens carries no greater food safety risk than produce from other sources. Produce from school gardens travels the shortest distance from harvest to plate, so safety can be easily managed with more direct oversight than produce travelling longer distances.
3. School gardens are often in full bloom and production in the summer months, which can make staffing the gardens a challenge. Options for meeting staffing needs, both in the summer and supplemental garden staff during the school year, utilize volunteers, community groups, teachers, students and parents. Funding sources are available that may cover the cost of staff, in addition to the construction and maintenance of the gardens. Options for school gardens not needing summer maintenance include hydroponic systems and tower gardens. More information on funding school gardens can be found on the USDA Farm to School resource page: https://www.fns.usda.gov/farmtoschool/farm-school-resources

Example Procurement Plan Language

The District may purchase produce grown in a school garden by utilizing the micro-purchasing method of procurement (less than $3,500).

5. Local Distributors That Sell Local

Schools can competitively solicit bids from the local distributors that provide other products and services to the school for its regular food service operations.

How do I know my distributor is providing locally grown foods?

1. Communicate with the food distributors to let them know you are interested in purchasing locally grown produce. Schools often are surprised to learn their distributors are already working with, or in the process of, establishing relationships with local producers. If not, they may be more inclined to seek out opportunities with local farmers if they are aware schools are interested in buying local produce.
2. Use language in your bids that assign more points for local products.

Evaluation Criteria	Total Points
Pricing & responsiveness: i.e., farm to school; fixed case pricing, fixed fee per case pricing, other pricing criteria, duration of firm pricing; escalation calculation methods	61
Suppliers qualifications: i.e. size, capacity, service capabilities, plant/facility, personnel, insurance, other related factors	17
Farm to school-local products & farms: i.e., breadth of products, farms, & supply capabilities*	16
Supplier's references & past performance	7
Supplier's safety, health and sanitation programs, practices, awards, performance, and evaluation site visits	10
Total	100

* Points for Preference of Local Produce (16 total out of 100 points) will be determined by the number of Oklahoma grown products that can be provided by the bidder (there are 36 different fruits/vegetables grown in Oklahoma. See Oklahoma Harvest Calendar), the number of farmers who will provide these local products, the Harvest of the Month program submitted by the bidder, and whether the local product is level one from the state, or level 2 within the region of 400 miles from the school district's area.

Example Procurement Plan Language

The District may purchase locally grown produce through the produce distributor bid, using a competitive proposal. The award of the produce bid will contain evaluation factor points assigned to locally grown produce, as listed below.

Provided a Bidder's proposal is responsive, evaluation and award will be based on the following evaluation criteria. Award of this proposal will be made to the Bidder(s) whose proposal(s) is most advantageous considering price and the other factors, including but not limited to the following factors.

Local Farm Requirements

- Local farms shall grow food with no detectable pesticide residues on/in final food products. Organic is preferred.
- Local farms shall be able to deliver product to the District's contracted produce supplier within 72 hours of harvest.
- Local farms shall not pre-treat, wash or clean raw or lightly processed foods with toxic detergents or cleansing agents such as bleach, ammonium or others not listed here.
- Local farms must be willing and capable of working with or delivering directly to the District's contracted produce vendor. They must be willing to meet basic variety, grading and packing standards of the contracted produce vendor.
- Local farms shall be able to provide experiential educational opportunities for District students such as farm tours and Farm to Student events.

Keeping it Legal

Regardless of the approach, a school choosing to purchase local foods must follow all local, state and federal procurement regulations. The amount of funds the school district will spend is a primary factor in determining which procurement method, or methods are used. This is often referred to as the spending threshold. To help make these decisions, the USDA has provided a "Decision Tree: How Will You Bring Local Foods into the Cafeteria with Your Next Food Purchase?" available at https://fns-prod.azureedge.net/sites/default/files/f2s/DecisionTree.pdf. Once the procurement method has been identified, it should be included in the school district's Child Nutrition procurement plan. Example language is provided above under each approach.

Tips for Writing Specifications

Product specifications are a general description of the local foods a school district is looking to purchase. Using specifications when purchasing locally is as important as when purchases are made from a large distributor because they clearly communicate the school's

expectations. Example items to include in the specification for local foods include:

- Freshness (e.g. "delivered with 48 hours of harvest");
- Harvest techniques;
- Production practices;
- State of origin labelling; and/or
- Ability to provide farm visits or visit classrooms.

Bringing it Together: What does local purchasing look like in practice?

A school district has decided that Farm to School and local foods would benefit the school nutrition program. Language was added to the Child Nutrition procurement plan, allowing for the use of federal funds. The district defined locally grown as within the state or adjacent states.

The school district, or local purchasing cooperative, was aware that several producers grow tomatoes and the following specification was written.

- Available at least 10 months out of the year
- Greenhouse-grown, hydroponically grown or grown outside
- Grade No. 1 quality
- Fully ripe
- Red color stage
- Ten-day shelf life
- Pesticide free and organic
- GAP and Good Handling Practices certified, preferred

- Transported to a school warehouse or to 18 individual schools
- Must be delivered two days before service
- Must be able to provide an estimated quantity of 36 cases per week

Based on the amount of tomatoes used in previous school years, the director determined the spending threshold for purchasing locally grown tomatoes falls below the small-purchase procurement threshold (less than $150,000). Using a list of tomato growers in the area, the director contacted producers to determine interest, and the written specifications were emailed to at least three producers for quotes. Once the quotes were received, the school district made, then documented a decision on the producer who best met the school district's needs. The delivery details were worked out and a contract was signed for purchasing tomatoes throughout the school year at a set price. Throughout the school year, the director monitored and evaluated the quality of product and service.

For other products, such as lettuce greens, the school district decided to use DoD Fresh. In March, when completing the DoD Fresh Survey, the director allocated 10 percent of the entitlement food dollars to DoD Fresh for the following school year. Once the school year began, the director placed weekly orders for the needed amount of greens from the DoD Fresh vendor using the FFAVORS order system. This approach did not require the director to write specifications or solicit quotes.

The director marketed the availability of Farm to School local produce to students and parents by featuring them on the school menu. Classroom activities were coordinated by having the tomato farmer visit the cafeteria and engage with students near the salad bar.

Conclusion

While implementing Farm to school initiatives may seem overwhelming, there are benefits to students, the school and the commu-

nity. Schools may use a variety of approaches in purchasing local foods that can be combined to best meet the needs of the school and producer. In making decisions, there are many resources available to help. To get started, check out websites listed throughout this fact sheet and below.

- Community Food Systems: Resources https://www.fns.usda.gov/farmtoschool/farm-school-resources
- Community Food Systems: Fact Sheets https://www.fns.usda.gov/farmtoschool/fact-sheets
- Oklahoma Farm to School http://okfarmtoschool.com/

Sources

USDA-Decision Tree: How Will You Bring Local Foods into the Cafeteria with Your Next Food Purchase? (August 2017) Accessed April 8, 2009. https://fns-prod.azureedge.net/sites/default/files/f2s/DecisionTree.pdf.

USDA – Geographic Preference: What it is and How to Use It. (August 2017). Accessed April 8, 2018. https://fns-prod.azureedge.net/sites/default/files/f2s/GeoPreference.pdf

USDA—Procuring Local Foods for Child Nutrition Programs (August 2016). Accessed March 23, 2018. https://fns-prod.azureedge.net/sites/default/files/f2s/ProoureLocalFoodsCNPGuide.pdf

USDA—Using DOD Fresh to Purchase Local Produce (December 20, 2017). Accessed March 23, 2018. https://www.fns.usda.gov/farmtoschool/using-dod-fresh-buy-local

USDA—School Gardens: Using Gardens to Grow Healthy Habits in Cafeterias, Classrooms, and Communities (December 20, 2017). Accessed March 23, 2018. https://www.fns.usda.gov/farmtoschool/school-gardens

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APPENDIX C

COOKING for KIDS
Culinary Training for School Nutrition Professionals

Growing Farm to School in Oklahoma Evaluation

You are invited to share your school district's experience with farm to school. In a broad sense, farm to school is any way you purchase foods from local growers, farmers or producers to use in the school nutrition program.

Your experience, no matter how small or big, is important in helping us know

- How schools are sourcing local foods,
- What kind of foods are being locally sourced, and
- What barriers, if any, are limiting your school district's sourcing of local foods.

The information you provide will be useful in helping identify future training needs and resources. Program evaluators will guide you through drawing a "map" to share your experiences. If you agree, we will contact you a second time in approximately 18 months to ask the same information to learn if the training and resources have been helpful in helping your district *grow farm to school!*

Your participation is voluntary. Your responses are confidential and will not be shared with anyone at your school or state agency. Neither your name or school will be used in evaluation reports. Your email will not be shared or provided to anyone.

If you have questions, please contact the principal evaluator at Deana.hildebrand@okstate.edu or 405-744-5059.

If you have questions about your rights as an applied research volunteer, please contact OSU IRB at (405) 744-3377 or irb@okstate.edu.

If you agree to participate please provide the following information so that we can contact you in approximately 18 months.

School District _____

What is your school nutrition position? If you hold more than one position, please mark the highest position.

- ☐ Child Nutrition Director
- ☐ Kitchen Manager
- ☐ Head Cook
- ☐ Cook
- ☐ Cashier
- ☐ Other _____

Your name _____

Your email address at school _____

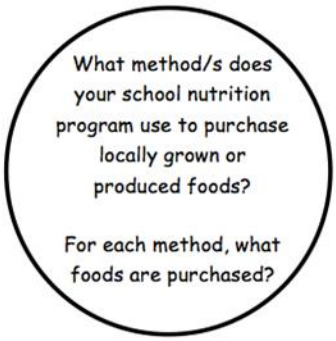
School telephone number where you can be reached _____-_____-_____

What is the best time of day to contact you at school? _____

Form #


The food groups
your students like
best are…
For each group,
what are the
specific food items?

Form #


What method/s does your school nutrition program use to purchase locally grown or produced foods?
For each method, what foods are purchased?

Form #


What prevents your school nutrition program from purchasing locally grown or produced foods?

Form #

APPENDIX D

COOKING for KIDS

Did you know that offering fresh fruits and vegetables in the school menu can help improve student satisfaction and participation?

USDA DoD Fresh is one of the easiest ways to "make it happen". Benefits include:

- High Quality: DoD maintains high quality standards and offers a variety of produce options. Including locally grown produce when in season.
- Easy Ordering: The Fresh Fruit and Vegetable Order/Receipt System (FFAVORS) catalog indicates which foods are locally grown
- Consistency: Weekly catalog updates and frequent deliveries make orders timely and fresh

How to get started with DoD Fresh...

- When filling out your USDA Foods Survey, look for the DoD Fresh item.
- Allocate some of your entitlement funds to this item. You decide how much. Other school nutrition directors who use DoD Fresh recommend 10% of your total entitlement allocation. You can use more, if desired.
- Next fall, the designated DoD distributor will send you the FFAVORS "grocery list" of fruits and vegetables. The items that are locally grown or produced will be marked with an asterisk. Order the amount and variety of fruits and vegetables needed to prepare your school's menu.
- The fresh produce is delivered to your school on a weekly basis. Most schools report receiving quality produce at a good price.

Click the link below for more details about this process.

Farm to School Guide for Child Nutrition Directors and Managers

APPENDIX E

Growing Farm to School in Oklahoma Evaluation – Post Survey

Name:

School District:

School Nutrition Position:

1. What method/s does your school nutrition program use to purchase locally grown or produced foods?

For each method, what foods are purchased?

2. What prevents your school nutrition program from purchasing locally grown or produced foods?

3. Did you attend Cooking for Kids Management Training in July of 2018?

4. Did you attend the farm to school session at Oklahoma SNA conference in June of 2018?

5. Did you participate in Cooking for Kid's chef consultation program in the 2018-2019 school year?

6. How many years of work experience do you have in school nutrition?

7. Is your school district considered to be in a rural or urban area?

APPENDIX F

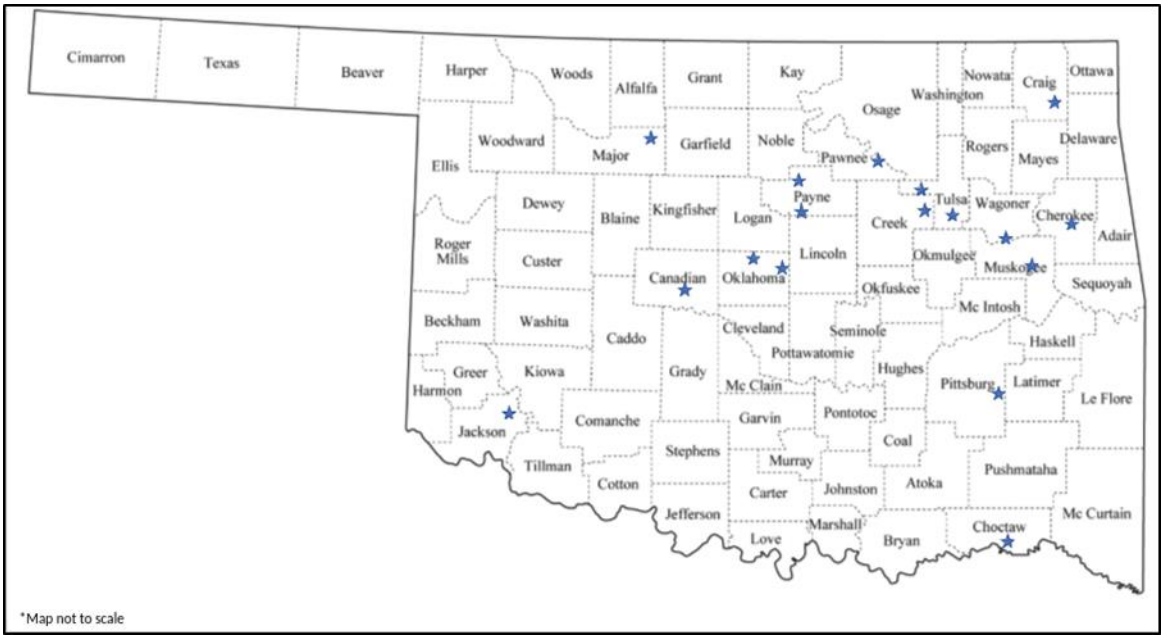
Barrier Themes Derived from Previous Literature with Specific Barriers Reported by Participants

Barrier Theme	Barriers Reported by Participants
Availability, lack of	Not available x8 No access Availability of products Farmer is now growing marijuana instead of produce Lack of local farmers x2 Small rural district - limited to no suppliers No local vendors No local farmers No local growers accessibility Location x3 Large CEP feeding school - not enough supply Not enough local production for big schools Limited availability from DoD
● Lack of distribution system	Would have to pick up produce and not able to do that Delivery Transport
● Seasonality	OK growing season not always during school year
● Quality	Shelf life

	Doesn't see a need to purchase local because they get good products from their distributor Not great products sometimes Produce is not always good quality
● Food service management company	Contracted with food service mgmt company x2
Knowledge, lack of	Where are farmers? What's available? Lack of information/resources Lack of confidence in picking farmer Don't know when DoD foods are local Not a lot of variety
● Process	Knowledge of process x3
● Network, lack of	Knowing where/who to purchase from Not familiar with farmers x2 Don't know farmers No success at farmers market FFA got a new teacher so no more greenhouse utilization Asked FFA with no success Not enough support from management Conflict of interest with school board member who is a local farmer
● Finances	Money

	Cost
Regulations	PO & approval
	Bidding procedures
	Not in procurement plan
	Can't find out soon enough to include in procurement/menu plan
	Ways schools have to spend money - can't spend money quickly
Time	Process takes too long
	Short staffed
	Time & effort to set up

APPENDIX G


Cimarron
Texas
Beaver
Harper
Woods
Alfalfa
Grant
Kay
Nowata
Craig
Ottawa
Washington
Osage
Woodward
Major
Garfield
Noble
Pawnee
Rogers
Mayes
Delaware
Ellis
Dewey
Blaine
Kingfisher
Logan
Payne
Creek
Tulsa
Wagoner
Cherokee
Adair
Roger Mills
Custer
Canadian
Oklahoma
Lincoln
Okmulgee
Muskogee
Sequoyah
Okfuskee
Mc Intosh
Beckham
Washita
Caddo
Cleveland
Seminole
Haskell
Pottawatomie
Greer
Kiowa
Grady
Hughes
Pittsburg
Latimer
Le Flore
Harmon
Mc Clain
Jackson
Comanche
Garvin
Pontotoc
Coal
Stephens
Murray
Tillman
Cotton
Carter
Johnston
Atoka
Pushmataha
Jefferson
Marshall
Choctaw
Mc Curtain
Love
Bryan
*Map not to scale

VITA

Michelle Elizabeth Tillinger

Candidate for the Degree of

Master of Science

Thesis: USE OF A NOVEL APPROACH TO ASSESS CHANGES IN LOCAL FOOD SOURCING IN A SAMPLE OF OKLAHOMA SCHOOL DISTRICTS

Major Field: Nutritional Sciences

Biographical:

Education:

Completed the requirements for the Master of Science in Nutritional Sciences at Oklahoma State University, Stillwater, Oklahoma in December, 2020.

Completed the requirements for the Bachelor of Science in Nutritional Sciences at Oklahoma State University, Stillwater, Oklahoma in 2018.

Professional Memberships:

Academy of Nutrition and Dietetics, Oklahoma Academy of Nutrition and Dietetics, North Central District Dietetic Association