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The Effect of Change in Middle School Lunchroom Setting on Student's Intake of Broccoli

By

Mia Wood Angst

A THESIS

Presented to the Faculty of

The Graduate College at the University of Nebraska

In Partial Fulfillment of Requirements

For the Degree of Master of Science

Major: Nutrition and Health Sciences

Under the Supervision of Professor Weiwen Chai

Lincoln, NE

November 2018

The Effect of Change in Middle School Lunchroom Setting on Student's Intake of Broccoli

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University of Nebraska, 2018

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Introduction:

Over the past three decades, childhood obesity has more than doubled in children and quadrupled in adolescents. One possible solution to combating this growing epidemic is by making small changes to prevent obesity during childhood that will influence children to follow a healthy lifestyle into adulthood. The Smarter Lunchrooms Movement aims to increase healthy eating by incorporating low-cost to no-cost alterations to the school lunchroom in an effort to increase consumption of healthier foods by making them more attractive and convenient.

Purpose: This research study assessed broccoli consumption among 6th – 8th grade students in a selected community school system following a Smarter Lunchrooms classroom activity intervention focused on catchy and appealing vegetable marketing approaches outside the cafeteria. This study was designed to address how effective a classroom activity intervention is for 6th – 8th grade middle school students in terms of increasing their broccoli intake and decreasing plate waste.

Methods: The intervention focused on increasing the appeal of broccoli by creating catchy, appealing names and then displaying age-appropriate signage highlighting these fun, interesting names for broccoli in the cafeteria. Two measures were used to track changes in food choice and consumption: (i) analysis of production and sales

records and (ii) analysis of plate-waste. Data for both measurements were collected before and after the implementation of the intervention for both intervention schools and control schools.

Results: Following the intervention, the proportion of students who selected broccoli increased at the intervention schools and decreased at the control schools. Broccoli tray waste decreased at one intervention school, but not at the other. High-income schools had more broccoli sales post intervention compared to the low-income schools post intervention. In all schools post intervention production records showed a decrease compared to the pre-intervention records.

Conclusion and Implications: This study indicated that through a classroom intervention activity focused on increasing the appeal of broccoli by creating catchy, appealing names, it is possible to increase the selection of broccoli in 6th – 8th grade students, especially with the use of more interactive teaching methods. More research is needed to determine how to create behavior change and increase student consumption of broccoli in students.

Author's Acknowledgements

This research project would not have been possible without several faculty and nutrition professionals. First, I would like to thank my advisor, Dr. Weiwen Chai for her guidance on this research. I appreciate all of the support you have given me. I would like to thank Dr. Linda Boeckner for investing her time and effort in me and originating my project. I am so grateful for all of the encouragement and advice you have given me on this research every step of the way. I would also like to thank Dr. Georgia Jones for serving on my committee and providing her recommendations, advice, and guidance.

I would also like to thank Jesse Coffee for lending her assistance and expertise. I would also like to thank all of the research assistants that volunteered their assistance to collect tray waste study data. In addition, I would like to thank Steven Svoboda and Stephen Walker for working with me on my data analysis and always being there for me when I had questions.

Thank you to my family, especially my husband, Aaron Angst, and my dad, David Wood, for their never ending love and support that have helped me get to this point in my academic career. I would also like to thank Debra Grier for believing in me, encouraging me to reach my goals, and for pushing me to the finish line. Your positivity and support have helped me more than you know.

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Chapter I: Introduction

Significance of Research

The United States has one of the highest childhood obesity rates. Childhood obesity rates have grown exponentially, pervading through all categories of race, ethnicity, family income, and geographic region¹. In the last three decades, childhood obesity rates in America have more than doubled in children and quadrupled in adolescents¹. Children that are overweight or obese have an increased risk of developing a myriad of health complications and chronic diseases². A study implemented amongst subjects who participated in the Bogalusa Heart Study illustrates that 70 to 80 percent of obese children and adolescents grow up to become obese adults and are therefore at a higher risk for health problems and chronic diseases².

One possible solution to combating this growing epidemic is by making small changes to prevent obesity during childhood that will influence children to follow a healthy lifestyle into adulthood. Every day, children in America purchase lunch in their school's cafeteria. The school cafeteria is a habitual environment for children and provides an excellent opportunity to encourage healthy eating behaviors and to introduce interventions. Targeting the school cafeteria environment plays an important role in influencing and developing healthy eating behavior in children and adolescents.

An intervention that has the potential to create healthy eating habits would be optimal in the adolescent period of life. Although adolescence has numerous definitions throughout the literature, for the purposes of this paper adolescence will be defined as the ages of 11-15 years old. Adolescence is an optimal opportunity for an intervention

because of the accelerated development of autonomy that takes place during this period of the life cycle. Through an increase in both physical and cognitive changes, adolescents discover their individual independence and decision-making³. During this time, parents begin to leave their children at home without a caregiver, stimulating a transitional period of emotional autonomy allowing adolescents to think for themselves and make their own decisions³. In addition, the effects of emotional autonomy cause adolescents to be vulnerable to peer pressure³. By influencing adolescents to make smarter choices in their school cafeteria, they can learn behaviors that they can use as a part of a healthy lifestyle at home.

One program that is already established is the Smarter Lunchrooms Movement developed by Cornell Center for Behavioral Economics at Cornell University. Research findings from the Smarter Lunchrooms Movement show that as of September 2018, the Smarter Lunchrooms Movement has been implemented in nearly 30,000 elementary, middle and high schools nationwide. The implementation of this program in schools has increased student consumption of healthy foods over 30% and has increased student selection of healthy foods over 40%⁴. A smarter lunchroom is one that encourages children and adolescents to choose more nutritious foods when presented with a wide range of choices⁴. There are more than 30 million children that are fed by the National School Lunch Program (NSLP)⁴. This program, designed for children and adolescents, applies research-based principals to encourage students to select, eat, and enjoy healthier foods in school without elimination of other food options. The Smarter Lunchrooms Movement has created a set of best practices that effectively create an environment to lead kids toward nutritious choices. These best practices are comprised of solution-based

principles that focus on specific parts of the school meal. The following are included as best practices:

1. Increasing the number of students that select fruit
2. Increasing the number of students that select targeted entrée
3. Increasing the number of students that select vegetables
4. Increasing the number of students that select reimbursable meals
5. Increasing the number of students that select white milk⁴.

Best practices and lunchroom solutions recommended by the Smarter Lunchrooms Movement have been tested and proven effective in several diverse elementary, middle and high schools throughout the nation. A Smarter Lunchrooms Movement study was conducted and evaluated over the 2011 school year period, resulting in significant increase in selection of vegetables from between 40%-70%⁴. In addition, it was found that naming vegetables and displaying the new names with the foods were effective strategies to encourage students to make healthier choices⁴. The impact of changes under the implementation of the Smarter Lunchrooms Movements best practices was measured with use of production and sales records and plate waste studies.

With the success of Smarter Lunchrooms Movement presented by Cornell University, the University of Nebraska was provided with the opportunity to use the same Smarter Lunchrooms Movement best practices in middle school students (6th – 8th grade students). In addition, a classroom activity component was added to the 8-week optional Family and Consumer Science course for students to learn more about vegetables and healthy food choices and for researchers to evaluate the effectiveness of this additional component to an already successful program. This study investigated this added activity

component as well as the impact on plate waste during a period of time from January through May 2016.

Purpose of Study

This research study assessed broccoli consumption among Nebraska 6th-8th grade students in a selected community school system following a classroom activity intervention focused on catchy and appealing vegetable marketing approaches outside the school cafeteria. This study was designed to address how effective a classroom activity intervention is for 6th-8th grade middle school students in terms of increasing their broccoli intake and decreasing plate waste. Quantitative pre- and post- intervention plate waste collection and an observation matrix were used to evaluate whether the classroom activity intervention would increase vegetable consumption of 6th-8th grade students as a step toward a healthful dietary change. Concurrent with this data collection, qualitative interviews were conducted with Family and Consumer Science teachers and freehand observations were used to explore how participants perceived the effect of the classroom activity. These protocols were used to address the following hypotheses:

Hypothesis

1. Consumption of broccoli will increase when broccoli is given fun and attractive names.

Quantitative Research Questions

1. If creative names are assigned to broccoli by middle school students and then displayed in a fun, eye-catching manner at the school lunchroom, will middle school students be lead to increase broccoli consumption, based on observed plate waste measurement and production records? ^{1}_{SEP}

Chapter II: Literature Review

Current Obesity Statistics

Obesity continues to be one of the most serious public health issues facing America. The speed at which obesity rates are increasing suggests that behavioral and environmental influences, versus genetic changes, have stimulated the epidemic. Over the years there have been gradual increases in our eating habits and consistent decreases in physical activity levels as evidenced by national ecological survey data. Several factors have shown to contribute to the increased levels of energy balance and increased obesity rates: less food is consumed at home, increased consumption of fast foods, higher energy availability per capita, increased consumption of soda, and larger portion sizes. In addition, there are multiple factors that are contributing to decreased physical activity: less activity required for activity's of daily living, less activity required for work due to advances in technology, decrease in household activity due to technological devices that decrease labor requirements, and occupations in general have become more sedentary due to technology advances in labor aids. Approximately 60% of American's do not participate in regular physical activity and 25% of Americans are completely sedentary⁵. In addition, physically activity in schools has decreased nationwide and around 50% of adolescents and young adults between the ages of 12 and 21 are not physically active on a regular basis⁵. When people consume more calories than they expend, their bodies store the excess calories as fat. In extreme cases of weight gain, overweight and obesity result. Approximately 300,000 deaths a year in the United States are currently associated with overweight and obesity, second only to cigarette smoking as a leading cause of

preventable death in America⁵.

Obesity is increasing in both genders and among all population groups⁶. Nationally, one in three children and adolescents are considered either overweight or obese⁶. Among children aged 6 to 19, approximately 15 percent, or 9 million children and adolescents are overweight¹. In 1999, approximately 13 percent of children and adolescents were overweight. Today there are nearly three times as many overweight adolescents¹ compared to 18 years ago. Currently 17 percent of children meet the criteria for obesity⁷. According to Center for Disease Control and Prevention (CDC)⁷, as of 2014, 36.5% of adults in the United States were obese (defined as a body mass index (BMI greater than or equal to 30), with men being approximately equal to women. In addition, 20.5% of children ages 2 to 19 were obese (defined as having a body mass index (BMI) at or above the 95th percentile of the gender-specific CDC growth charts), with boys having equal rates as girls (21%, respectively)⁷.

Nebraska mirrors the nation-wide trend of increasing obesity, with 15.1% of children considered overweight and 13.8% of children considered obese⁸. This was a slight decrease from 2007, when 15.6% of children were considered overweight and 15.8% were considered obese⁸. In addition, statistics from the Youth Risk Behavior Survey (YRBS) indicates that as of 2015, 13.9% of high school student's students were obese and 16% of were overweight⁹. The 2012 National Survey of Children's Health found that the combined percentage of overweight and obese children ages 10-17 was 28.9%, placing Nebraska 22nd out of all states for overweight and obesity rates⁹. Yet obesity begins even younger than adolescence; the 2011 Pediatric Nutrition Surveillance Survey (PedNSS) found that 15% of Nebraska's low-income children ages 2-5 were

obese⁹.

Nebraska has met the Healthy People 2020 goal of reducing the obesity rate of obese children and adolescents to 14.5%¹⁰. While great strides are being made in Nebraska to reduce obesity, efforts must continue in communities where rates are higher. This study will specifically focus on the Lincoln, Nebraska community. As the capital city and home of the largest University in the state, the city of Lincoln is the second most populous city in Nebraska, covering approximately 94.267 square miles. As of the census of 2016, there were 280,369 people, 112,386 households, and 66,308 families residing in the city. The racial makeup of the city was 80% White, 4% Black, 1% Native, 4% Asian, 7% Hispanic and 3% from other races¹¹. In the 1970's, Lincoln was designated as a "refugee-friendly" city by the U.S. Department of State due to its stable economy, educational institutions and size. Since then, refugees from Vietnam, Karen (Burmese ethnic minority), Sudanese and Middle Eastern have settled in Lincoln¹². In the 2017-2018 school year, Lincoln Public Schools provided support for approximately 3,100 students from 100 countries, who spoke 50 different languages¹³. Several coalitions, organizations, partnerships and agencies are actively working together in Lincoln Public Schools and in the Lincoln community to provide the support and resources to prevent childhood obesity, physical inactivity and food insecurity.

The Partnership For a Healthy Lincoln (PHL) is a non-profit organization that looks at health initiatives, healthy lifestyles as it relates to the low income, refugee and minority populations in the city of Lincoln. PHL's mission is to improve the health, wellness and fitness of communities and focuses on improving the health and fitness of children by changing the policies in Lincoln Public Schools¹⁴. According to a report

released by the Partnership for a Healthy Lincoln, children from kindergarten to eighth grade have experienced a decrease in obesity rates from 17.2% to 15.8% between the years of 2012 and 2013¹⁴. Though this decrease is promising, there is still much room for improvement, especially in middle schools, where obesity was higher for the 2016-2017 school year¹⁵. The current percentage of kindergarten through 8th grade students who are obese increased from 15.8% in 2013 to 16.8% in 2016¹⁵.

In Lincoln Public School (LPS) there is a correlation between lower income students and higher obesity rates, as is also the trend nationally. LPS schools with a higher prevalence of obesity had a larger population of students that qualified for free/reduced priced lunches compared to schools nationwide¹⁶. Elementary schools have a small advantage over middle schools because elementary school policy states recess and physical activity breaks are mandatory, but this is not the case for middle schools¹⁶. Also lacking in middle schools nationwide are required classes in family and consumer sciences. Those types of classes are only offered as an elective class.

Consequences of Obesity

Inadequate fruit and vegetable consumption may be a risk factor for childhood obesity and its related chronic health conditions, which include heart disease, diabetes, breathing and joint issues and fatty liver disease¹⁷. In addition to chronic diseases, pediatric overweight and obesity have been linked to social distress and psychological problems¹⁷. Children and adolescents that are overweight and obese are more likely to have lower self-esteem, increased loneliness, greater use of tobacco and alcohol, and experience extreme social stigmas¹⁸.

Overweight and obesity is a risk factor for several chronic conditions in children

and adolescents. Chronic conditions that result from overweight and obesity include but are not limited to heart disease, diabetes, asthma, atherosclerosis, sleep apnea, and several forms of cancer². Whether or not the development of these risk factors during childhood or adolescence will increase the severity of a normally adult-onset disease is not completely understood. Yet, several studies have shown that child and adolescent obesity are associated with earlier mortality and morbidity in adulthood¹⁹. However, it is uncertain whether obesity during childhood and adolescence increases the risk or the severity of additional adult onset obesity associated diseases, such as cancer (especially breast, endometrial, or prostate cancers)²⁰. With specific evidence leaning towards an increased risk of earlier mortality and longer morbidity rates, preventing and decreasing childhood obesity is a major issue of concern.

The consequences of obesity not only put a burden on the individual, but also contribute to the health care costs for the whole country. Currently, obesity places approximately 78 million Americans at an increased risk for a range of preventable chronic health conditions⁹. It is estimated that adult obesity costs in health care range from \$147 - \$210 billion per year. Furthermore, Medicare and Medicaid pay approximately \$61.8 billion of the total cost annually. The majority of expenses are attributed to the cost of obesity related diseases. The costs associated with health care from obesity in children and adolescents alone account for \$14.1 billion annually⁹.

Components that Impact Childhood and Adolescent Obesity

Currently, not all children and adolescents are meeting the Dietary Guidelines for Americans, 2015-2020, the most recent dietary recommendations intended for Americans 2 years and older which are created by scientific experts from the US Departments of

Agriculture (USDA) and Health and Human Services (HHS)²¹. More specifically, children and adolescents in the United States do not meet the recommendations for fruits, vegetables, or whole grains²¹. Data from the National Health and Nutritional Examination Survey (NHANES) showed that the top six foods that made up the empty calories in diets of children and adolescents were grain deserts, pizza, soda, fruit drinks, dairy deserts and whole milk²². In addition, children and adolescents exceeded the sodium recommendation, drank more soda than milk on a daily basis²¹, and consumed 40% of daily calories from solid fats and added sugars²¹.

According to NHANES data, snacking among adolescents increased from 61% in 1977-1978 to 83% in 2005-2006. In addition to increased snacking, the amount of snacks per day increased from 1.0 to 1.7 portions. These snacks accounted for 526 calories on average, which is nearly 25% of an average youth's total needs for the day. Though these snacks often provided higher proportions of Vitamin C and E, they provided lower proportions of most other nutrients, specifically protein, vitamin A, Folate, iron and zinc. Adolescents did not make up for the added calories from snacking during the day by consuming smaller portion sized meals. Additionally, frequent snacking was associated with an increased daily caloric intake, resulting from the high sugar content of these snacks²³.

With clear room for improvement to meet Dietary Guidelines, examining the consumption of fruit and vegetables is one key area to investigate. Although childhood and adolescent obesity is a multifaceted issue with several causes, there is minimal literature on fruit and vegetable consumption in children and adolescents and its effect on obesity. Moreover, there is even less literature on the effect of interventions on vegetable

consumption in adolescents. Because adolescence is a time of increased independence, decision-making and cognitive development, it is an important time period to learn healthy eating behaviors²⁴.

Prevention of Childhood and Adolescent Obesity

Adequate intake of fruits and vegetables has been inversely associated with obesity and related chronic health conditions, including stroke, cardiovascular disease and certain cancers²⁴⁻²⁸. Increasing consumption of fruits and vegetables may have a protective effect against obesity and related health conditions by several mechanisms. Adequate consumption of fruits and vegetables increases fiber intake, potentially reduces intake of energy-dense foods and increases consumption of antioxidants, all of which can contribute to a reduction in disease risk²⁹.

As eating adequate amounts of fruits and vegetables is related to numerous health benefits and dietary patterns during childhood and adolescence are associated with food patterns later in life²⁹, increasing the consumption of these foods among children and adolescents has become a public health priority. Youth's intake of fruits and vegetables are influenced by numerous factors. Parental eating behaviors contribute to children's attitudes regarding different foods and their subsequent food preferences³⁰. Accessibility and availability of fruits and vegetables³¹, family norms and taste preferences³² and frequency of exposure³³ also impact how many and the variety of fruits and vegetables youth eat on a regular basis.

Fruit and Vegetable Intake Recommendations

In most children and adolescents, obesity is preventable if one eats a balanced and healthy diet. The 2015-2020 Dietary Guidelines for Americans recommend that

individuals aged 2 years old and over increase their consumption of fruits and vegetables. Females between the ages 9-13 are recommended to consume 1½ cups of fruit and 2-3 cups of vegetables per a day. Males between the ages 9-13 require a higher intake of fruits and vegetables than females. Males ages 9-13 are commended to consume 1½ to 2 cups of fruits per day, and 2 to 2½ cups of vegetables per day³⁴. The 2015-2020 guidelines suggest that Americans, in general, double their intake of fruits and vegetables to ensure that nutrition requirements are met and to aid in the prevention of chronic diseases. Evidence shows that nationwide fruit and vegetable consumption has not increased in recent years resulting in more calls for increased efforts to improve the proportion of calories that are consumed from these nutrient-dense foods³⁵. Numerous stakeholders are critical in driving these changes, including parents, schools, childcare providers, community leaders and local and federal officials³⁶.

The United States national median intake of fruits and vegetables for adults is 1.1 and 1.6 servings per day (respectively)²⁴. In Nebraska, median intake among adults for fruits and vegetables is less than the national average, at 1.0 and 1.5 servings per day, respectively²⁴. In Nebraska, fewer than 1 in 4 adults consume the recommended amounts of fruits and vegetables and 41.0% of adolescents report consuming less than 1 serving of fruit daily (compared to 36.0% nationally)²⁴.

Childhood and Adolescent Obesity and the School Environment

The school environment plays an integral role in the development of youth' eating habits, as approximately 60 million youths are exposed to food in these settings²¹. There are approximately 448,443.84 youth under the age of 18 living in Nebraska²⁴ who may benefit from improvements to school or childcare nutrition programs, for example

the National School Lunch Program. Recent studies show that, when implemented in schools, food policies can improve children's fruit and vegetable consumption^{17,28}.

Youth's fruit and vegetable consumption may be improved in schools when the federal regulations regarding nutrition standards are met or exceeded²⁷. There are numerous avenues that schools can take to improve fruit and vegetable consumption, including proper training of staff to serve as role models²⁸, providing nutrition education in the classrooms²⁷, implementing school garden programs²⁹ and offering hands-on activities in which children gain exposure to a variety of different fruits and vegetables²⁸.

The idea that children and adolescents' fruit and vegetable intake is related to individual factors (such as taste preferences), interpersonal factors (such as family norms) and community factors (such as availability) aligns with the theory behind the Socioecological Model³⁰. This model posits that health behaviors are complex, with influential factors at individual, family, relational, community and societal levels. It has been suggested that effective behavior-based interventions should target multiple levels to be effective³¹.

A review of Behavior Risk Factor Surveillance Survey (BRFSS) data from Lincoln-Lancaster County in Nebraska demonstrates that adults in this county are not consuming adequate amounts of fruits and vegetables. In 2013, 38.1% adults reported consuming fruits less than 1 time per day and 21.2% of adults reported consuming less than 1 serving of vegetables per day. While this is an increase in consumption from 2011, when 41.0% and 24.8% of adults reported consuming less than 1 serving of fruits and vegetables (respectively) daily, there are still improvements to be made. Nationally, 37.7% and 22.6% of adults report consuming fruits and vegetables less than one time per

day, respectively¹⁰. Therefore, adults in Lincoln-Lancaster County, Nebraska are consuming fewer fruits and vegetables than the rest of the nation. Unfortunately, limited information exists on the fruit and vegetable intake of children and adolescents under the age of 18 in Lincoln-Lancaster County. However, as parental intake of fruit and vegetables is correlated to child intake³², this information provides helpful insights into the current state of the issue within Lincoln-Lancaster County.

Based on these findings, in Lincoln-Lancaster County, there is an opportunity to address fruit and vegetable consumption by implementing interventions in the school environment. These interventions should focus on improving knowledge, behavioral skills, access and perceptions related to fruits and vegetables. Parents, family and consumer science teachers, health teachers, chefs, food service management, and school officials are key stakeholders in the development of these interventions. Additional stakeholders are school nutrition professionals, and extension educators.

The Cornell Center for Behavioral Economics in Child Nutrition Programs has documented best practices for increasing student consumption of healthy foods and new offerings, known as the Smarter Lunchroom Movement. These best practices are implemented by providing low cost/no-cost solutions, sustainability and promotion of healthful eating behaviors based on lunchroom environment focus. Smarter school lunchroom strategies include moving and highlighting more nutritious food groups such as fruits and vegetables to make them more accessible to students, naming and displaying vegetables with catchy titles, highlighting the healthy entree on the lunch line, and implementation of healthy choices lines³⁷.

The Smarter Lunchrooms Movement strives to improve the quality of children's eating behaviors in schools by a variety of evidence-based principles. Researchers with this program have demonstrated that when fruits and vegetables are given fun and attractive names, consumption of these foods will increase³⁷. Additional research has concluded that when fruits and vegetables are marketed as "the convenient" option, sales increase³⁸. These findings suggest that there are opportunities to address vegetable consumption in the school setting by utilizing a variety of unique marketing techniques.

National School Lunch Program

The National School Lunch Program (NSLP) is a federally assisted meal program for public schools, non-profit private schools, and residential child care institutions. NSLP was established under the National School Lunch Act in 1946³⁹. The National School Lunch Act in 1946 was "created as a measure of national security, to safeguard the health and well-being of the nation's children"³⁷. In 2010, Healthy, Hunger-Free Kids Act (HHFKA) was enacted to provide funding for federal school meal and youth nutrition programs, increase access to healthy foods, and promote overall student wellness. The HHFKA has made modifications to the meal patterns and nutrition standards for the NSLP and the School Breakfast Program to include training and certification for all food service personnel, increased access to school meals, increased federal reimbursement rate for school lunches, and building stronger local school nutrition and wellness policies⁴⁰. Today, the NSLP operates in more than 100,000 public and non-profit private schools and residential care institutions and is the second largest federally assisted program in the nation³⁹.

In the United States, 99 percent of all public schools participate in the NSLP⁴¹. The purpose of NSLP is to provide balanced meals that are nutrient dense at a low-cost or free to more than 31 million children each school day. For many children, NSLP is a major source of food obtained at school. Each School or residential care institution that chooses to participate in NSLP receives cash subsidies and USDA foods from the U.S. Department of Agriculture (USDA) for every meal they serve. In return, the participating schools must serve lunches that meet federal requirements and they must offer free or reduced price lunches to eligible children. Any child that attends a school or institution participating in NSLP may purchase a meal through the National School Lunch Program. Students who come from families with household incomes at or below 130 percent of the poverty level are eligible for free meals. Students who come from families with incomes between 130 percent and 185 percent of the poverty level are eligible for reduced-price meals, where students are charged no more than 40 cents per meal. Participating schools can also be reimbursed for snacks served to children through age 18 in afterschool educational or enrichment programs³⁹.

Schools that participate in NSLP must serve lunches that meet the federal requirements for meal patterns and nutrition standards based on the *Dietary Guidelines for Americans*. The current federal requirements for meal patterns increase the availability of fruits, vegetables, and whole grains. NSLP also provides dietary specifications for grades K-5, 6-8, and 9-12, which state specific caloric limits and sodium reductions to ensure age appropriate meals are being served³⁹. NSLP lunches are planned to provide approximately one third of the recommended dietary allowance for protein, vitamins A and C, iron, calcium, and calories⁴¹. No more than 30 percent of the

meals should be from fat and fewer than 10 percent of the calories should come from saturated fat³⁹. Although school lunches are required to meet the federal meal requirements set by the *Dietary Guidelines for Americans*, the specific foods served and the preparation methods are decided by local school food authorities³⁹.

Reimbursable Meals

Under the NSLP, school lunches are required to offer five meal components: fruits, vegetables, grains, meat or meat alternate, and milk. When a meal contains at least three of these five components, and at least one serving of fruit or vegetables, the meal qualifies as a reimbursable meal. Students participating in NSLP are allowed to decline two of the five components, however, one of the chosen components must be a fruit or vegetable. The maximum amount of food components a child can choose for a reimbursable meal is five. When a school follows the USDA guidelines of offering five components and serving three in the required serving sizes, the school receives a monetary reimbursement from the USDA for each meal³⁹.

Reimbursable meals are an important component to a school lunch program. The majority of the support that USDA provides to schools in the NSLP comes in the form of reimbursements. Reimbursement rates vary depending on whether the meal is paid in full, offered at a reduced price, or free and on the school's participation rate. In the 2014-2015 academic year, USDA paid \$0.28, \$2.53, and \$2.93 for paid, reduced, and free meals respectively to schools that served 60 percent or more free and reduced priced lunches³⁹. Participation rate is defined as the number of students buying reimbursable meals in the federally assisted meal programs compared to the student enrollment number³⁹.

Competitive Foods

Foods and beverages sold in schools that are not included in the USDA School Meal Programs are called competitive foods. Competitive foods are sold, served, or given to children and adolescents in schools that are not included in the subsidized school meal programs⁴². While federally reimbursable meal programs supply most of the food and beverage items in school cafeterias, most schools also sell competitive foods⁴².

Common competitive foods include cookies, cakes, brownies, chips, ice cream, soda and sports drinks. These food items are termed competitive because they are sold along with nutritionally regulated school meals and they “compete” for student’s food selection⁴²⁻⁴³.

On a typical day, approximately 40 percent of public school students consume competitive foods⁴³. In school cafeterias, competitive foods are generally sold in vending machines, snack bars, school stores, bake sales, fundraisers and as à la carte items⁴²⁻⁴³.

Competitive foods are typically high in calories and are of low nutritional value. Data from National studies show that students who purchase reimbursable meals also purchase competitive foods. This data also indicates that students tend to consume less of their lunch, eat more fat and have a decreased nutrient intake⁴². Researchers have a link between competitive foods and beverages with excess caloric intake and obesity amongst school-aged children⁴². A study conducted by Story, Nannery, and Schwartz (2009) showed that competitive foods are extensively available in schools, particularly in middle and high schools. In addition, this study found that the availability of competitive foods and beverages is directly correlated to student’s high caloric intake from low nutrient foods and inversely correlated with lower intake of fruits and vegetables³⁷.

Moreover, students that attend schools that do not offer à la carte items eat over half a serving of fruits per day compared to students in schools that offer à la carte items⁴⁴.

Gaps in Knowledge

There is a surplus of literature linking inadequate intake of fruits and vegetables to obesity in children and adolescents^{2, 17, 24, 26-28, 31-33, 35-36,41}. However, research commonly categorizes fruit and vegetable consumption as one category when studying the causes of childhood and adolescent obesity. With fruits and vegetables categorized as one category, it is difficult to determine whether childhood and adolescent obesity is associated more with inadequate intake of fruits or inadequate intake of vegetables. More research is needed on vegetable consumption alone and risk factors of childhood obesity related to vegetable consumption. The exact impact on childhood obesity associated with vegetable intake still needs to be studied in order to develop effective obesity prevention interventions.

Every day, children and adolescents in America purchase lunch in their school's cafeteria which is a habitual environment for children and adolescents and provides an excellent opportunity to encourage healthy eating behaviors and to introduce interventions. Interventions focused on improving knowledge, behavioral skills, access and perceptions of vegetables have the potential to provide statistical data on strategies that are effective in increasing vegetable intake. With inadequate vegetable intake linked to childhood and adolescent obesity^{2, 17, 24, 26-28, 31-33, 35-36,41}. More interventions specifically focused on increased vegetable intake need to be implemented in schools nationwide. The Smarter Lunchrooms Movement applies research-based principals that focus on specific parts of the school meal, such as youth vegetable selection and

consumption. By encouraging children and adolescents to select, eat and enjoy healthier foods without elimination of other food options, The Smarter Lunchrooms Movement effectively leads kids toward nutritious choices⁴. By influencing children and adolescents to make smarter choices in their school cafeteria, they can learn behaviors that they can use as a part of a healthy lifestyle at home.

Chapter III: Methodology

Study Design

This goal of this study was to assess broccoli consumption in middle school students following a classroom activity intervention focused on catchy and appealing vegetable marketing approaches in the classroom. This study was designed to address how effective a classroom activity intervention is for middle school students, and if effective, if broccoli consumption increased and tray waste decreased as measured by tray waste through tray waste collection observation studies and production records. A randomized study design was used (Figure 1)⁴⁵. The current project was approved by the Institutional Review Boards (IRB) of the University of Nebraska-Lincoln and Lincoln Public Schools (See Appendix B).

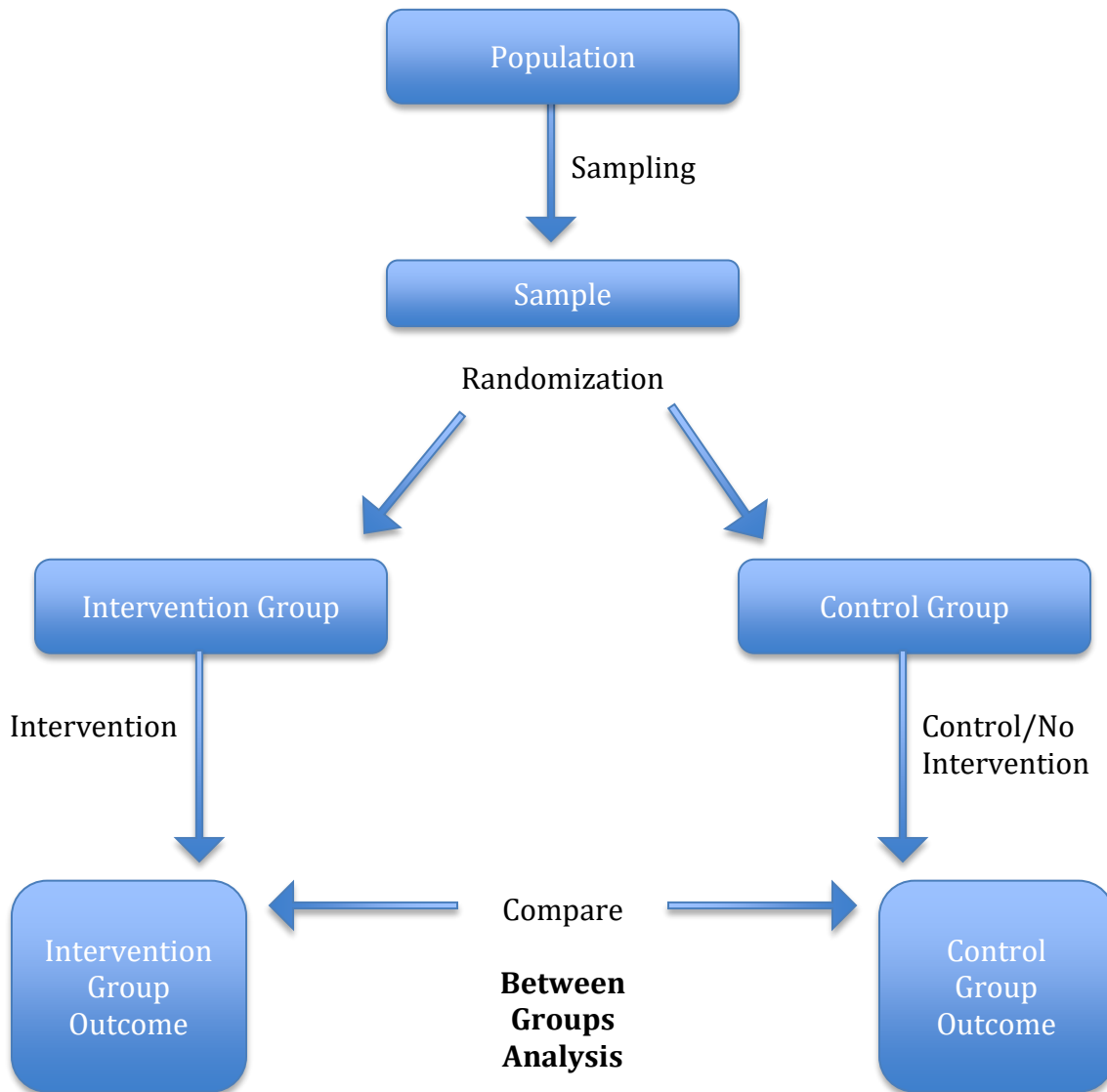


Figure 1. Quantitative Experimental Design: Between Groups Model

Study Schools

The Smarter Lunchroom Movement in Nebraska is a statewide dissemination project to create and evaluate smarter strategies in 57 Nebraska cafeterias. The participating middle schools from the Lincoln Public School district in the current study included two high-income middle schools and two low-income middle schools based on the percentage of students receiving free or reduced price school lunch. The two low-

income participating middle schools had greater than 70% students receiving free or reduced price school lunches (76.4% and 75.9%); the two high-income middle schools had approximately 15% (14.3% and 15.9%) of students participating in free or reduced school lunches. From the four participating middle schools, two schools (one in the high-income category and one in the low-income category) were randomly assigned to participate in the intervention and two middle schools (one in the high-income category and one in low-income category) were randomly assigned to act as the control schools. A summary of school characteristics is presented in Table 1.

Table 1. Demographics and Characteristics of Participating Middle Schools

	Scott	Lux	Culler	Goodrich
Total number of students	1,124	1,053	730	841
Race/ethnicity (%)				
White	83.2	83.8	49.0	47.4
Black/ African American	1.7	1.5	14.0	11.7
Latino/Hispanic	6.2	4.7	23.2	24.7
Asian	3.4	5.3	5.5	6.8
Native American	0.4	0.3	0.7	0.7
Other	5.1	4.4	7.6	8.7
Receiving free/reduced price lunch (%)	14.3	15.9	76.4	75.9
School Code	1	2	3	4
Intervention (I)		I		I
Control (C)	C		C	

Note: Data for student participation in free and reduced price lunch was found in the 2017 Lincoln Public School Report.

Intervention and Curriculum

In January 2016, the Family and Consumer Science teachers in the intervention schools were trained on the Smarter Lunchroom Movement, specifically focusing on ways to increase vegetable intake in middle school aged students. They were provided with a lesson plan developed by the Smarter Lunchroom Movement based on creating

fun, catchy names for vegetables to teach their students. The first part of the lesson plan focused on teaching students to create catchy, appealing names for all types of vegetables using fun, interesting words. For the creative design section of the lesson plan, students were instructed to use descriptive and fun words to add interest to broccoli, specifically. In addition, teachers and students worked together to display the fun, catchy names for broccoli in the lunchroom (Appendix C). The Family and Consumer Science teachers were informed on how to implement the Smarter Lunchroom Practices in their classrooms and in their lunchrooms (Appendix D).

This research examined the implementation of one environmental change to the lunchroom in participating middle schools. The two randomly selected intervention middle schools (one in high-income category and one in low-income category) implemented the aforementioned environmental changes while the two randomly chosen control middle schools (one in high-income category and one in low-income category) did not. The Smarter Lunchroom Movement in Nebraska used two measures to track changes in food choice and consumption: (i) analysis of production and sales records and (ii) analysis of plate-waste. Data for both measurements were collected before and after the implementation of the intervention for both intervention schools and control schools. Tray waste data were collected following the Smarter Lunchroom Movements protocol (see Appendix E). Tray waste data were collected using the visual estimation method. Visual estimation included weighing each food item being measured, which helps evaluators visualize a portion size. Tray waste data collectors estimated how much food was left for each food item being measured by using the Quarter Waste Method (see Appendix E). A full portion size of each food item being measured was provided to tray

waste data collectors so they could more accurately estimate how much of the portion remained when the trays were returned to the tray waste observation station. Tray waste data were recorded on a spreadsheet that outlined the food items and number of trays that needed to be observed.

Evaluation-Visual Plate Waste Study Before Intervention

Prior to the intervention, all four randomly selected Lincoln Public Middle Schools were evaluated through a tray waste study conducted on three different days in January 2016. Tray waste studies were conducted again in all four schools on three different days in March 2016, following the intervention period. Researchers involved in the tray waste study were trained by the experts from Cornell University through a three-day Smarter Lunchroom Training Workshop. In addition, research assistants who assisted with pre- and post-intervention plate waste protocol at the schools received in-depth training and were required to have updated CITI certificates for working with human subjects in social/behavioral research. The tray waste study determined the intake of broccoli, specifically, and other foods among middle school students during the lunch period.

Plate Waste Observations-Pre and Post-Intervention

The tray waste study involves using visual estimation while looking at trays as they are returned to the dish room in the schools to see which vegetables remain and in what quantities. Approximately 4 – 5 trained research assistants classified foods using a rating scale and estimated portion sizes on trays before and after consumption. Two research assistants documented whether students left none, 1/4, 1/2, 3/4, or all of the food items on the tray on a food waste spreadsheet. Twenty percent of trays at each school site

were selected at random during the lunch period to use for tray waste evaluation. Pre- and post-intervention tray waste observations took place on days when similar menu items were offered to the students. Vegetable intake estimations and broccoli, in particular, from tray waste were recorded on a food waste spreadsheet. Three repeat tray waste observations took place at each school site selected for both the control group and the experimental group middle schools during pre- and post-intervention periods, as previously described. Copies of sales records and production records for the dates the tray waste study were collected at the end of the tray waste data collection.

Post Intervention Interviews

At the end of the tray waste data collection, interviews were conducted with the Family and Consumer Science teachers that implemented the classroom activity intervention at the two intervention middle schools. Participating teachers were interviewed in a separate, empty classroom, away from students and teachers. The investigator explained to the teachers that these interviews were completely optional and consent forms were provided to each teacher to sign (see Appendix F). It was also explained that the responses documented through these interviews would only be viewed by the investigator and that their responses would be kept anonymous.

After verbal instructions were given, the investigator asked scripted questions with some leeway to ask additional questions based on the teachers responses (see Table 2 or Appendix G). Each interview was transcribed and coded by the lead investigator based on the school code number to keep the interviews anonymous.

Table 2. Family and Consumer Science Teacher Follow Up Questionnaire

1.	Tell me your thoughts about the Vegetable intervention for the Smarter Lunchrooms Movement.
2.	Tell me a little bit about your own vegetable consumption.
3.	Tell me about any challenges in how this intervention worked in your school setting.
4.	How did you engage students in naming vegetables?
5.	How did you engage students in making signs?
6.	How many days did they do the Smarter Lunchrooms Movement activities? How long did they do the activities each day?
7.	How much time did you spend implementing the activities?
8.	What did you observe about vegetable consumption with your students before implementing this project?
9.	What did you observe about vegetable consumption with your students after implementing this project?
10.	What, if anything, did you observe with your students with vegetable consumption before this project? After this project?

Data Analysis

Production and sales records for the months of January and March 2016 were used in this study. Tray waste estimations were entered into Microsoft Excel spreadsheets for each participating middle school. All middle schools used printed Excel sheets to document tray waste estimations. Each school was individually coded and transcribed into the excel sheet. All written data were entered into an electronic spreadsheet and then organized by common food items served at each school for each tray waste collection date. The data collected from the tray waste studies of 6th, 7th and 8th graders before the intervention were measured against data from plate waste studies of 6th, 7th and 8th graders after the intervention takes place. All items from pre-intervention collection data were transcribed on one Excel document and all items from post-intervention collection data were transcribed on separate Excel document and then

exported to SPSS. In order to analyze each middle school individually, schools were assigned a code number: Scott = 1; Lux = 2; Culler = 3, Goodrich = 4. Scott and Culler were control schools and Lux and Goodrich were intervention schools. Schools were grouped into: 0 = Control, and 1 = Experiment Variables for amount wasted were coded into: 0. None wasted, 1. $\frac{1}{4}$ wasted, 2. $\frac{1}{2}$ wasted, 3. $\frac{3}{4}$ wasted, 4. All wasted.

One way ANOVA Pairwise comparison was used to assess the differences in broccoli tray waste among the four schools.

Chapter IV: Results

Broccoli consumption was assessed at Scott, Lux, Culler and Goodrich Middle Schools in Lincoln, Nebraska, before and after the Smarter Lunchrooms Movement Intervention according to Table 3.

Table 3. Dates of tray waste collection at each school before and after intervention.

Pre	Post
January 14 th , 2016	March 4 th , 2016
January 22 nd , 2016	March 16 th , 2016
January 27 th , 2017	March 24 th , 2016

Cheesy Broccoli Selection and Cheesy Broccoli Tray Waste

Comparisons of the percent of Cheesy Broccoli tray waste among the schools, and the number of students in each school who selected broccoli both pre and post intervention are shown in Table 4. In all schools, except Lux Middle School, the high-income intervention school, the percent of tray waste for Cheesy Broccoli was decreased from pre- to post intervention (from 29.3-41.2% decrease). Examination of the numbers and percent of students who selected broccoli pre- and post-intervention indicate that control schools (Scott and Culler) had fewer percentage of students selecting Cheesy Broccoli in the post intervention period (13.3% and 44.7% decrease, respectively, while both intervention schools (Lux and Goodrich) showed much larger percentages of students choosing Cheesy Broccoli in the post intervention period (from 5.2 to 17.0% for Lux; 9.4% to 10.4% for Goodrich)

Table 4. Percent of Broccoli Tray Waste and Broccoli Selection Before and After Intervention

	High-Income		Low-Income	
	-----		-----	
	Scott Control	Lux Intervention	Culler Control	Goodrich Intervention
Cheesy Broccoli Tray Waste (%)				
Pre-intervention	50.0	24.0	40.0	22.0
Post-intervention	29.4	28.7	28.3	13.4
Changes (Post-Pre)	-20.6	-0.7	-11.7	-8.6
% decrease*	-41.2	+19.5	-29.3	-39.1
Number of students selecting broccoli				
Pre-intervention				
N (total)	582	657	416	434
N (selecting broccoli)	26	34	28	41
% Selecting broccoli	4.5	5.2	6.7	9.4
Post-intervention				
N (total)	583	651	402	394
N (selecting broccoli)	23	111	15	41
% Students selecting broccoli [†]	3.9	17.0	3.7	10.4
% increase [‡]	-13.3	+226.9	-44.7	+10.6

* % decrease in broccoli tray waste = [(broccoli tray waste post-intervention – broccoli tray waste pre-intervention) / broccoli tray waste pre-intervention] x 100%

A positive number indicates increasing in broccoli tray waste; a negative number indicates decreasing in broccoli tray waste.

[†] % Students selecting broccoli = number of students selecting broccoli / total number of students observed.

[‡] % increase in the % of students selecting broccoli = [(% students selecting broccoli post-intervention – % students selecting broccoli pre-intervention) / % students selecting broccoli pre-intervention] x 100%

A positive number indicates increasing in the number of students selecting broccoli; a negative number indicates decreasing in number of students selecting broccoli.

Statistical Comparison of Cheesy Broccoli among Participating Intervention and Control Schools

Intervention and control schools were compared at baseline and after implementation of the intervention using a one-way ANOVA Post Hoc Test (Table 5).

Table 5. ANOVA for Between-Subjects Effects using Cheesy Broccoli Waste

Source	Type III Sum of Squares	d f	Mean Square	F	Sig.
Corrected Model	41.413 ^a	7	5.916	3.031	.004
Intercept	324.212	1	324.212	166.096	.000
School	25.402	3	8.467	4.338	.005
Pre_v_post	6.382	1	6.382	3.270	.072
School * Pre_v_post	10.042	3	3.347	1.715	.164
Error	607.057	311	1.952		
Total	1057.000	319			
Corrected Total	648.470	318			

a. R Squared = .064 (Adjusted R Squared = .043)

The model indicated a significant school effect on cheesy broccoli waste ($p=.005$). However, there were no overall differences in cheesy broccoli waste post-intervention vs. pre-intervention ($P=.072$). There were no significant interactions between schools and pre vs. post-intervention cheesy broccoli waste ($P=.164$).

The Post Hoc test examined each school and compared tray waste between each school using the LSD method. (Table 6). Results indicate that Goodrich Middle School, the low-income, intervention school, had significantly overall lower mean Cheesy Broccoli waste compared to the other three schools ($p<0.05$).

Table 6. Mean Cheesy Broccoli Tray Waste Before and After Intervention among the Participating Schools

	High-Income		Low-Income	
	Scott Control	Lux Intervention	Culler Control	Goodrich Intervention
Cheesy Broccoli Tray Waste (%)				
Pre-intervention				
N	26	34	28	41
Mean tray waste*	1.92 ± 1.49	0.94 ± 1.46	1.61 ± 1.79	0.88 ± 1.47
Post-intervention				
N	23	111	15	41
Mean tray waste†	1.17 ± 1.64	1.19 ± 1.21	1.13 ± 1.81	0.54 ± 1.03
Mean across pre- and post-intervention‡	1.57±1.59 ^a	1.13 ± 1.27 ^a	1.44 ± 1.79 ^a	0.71 ± 1.27 ^b

Values are presented as mean ± standard deviation. Mean values within a row with different superscript letters (a,b) are significantly different (Post Hoc test, P < .05). Values represent the following scale: 0=0% waste; 1=25% waste; 2=50% waste; 3=75% waste; 4=100k% waste

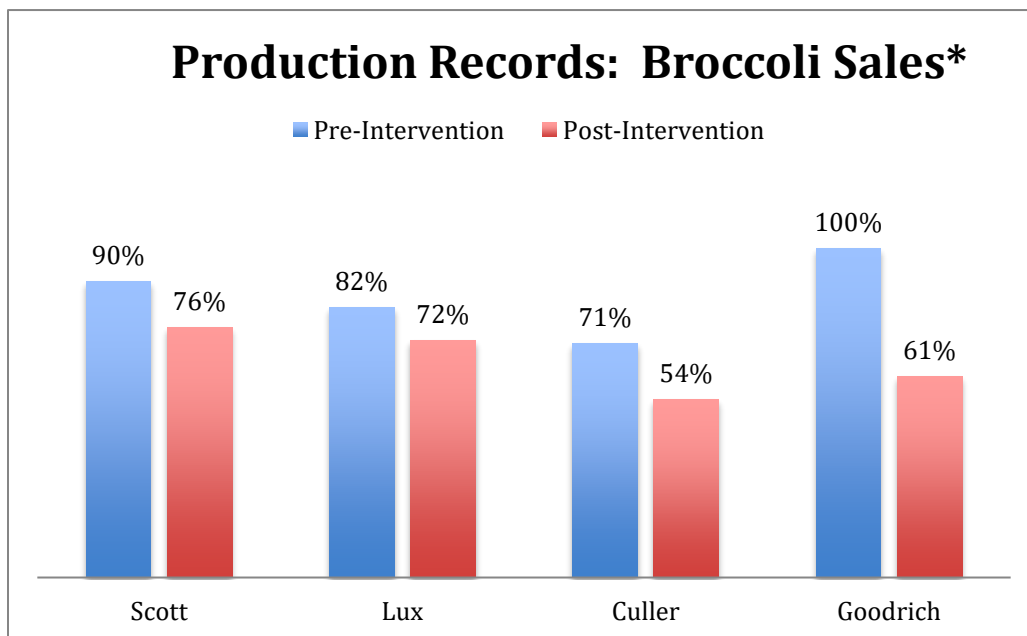
*Mean of broccoli tray waste pre-intervention calculated as follow: the total broccoli tray waste pre-intervention /total number of students present pre-intervention

†Mean of broccoli tray waste post-intervention calculated as follow: the total broccoli tray waste post-intervention /total number of students present post-intervention

‡Mean of broccoli tray waste pre- and post-intervention all together calculated as the total broccoli tray waste for pre- and post-intervention combined / the total number of students present across for pre- and post-intervention combined.

Broccoli Production Records Among Participating schools

The production records for the intervention and control schools both before and after implementation of the intervention are shown in Figure 2. Overall, the production records show that the high-income schools (Scott and Lux) had more broccoli sales post intervention compared to the low-income schools post intervention. In all schools post intervention production records showed a decrease compared to the pre-intervention record. Between the two Intervention Schools, production record sales show that the percent of Cheesy Broccoli decreased the most in Goodrich (from 100% to 61% in Goodrich; from 82% - 72% in Lux). The cheesy broccoli sales in the two control schools had a very similar decrease in sales (from 90% to 76% for Scott; from 71% to 54% for Culler).



*The percentages based on the amount of broccoli sold compared to the amount of broccoli produced.

Figure 2. Broccoli Sales According to Production Records in the Baseline (Pre-Intervention) and Post-Intervention Periods.

Teacher Perceptions

Table 7 highlights the themes that came from Family and Consumer Science (FCS) teacher interviews after the intervention. A complete listing of all of the comments provided by the FCS teachers is provided in Appendix H. The themes reflected on the teachers' personal vegetable consumption and their observations of the students' consumption before and after the intervention. Teachers reacted to the intervention curricular materials, and the challenges to students and engagement of students in the process.

The identified themes are: 1) Evaluation of intervention; 2) FCS teacher vegetable consumption; 3) Challenges; 4) Student engagement; and 5) Student Behavior Change. A brief description of each theme follows:

Evaluation of Intervention: Teachers noted that the Smarter Lunchrooms Movement classroom activity gave students the opportunity to learn more about vegetables, which they appreciated because students had little knowledge about vegetables prior to the intervention.

FCS Teacher Vegetable Consumption: There was only one teacher that ate vegetables daily, other teachers stated that they had a hard time eating vegetables, especially on the weekends.

Challenges: Overall, there was a wide array of challenges for each FCS teacher when implementing the intervention activity in their classrooms. Some reasons for teachers having challenges implementing the activity included: the activity did not keep

students interested, students did not have enough time to complete the activity, and wording of the activity was too difficult for students to understand.

Student Engagement: One teacher indicated that students needed to be probed for questions and provided examples in order to complete the activity. Other teachers noted that the students brainstormed catchy, appealing names for vegetables and completed the activity all on their own.

Student Behavior Change: Before the intervention, FCS teachers indicated that students struggled with vegetables due to lack of knowledge, and students struggle to eat the recommended daily intake of vegetables. After the intervention, some FCS teachers indicated that nothing related to student vegetable consumption or selection had changed, while one FCS teacher stated that students had a positive attitude about vegetables.

Table 7. Qualitative Themes and Evidence from Family Consumer Science Teachers in the Intervention Schools

Themes	Selected Statements as Evidence
Evaluation of Intervention	<p><i>L1: "Good that we focused on vegetables"</i></p> <p><i>L2: "Needed to go back a step...educate them on what vegetables do for you"</i></p> <p><i>G1: "Fun and creative lesson"</i></p>
FCS Teacher Vegetable Consumption	<p><i>L1: "I go through spurts...the weekends are hard for me..."</i></p> <p><i>L2: "I eat all vegetables."</i></p> <p><i>G1: "I have a hard time eating vegetables."</i></p>
Challenges	<p><i>L1: "If it was focused on all vegetables the kids would have been more excited about it."</i></p> <p><i>L2: "I didn't have any challenges other than time."</i></p> <p><i>G1: "biggest challenge was the wording."</i></p>
Student Engagement	<p><i>L1: "...they brainstormed their own ideas..."</i></p> <p><i>L2: "probing them for questions, giving examples"</i></p> <p><i>G1: "they did it all on their own"</i></p>
Student Behavior Change	<p><u>Student Vegetable Consumption Before Intervention</u></p> <p><i>L1: "vegetables is an area where they all kind of struggle to get what is recommended for them"</i></p> <p><i>L2: "They hate vegetables"</i></p> <p><i>G1: "they don't mind vegetables, that they just had certain ones that they really disliked"</i></p> <p><u>Student Vegetable Consumption After Intervention</u></p> <p><i>L1: "I didn't observe anything"</i></p> <p><i>L2: "No change observed"</i></p> <p><i>G1: "Before the project they mainly complained about the lunchroom meals, After the project there was a more positive focus on vegetables"</i></p>

Chapter V: Discussion and Conclusions

Broccoli Selection and Tray Waste

This study aimed to determine whether implementation of Smarter Lunchrooms intervention would increase consumption of broccoli in intervention middle schools who received additional nutrition education compared to control middle schools in Lincoln, Nebraska. The current findings suggest that the proportions of students selecting broccoli increased after intervention for both intervention schools, Lux and Goodrich, while there were decreases in the percentage of students choosing broccoli for the two control schools. However, although broccoli selection (as expressed by the proportion of students who chose broccoli for their lunch) increased both at Goodrich and Lux following the intervention, Lux school students, at post-intervention, wasted more of the broccoli they selected and broccoli consumption did not increase.

The Smarter Lunchrooms Movement has been shown to increase the choice and consumption of healthy food items in the lunchroom by altering the environment. These interventions have been shown to be successful in increasing vegetable choice and consumption. The aim of most of those studies was to increase the accessibility of healthy food items into accessible areas of the lunchrooms, and giving fruits and vegetables descriptive names⁴⁶. Studies showed that children are influenced by branding, especially if the food items are being marketed with bright colors, pictures and cartoon characters. One study examined the effect that branding meals with McDonald's logos had on the acceptance and preference of those foods among low-income children. The results of that study showed that 4 out of 5 children were more likely to prefer the tastes of foods if they thought they were from McDonald's⁴⁷. Another study focused on

increasing taste expectation by giving vegetables creative age-appropriate names. The results indicated that vegetable choice and consumption were higher in vegetables that were given creative names compared to vegetables without creative names⁴⁸.

Our findings were consistent with those previous studies in that the number of students selecting broccoli increased following the intervention among the two intervention schools, Lux and Goodrich. However, only Goodrich school demonstrated a reduction in broccoli tray waste post-intervention. The two control schools, Scott and Culler regardless of their socioeconomic status (high-income or low-income school) appeared to show similar patterns, that is, decreases in proportions of students selecting broccoli as well as decreases in broccoli tray waste were observed for both schools post-intervention relative to baseline.

At Lux, one of the intervention schools, the amount of tray waste increased by 19% post intervention compared to the baseline data collected. However, the proportion of students who selected broccoli increased approximately 200% post intervention. The increase in broccoli tray waste may be due to the fact that there was a significant increase in the number of students selecting broccoli at Lux, and consequently leading to increased broccoli waste. This suggests that while giving broccoli fun and attractive names had more students to select broccoli from the salad bar, fewer students ate their entire portion of broccoli.

For Goodrich, the other intervention school, the percentage of students who selected broccoli increased following the intervention (by 10.6%). However, contrasting to Lux, broccoli tray waste post-intervention also decreased (by 39.1%) compared to pre-intervention (Table 4). Although Goodrich was a low-income school, it had the highest

percentage of students choosing broccoli at baseline (9.4%). In contrast, Lux, a high-income school only had 5.2 % of students who selected broccoli. This could be due to the fact that less vegetable options were given to students at Goodrich compared to other schools. For example, Lux had a salad bar with several options of vegetables to choose from. On the other hand, Goodrich's cafeteria did not have a salad bar installed, and only two vegetable options were offered to students during each lunch period. In fact, a spinach salad was offered in addition to broccoli at Lux on the day when baseline data collection occurred. The Family and Consumer Science (FCS) teachers indicated that it was very rare that students were offered the spinach lettuce salad so when it was offered, it is possible students would choose the spinach lettuce salad over other vegetable options, thereby resulting in lower selection of broccoli among the students at Lux.

Further, among the four schools (intervention and control schools altogether), Goodrich, a low-income school that received intervention had significant lower overall broccoli tray waste (the average broccoli tray waste pre- and post-intervention combined) compared to the remaining three participating schools in the study. In addition, Goodrich is the only participating school that had the overall broccoli tray waste below 25% (of the entire tray). It could be in part explained by the following: 1) Goodrich was offered less vegetable choices compared to others schools, which was suggested by the lower average broccoli tray waste at baseline (0.87 for Goodrich vs. 1.61 for Culler, 1.92 for Scott, and 0.94 for Lux); and 2) Goodrich received Smarter Lunchrooms intervention.

Broccoli Production Records Among Participating Schools

The difference in the amount of cheesy broccoli sales at each school may be due to varying amounts of cheesy broccoli prepared for each tray waste collection date. The

amount of cheesy broccoli produced was not the same at both pre and post intervention for all schools. The amount of cheesy broccoli produced at Lux was the same pre and post intervention, while the amount of cheesy broccoli produced varied each tray waste collection date at Scott (from 4 lbs. to 22 lbs.), Culler (from 6 lbs. to 50 lbs.) and Goodrich (from 3 lbs. to 18 lbs.). Our findings show that the high-income intervention school had the least amount of change in broccoli sales (10% decrease) from pre-intervention to post-intervention, which may be due to the consistency in the amount of cheesy broccoli produced compared to the other schools. In future studies, it would be optimal for the amount of broccoli produced for the school lunch tray line to be the same pre and post intervention at all study schools.

Family and Consumer Science Teacher Interviews

The difference in broccoli tray waste between the Lux and Goodrich may be due to the way the intervention activity was implemented and how the signage was displayed at each school. After the intervention activity was implemented in the Family and Consumer Science classes at Lux and Goodrich, the teachers were interviewed to discuss their reaction to the curriculum and their observations of the students before and after the intervention activity (see appendix H). At Lux, two FCS teachers implemented the intervention activity for two full class periods. At Goodrich, the FCS teacher implemented the intervention activity for three full class periods.

When comparing both schools after the intervention, the high-income school (Lux) had a different reaction compared to the low-income school (Goodrich). At Lux, one teacher did not get a chance to observe any vegetable consumption change before and after the intervention due to the quarter change. Another FCS teacher at Lux observed

no change in vegetable consumption after the implementation of the intervention. This FCS teacher also observed negative responses from students during the lunch period that saw the creative names displayed on the salad bar; “when the posters were put up students would come in and go ‘EW broccoli who likes broccoli?’ ”. Figures 3 and 4 show examples of different signs that were posted on the salad bar in the cafeteria. More photo examples of student signs can be found in Appendix I.



Figure 3. Student Signs Displaying Creative Names for Broccoli Displayed on the Salad Bar in Lux Middle School’s Cafeteria.



Figure 4. Examples of Student Signs Displaying Creative Names for Broccoli Displayed on the Salad Bar at Lux Middle School.

The FCS teacher at Goodrich observed a more positive response from the students that participated in the intervention activity. Before the project, the FCS teacher observed that students would complain about the lunchroom meals and how they did not like them. After the intervention, the FCS teacher said students had a more positive attitude about vegetables, they not only wanted to eat more vegetables but they wanted to promote the importance of eating vegetables and healthy eating to the other students in their school. As a low-income school, the cafeteria layout is different at Goodrich and does not offer a salad bar to post signs. Instead, the students put up large posters on the walls around the cafeteria, Figure 5 and Figure 6 show examples of the posters that were made by Goodrich students. Additional photos of posters made by Goodrich students can be found in appendix I.

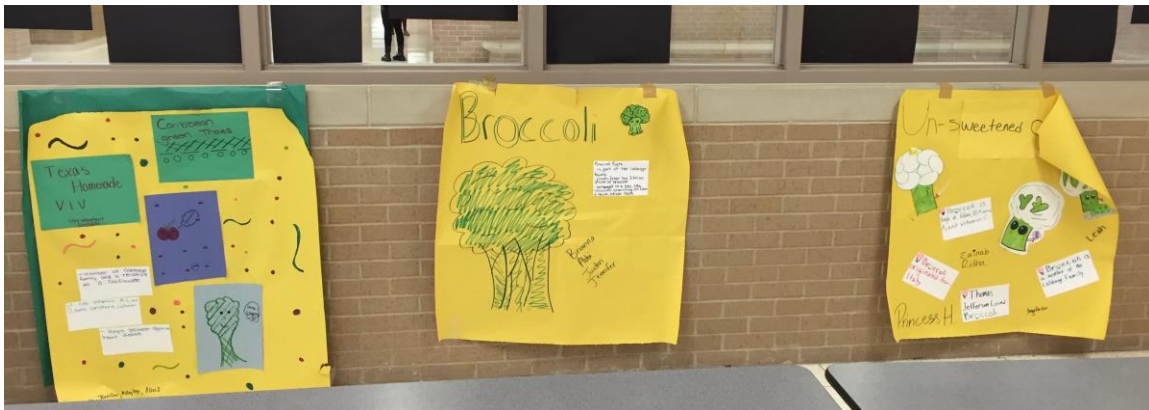


Figure 5. Examples of Student Posters Displaying Creative Names for Broccoli Displayed on the South wall of the cafeteria at Goodrich Middle School.

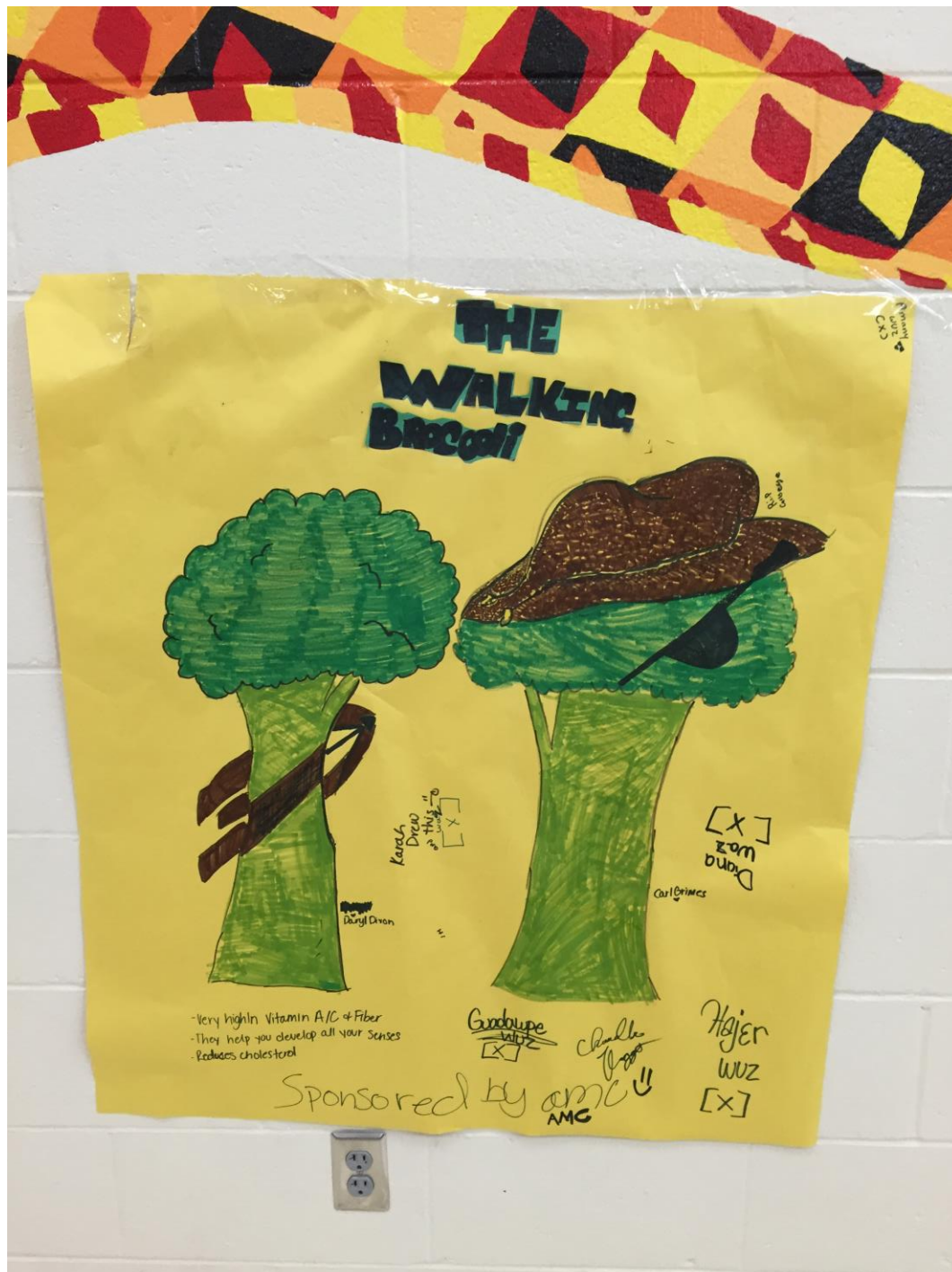


Figure 6. Student Poster Displaying “The Walking Broccoli” displayed on the East wall of the cafeteria at Goodrich Middle School.

Strengths

This study had several strengths. While we did observe that the intervention was effective at increasing decreasing broccoli tray waste at the low-income school (Goodrich), we saw that the intervention had an opposite effect at the high-income school (Lux). This discrepancy may in part be due to the numerous options of vegetable choices offered to students at Lux compared to Goodrich.

Tailoring the intervention to specific age groups is also important. This study examined findings from 6th and 7th graders. For this study, we could not distinguish the groups by age, but the feedback received by the Family and Consumer Science teachers during their interviews provided information on what grades participated in the intervention at each school. At Lux, the FCS teachers implemented the activity to 6th grade and 7th grade students. The FCS teachers did not implement the activity with the 8th grade students because, according to the teachers, “If the 8th graders did it, they wouldn’t have been have as mentally connected with the activity”(see Appendix H) compared to the 6th and 7th grade students.

Students were observed while the intervention activity was being implemented. Teachers had to really try hard to engage the 7th grade students by probing them with questions and giving them examples to get the students to get creative and complete the activity. The 6th grade students were more engaged in the naming vegetable activity compared to the 7th graders, but both grades needed to be educated on different types of vegetables. During the post intervention interviews, the teachers indicated that they do not get to focus on vegetables enough when they talk about MyPlate with the students. One FCS teacher had to pause the intervention activity to educate the students on what

vegetables do for you so they could understand the activity better. Following the intervention, a higher proportion of students selected broccoli, but students were observed having negative reactions to the signs displayed on the salad bar. This could be due in part that the signage created for the salad bars were created by 6th and 7th grade students and the featured images may have appealed more to a younger population while they created a negative or potentially childish view of broccoli for the older students. At Goodrich, the FCS teacher implemented the activity to 6th grade students only. The 6th grade students that participated in the intervention activity managed to engage students in all grades with their posters that were put up around their cafeteria. The 6th grade students took the intervention activity one step further and incorporated the intervention activity into an after school nutrition club to get more students involved. To decipher the associations between different types of intervention strategies and outcomes, more research employing wider range of intervention tactics is needed among a more diverse age range of students.

Many of the Smarter Lunchrooms Movement interventions in the literature have been implemented in primarily older students including middle and high school level. The Smarter Lunchrooms Movement has shown to be effective in these populations in increasing selection of vegetables as well as consumption of vegetables and other healthy food items. This study adds to the research on the Smarter Lunchrooms Movement by showing that interventions in middle school students can be effective in increasing the selection of broccoli, as seen at Lux and Goodrich, and that it can aid in decreasing broccoli tray waste following the intervention as seen in Goodrich. The Smarter Lunchrooms Movement aims to influence student food choice by making small changes

to the cafeteria environment using the Smarter Lunchrooms Movement best practices and strategies. Several schools across the country have implemented these best practices and found them to be an effective intervention strategy.

Limitations

This study did have several limitations. Researchers were assigned to tray waste collection dates based on the researcher availability, which possibly introduced bias to the findings. The meals that were served on pre intervention tray waste collection dates were not identical to the meals served post intervention. The two high-income schools had a salad bar, and while most of the items on the salad bar stayed consistent throughout the study, certain offered fruits and vegetables changed day-to-day based on availability and varied by school.

One limitation of this study was the small sample size. The sample size was so small that quantitative data were difficult to analyze to show statistical significance of broccoli tray waste before and after the intervention. Capturing all students that obtained a school lunch during the data collection dates was another challenge. The Lunchroom staff handed out red tickets to randomly selected students; tray waste data was collected from students who had the red tickets on their trays. Some students may not have been captured before they threw out their tray if they did not notice the red ticket on their tray. Since student's trays were randomly assigned red tickets, we did not observe the same students' trays before and after the intervention. This prevented the matching of trays to analyze consumption of broccoli.

With different researchers assigned to different tray waste collection dates, data collection using visual quarter waste estimation method may not have been consistent as

visual estimations may differ between researchers in spite of attempts to train researchers for consistency prior to the beginning of the project.

In addition, researchers observed students dropping food underneath the tables, this is a limitation to the study because we do not know how much food is wasted or which trays are being tampered with. In addition, it was observed that several students would stack multiple students' lunches on their trays that had red tickets before they brought their tray to the examination table. As a result, tray waste data could not be collected on these trays, so the measurement of broccoli tray waste may not have changed much due to the tampering of student trays.

The low-income schools did not have the salad bar and were offered only a couple choices for vegetables compared to the high-income schools that had several vegetable options to choose from. Since the low income schools only had a couple of choices, the data collected may be biased compared to the higher income schools where students had several different vegetable options to choose from.

Implications for Further Research

Since altering the school environment is a convenient opportunity to reach middle school students, additional research is necessary to determine what intervention strategies are most effective at increasing healthful food consumption in middle school students, such as vegetables and broccoli, in particular, for this study. Since this study was small and the collection of quantitative data could be improved, a repeat of this study itself with a larger population with improved tray waste data collection methods could be an area of future research. After completing this study, areas that still need to be investigated are:

1. What type of classroom intervention is necessary to result in behavior change?

2. What methods are best at encouraging behavior change in the middle school population?
3. What is the effect of an intervention that includes the participation of all middle school adolescents?
4. Are there particular age groups of students that benefit the most from a classroom activity intervention?
5. If knowledge is present, what other factors prevent behavior change with selection and consumption of healthy foods (i.e. socioeconomic status, convenience, etc.)?

Due to the promise that this study showed with some change in broccoli tray waste and consumption, and the lack of studies specifically focused on increasing vegetable consumption in adolescents in the current literature, it is important to gather further research on this topic. Both correlational and intervention studies would be beneficial in the area of vegetable consumption in adolescents to contribute to the understanding of childhood obesity and its prevention efforts.

Based on the student's lack of knowledge about vegetables observed, it is important for future intervention studies to incorporate nutrition education. Research should incorporate nutrition education interventions focused on vegetables in middle school and elementary school students, as they are still developing their eating habits³, and making changes in this age group may lead to more powerful influence to increase vegetable consumption. Studies need to observe whether these interventions are kept up after leaving the schools, by returning months or years later to assess whether the interventions

are still in place and whether they are still having a positive influence on students food choice and consumption.

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Appendix A

Lincoln Public Schools Letter of Approval

Lincoln Public Schools

5905 O Street • Box 82889 • Lincoln, NE 68510 • (402) 436-1790

RR 15-

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March 12, 2015

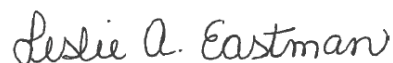
Mia Wood, Student
Linda Boeckner, Ph.D.
Department of Nutrition and Health Sciences
UNL

RE: Request to Conduct Research in the Lincoln Public Schools

Dear Ms. Wood and Dr. Boeckner:

Your request to conduct a study entitled, "Smart Lunchroom Movement" with Lincoln Public Schools (LPS) Family and Consumer Science (FCS) teachers is approved. Please contact Jessie Coffey, Nutrition and Special Diet Specialist, to coordinate the implementation of this study. Please note that all research personnel actively involved in data collection at any LPS building need to have a background check on file. Consent is required for this study, please use the form submitted with your request.

Sincerely,



Leslie A. Eastman, Ph.D.
Director of Assessment and Evaluation Services

cc: Jessie Coffey, Nutrition and Special Diet Specialist
Kay Byers, Human Resources Supervisor

Appendix B

IRB – Project Approval – Certification of Exemption



IRB - Project Approved - Certification of Exemption

Your project has been approved by the IRB.

Project Title: Smarter Lunchrooms Movement: The effect of change in middle school lunchroom setting on students intake of vegetables.

Approvers Comments:

Dear Dr. Boeckner and Ms. Wood,

Project ID: 15544

Form ID: 24566

Review Type: New project form Exempt research

Title: Smarter Lunchrooms Movement: The effect of change in middle school lunchroom setting on students intake of vegetables

This project has been certified as exempt, category 2. You are authorized to begin your research.

The stamped and approved form(s) have been uploaded to NUgrant. Please use the stamped form(s) to make copies to distribute to participants. If changes need to be made, please submit the revised form(s) to the IRB for approval prior to use.

Please allow sufficient time for the official IRB approval letter to be available within NUgrant.

Cordially,

Rachel Wenzl, CIP
Research Compliance Services
Human Research Protection Program

This message has been sent to you through NUgrant. To view details please follow this link:

<https://nugrant.unl.edu/era/orr/irb/projectDetails.php?ProjectFormID=24566>

University of Nebraska-Lincoln
<https://nugrant.unl.edu>

Specifically, Project #14973 does not fall under the IRB definition of human participants. Human participant research is defined, as research that involves living individuals and the investigator will obtain data or information about those individuals that is privately identifiable to the subject. Based on this assessment, the project will be identified as Not Human Subjects Research and no further oversight is required at this time; however, should the scope of your project change, please contact the IRB office at 472-6929 to discuss future procedures.

Appendix C
Intervention Activity

Question: In the lunchroom, What's in a Name?

Answer: A LOT! To boost participation, make foods sound Good Enough to Eat.

Warm-Up: Which option in each pair **sounds** more appealing, assuming they cost the same? Put yourself in the shoes of the items' target audience.

List 1: Crayon Colors

Red___

Brick Red___

Green___

Caribbean Green___

Blue___

Midnight Blue___

Purple___

Plum Purple___

List 2: Car Names

Mini Van___

Grand Caravan___

Truck___

Silverado___

Sports Car___

Mustang___

SUV___

Expedition___

List 3: Foods

Steak___

Sizzling T-bone Steak___

Coleslaw___

Tangy Coleslaw___

Salad___

Crisp Garden Salad___

Grilled Cheese___

Crunchy Toasted Cheddar Sandwich___

Follow-up questions:

1. *Why are the names in the right-side column more appealing than those on the left?*
2. *Why is it important to remember the target audience's perspective?*



Matching: Create catchy, appealing names for these foods using fun, interesting words.

Choose 1-2 descriptors to add to each food to create new names for the dishes.

Focus: Middle-School aged children (Grades 6-8) are attracted to descriptive sensory words

Ex. Spiced Butternut Squash, Fluffy Mashed Potatoes, Warm Baked Apples

Word bank:

Texas	VIP	Snappy	Sweet	Harvest
Homemade	Tasty	Fresh	Holiday	Garden
Silly Dilly	X-Ray Vision	Steamed	Yummy	Power Punch
Garden-Fresh	Monster	Jumping	Colorful	Cheesy
Mighty	Crunchy	Crispy	Zappy	Zesty

Bright (color) → Ex: Bright Green, Bright Orange, Bright Yellow

_____green beans

_____corn

_____peas

_____mixed vegetables

_____carrots

_____broccoli

Follow-up questions:

1: Which names are the best? What makes them appealing to each audience?

2: Which names could you use in your lunchroom?



Creative Design: Pretend your group is starting a restaurant, but you are only allowed to serve foods from your school lunchroom. Use descriptive and fun words to add interest to **Broccoli**. If you need help brainstorming names, use the word bank on page two. The first one has been done for you.

1. Tiny Tasty Tree Tops

2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

Application: Choose your favorite two Broccoli names that you would like to promote in your lunchroom.

1. _____
2. _____

Follow-up Questions: Which names are best? Which could you use in your lunchroom?



Appendix D

Smarter Lunchrooms Staff Training: Give Vegetables Catchy Names

Smarter Lunchrooms Staff Training: Give Vegetables Catchy Names

Objective:

Increasing the number of students that select vegetables by giving them catchy, appealing, age-appropriate names and displaying the age-appropriate names on posters or menu boards outside the cafeteria. This workshop will instruct Family and Consumer Science teachers on how to implement these practices to their students to create a smarter lunchroom.

Materials:

- What's in a Name? worksheets
 - Page 1: Print one copy, divide the 3 lists
 - Pages 2-3: Print one per participant pair or group, double-sided if possible
- Name cards for foods (index cards, cut poster board, 8x11 paper, etc.) [optional]
- Markers/art supplies for writing name cards [optional]

Time: 25-30 minutes (can be split into two 10 to 15 minute workshops between steps 6-7)

Procedure:

1. Assemble and welcome the participants. Introduce the Smarter Lunchroom Movement. Introduce the workshop: "Today we will learn how to teach middle school aged students how to market vegetables in their lunchrooms."
2. Divide participants into three different groups. Assign each group one list from the warm-up activity. Ask the participants the warm-up prompt question. Allow the groups work for 1-2 minutes on the warm-up activity.
3. Invite groups to share their answers (The likely answers are all the right-column choices, see attached "Give foods catchy names" worksheet). Ask the follow-up questions. Allow the groups work for 1-2 minutes.
4. Invite groups to share their answers (Likely answers: The right-column choices are more descriptive, use sensory words, use appealing description, create clear imagery, invite imagination, etc. It is important to remember the target audience because it is their opinions which the products are trying to appeal and "sell" to; they might have different likes, dislikes, or wants than a workshop participant).
5. Divide the participants into pairs or small groups. Give each group a copy of the Matching activity. Depending on your needs and time constraints, assign the groups to do either activity (6-8) activities, as that is their target population. Let the groups work for 3-4 minutes.

6. Invite groups to share answers. Discuss the follow-up questions as a whole group.
7. Individually or in small groups, complete the creative design activity. Assign the audience (grades 6-8).
8. Let the groups work for 8-10 minutes. Remind them to move on to the bottom Application section 2 minutes before the end of the work time.
9. Invite groups to share answers. Discuss the follow-up questions as a whole group.
10. Thank the participants. Tell them to let the children use the favorite new vegetable names in upcoming menus. Write names on menu cards placed next to the items on the serving line, on menus (online, sent home on flyers, and in the lunchroom, and in announcements).

Smarter Lunchrooms Staff Training: Give Foods Catchy Names (2014). *Smarter Lunchrooms Movement*. Retrieved from <http://smarterlunchrooms.org/resource/workshops-lunchroom-staff>.

Appendix E

Smarter Lunchrooms Movement Tray Waste Protocol

HERE ARE THE EASY STEPS TO MEASURE PLATE WASTE:

Materials:

Scale, a long table, spreadsheet & pencil to record data

Set up a spreadsheet to collect data on.

List every food item offered down the rows of the first column. List tray number (1,2,3...200) in the next columns. Each column will represent one tray or student and each row will represent the food item being measured.

Download Spreadsheet and Example:

[Blank Tray Waste Data Spreadsheet](#) - Fill in your spreadsheet with the names of the foods to be served on the day you are collecting plate waste in advance.

[Example Tray Waste Data Spreadsheet](#)

Weigh Foods:

Prior to the lunch period, weigh each food item being measured. To get the most accurate measurement, weigh at least three different servings and take the average (sum of the weight of three divided by 3). Determine the weight of each empty tray, plate, and/or bowl or other packaging (if there is any) that the food was weighed in. Subtract this number from the averaged total and the new total is the approximate weight of the item. For items that are prepackaged, just record the weight that is given per serving on the package. Weighing servings not only helps you visualize a portion size but also can be useful in determining the nutritional value of consumed or wasted foods.

View Portion Sizes:

All tray waste data collectors should familiarize themselves with what one portion of food looks like. This can be done while taking the pre-weight. This way, they can more accurately estimate how much of the portion is remaining when the trays are discarded.

Set Up a Station:

Prior to students' arrival, set up a station at which trays will be collected. If possible, put the station near where students normally return their trays so that the change in the environment is less disorienting.

Collect and Record Data:

Ask students to place trays on the table and as each tray comes in estimate how much food is left on the tray using the following Quarter Waste Method:

- Enter a 0 for none wasted.
- Enter a 1 for $\frac{1}{4}$ wasted.
- Enter a 2 for $\frac{1}{2}$ wasted.
- Enter a 3 for $\frac{3}{4}$ wasted.
- Enter a 4 for all wasted.

Record the observations on the spreadsheet provided.

- If you can't tell whether or not an item was on the tray, leave the corresponding space blank.
- Only enter data for food wasted that you can identify.
- Note that each numbered column represents a specific tray.

Once you have estimated and recorded each food item, you will be ready to analyze the data that you have collected!

Analyzing Tray Waste Data Made Easy

The data that you collected can tell you the percentage of food being wasted before and after you implemented a change in your cafeteria. It will also tell you how many students are selecting food items. If food waste has decreased and students are selecting the healthful foods that are being promoted, you know that your efforts have been successful! Sharing your successes is key to gaining support from the school community as well as from parents and district wide stakeholders! The best way to communicate your data is by presenting it in an easy to understand way. The following steps are designed to help you make your recorded data into simple, straightforward bar graphs that you can feature in school newsletters, at board meetings, or on the school website!

The first step is to organize your data by entering it into a Microsoft Excel spreadsheet. For help using the program, ask a high school business teacher or, better yet, a high school student!

Enter all of the data as it appears on your Tray Waste Data spreadsheet. Make one spreadsheet for the data collected before you implemented the change and one spreadsheet for after. Each column will represent one tray or student and each row will represent the food item being measured.

Next, average each row that represents a particular dish or food group (ie. entrée, fruit, vegetable, grain, milk). The average is calculated by adding all of the data in one row and dividing by the number of students that selected that item. Cells that are blank indicate that that student did not select the item being measured. Using the data below as an example, you would add $1+1+4+0=6$ and then divide $6/4$. The average of wasted green beans is 1.5.

Wasted Food Item	Tray 1	Tray 2	Tray 3	Tray 4	Tray 5
Vegetable Side: Green Beans	1		1	4	0

Convert these averages to percentages by multiplying each calculated average by 25. For example if the average amount of green beans wasted is 1.5, when multiplied by 25 you find that an average of 37.5% of green beans are wasted.

Now you are ready to generate a graph that summarizes the findings. You can create one graph that shows the percentage of food being wasted. You will also want to share the percentage of students that select each item. For example if you are particularly concerned with vegetable intake, it is relevant to communicate the percentage of students selecting vegetables as well as the percentage of those vegetables that students throw out.

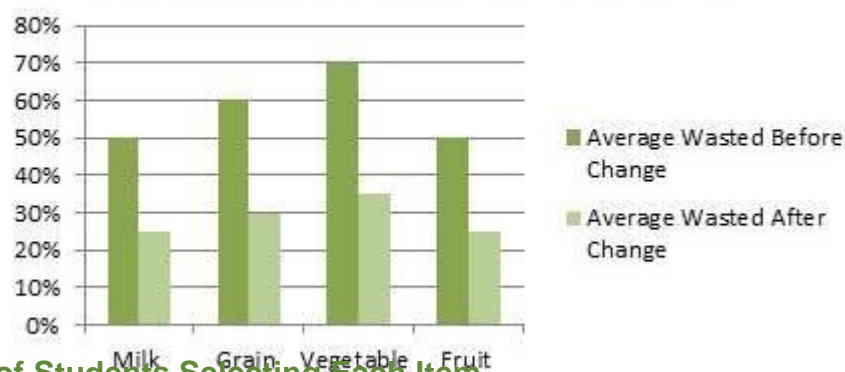
Percent Food Wasted

In a new Excel “workbook” create a chart that indicates the average percent food waste before and after implementation. For example:

Food Item	Average Wasted Before Change	Average Wasted After Change
Milk	50%	25%
Grain	60%	30%
Vegetable	70%	35%
Fruit	50%	25%

To make this chart into a graph, simply select all of the cells in your chart (including titles) and click insert > chart > column. You will now see a simple readable graph!

Percent Food Wasted in Cafeteria



Percent of Students Selecting Each Item

In a new Excel “workbook” create another chart that shows how many students are selecting each food item. To find this data return to your initial spreadsheet and count the students who selected each item and divide that number by the total number of students whose trays you measured. Remember that empty cells indicate that the student did not select that food item. Consider this example

again:

Wasted Food Item	Tray 1	Tray 2	Tray 3	Tray 4	Tray 5
Vegetable Side: Green Beans	1		1	4	0

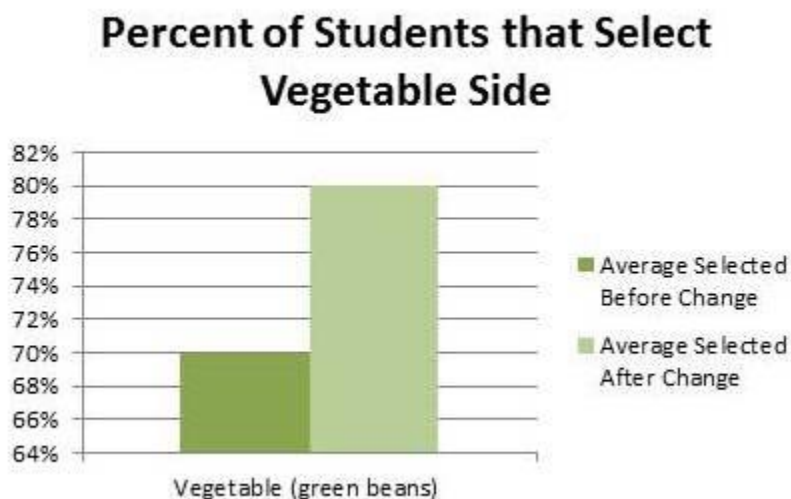
According to this chart, 5 trays were measured and of those 5 trays 4 included green beans.

Once you have the number of total trays measured and the number of students that selected each item, calculate the percentage of students that select each item using this formula: $\text{Total \# Trays Measured} / \text{Trays that included food item} \times 100 = \text{\%}$

Plug these percentages into your new chart:

Food Item	Average Selected Before Change	Average Selected After Change
Vegetable (green beans)	70%	80%

Follow the steps above to convert this chart into a graph:



Using Your Data and Graphs

Bar graphs created in Excel can be copied and pasted into other documents so that you can share your graphs easily! With your easy to read bar graphs you are ready to show off your results!

Beyond how much food is wasted or consumed, stakeholders may be interested in knowing about the nutritional value of the foods that students eat. Having the

weight of each food item recorded in your spreadsheet makes it easy to look up nutritional values. Simply **convert ounces to grams** (if not already recorded in grams) and use the **USDA National Nutrient Database for Standard Reference** to find detailed nutrition information about the food item that you are analyzing. If you know how many calories, for example, are in one full serving of green beans and you know that 80% of green beans are being eaten you can easily calculate how many calories from green beans kids are eating by using this formula:

$$\text{calories in one serving} \times .8 = \text{average calories eaten}$$

This data can also be easily shared with a bar graph by following the instructions

Appendix F
Informed Consent Form



College of Education and Human Sciences
Department of Nutrition and Health Sciences

INFORMED CONSENT FORM

Project Title: The Smarter Lunchrooms Movement

Purpose of the Research:

The purpose of this study is to conduct interviews with Family and Consumer Science teachers to gain their perspective on a teaching plan and activities that will be implemented in their classrooms to address the Smarter Lunchrooms Movement.

Procedures:

You were recruited for this interview because you have been identified as being a Family and Consumer Science teacher in the Lincoln Public Schools. This interview will take place following final plate waste data collection to address and obtain feedback on the Smarter Lunchrooms Movement lesson plan and activities. The interview will take place in one of the school buildings and each interview will last approximately 30 minutes.

Risks and Potential Discomfort:

- This project involves less than minimal risk and does not affect the rights of the participants in any way.
- It is possible that you may feel uncomfortable sharing information by participating in these interviews, although not likely. If you feel any tension created by the discussions, you are free to withdraw from the activity.
- If there are problems resulting from participation, you may contact Dr. Linda Boeckner at the University of Nebraska-Lincoln at 402-472-7634.

Benefits:

The information gathered from this session will be used to help researchers evaluate the Smarter Lunchroom Movement teaching plans for teachers, which you may use in the future.

Confidentiality:

Due to the nature of the interview, complete confidentiality cannot be guaranteed. Information will be compiled in aggregate form and no identification of individuals will be reported. All information obtained during this study will be stored in locked facilities and will be available only to the research team. Results of the interviews will be reported to the community and at professional conferences.

**Compensation:**

Participants will not receive any compensation for attendance at these interviews.

Opportunity to Ask Questions:

You may ask questions concerning this research at any time during the project. If you have any questions concerning your rights as a participant that have not been answered by the project investigator, or to report any concerns about the study, you may contact the University of Nebraska-Lincoln Institutional Review Board, telephone 402-472-6965.

Voluntary Participation & Freedom to Withdraw:

Your participation with this project is completely voluntary. You can choose not to participate or withdraw without affecting your relationship with the researchers or the University of Nebraska-Lincoln.

Consent, Right to Receive a Copy:

You are voluntarily making a decision whether or not to participate in this interview for research. Your signature certifies that you have decided to participate having read and understood the information presented. You will be given a copy of this consent form for your own records.

Signature of Participant:

Date: _____

Signature of Researcher:

Date: _____

For questions about the project contact:

Dr. Linda Bockner

402-472-7634

lboeckner1@unl.edu

Mia Wood, Research Assistant

402-320-3208

miarose216@yahoo.com

Appendix G

Family and Consumer Science Teacher Questionnaire

Family and Consumer Science Teacher Follow Up Questionnaire

Introduction:

Thank you again for taking the time to visit with me about your

Smarter Lunchrooms Movement training. I would now like to hear your feedback about the lesson plan and activities carried out throughout the semester. Again, please keep in mind during the discussion that there are no right or wrong answers but rather differing points of view. Please feel free to share your point of view even if it differs from what others have said.

Questions:

1. Tell me your thoughts about the Vegetable intervention for the Smarter Lunchrooms Movement.
2. Tell me a little bit about your own vegetable consumption.
3. Tell me about any challenges in how this intervention worked in your school setting?
4. How did you engage students in naming vegetables?
5. How did you engage students in making signs?
6. How many days did they do the Smarter Lunchrooms Movement activities? How long did they do the activities each day?
7. How much time did you spend implementing the activities?
8. What did you observe about vegetable consumption with your students before implementing this project?
9. What did you observe about vegetable consumption with your students after implementing this project?
10. What, if anything, did you observe with your students with vegetable consumption before this project? After this project?

Thank you so much for taking time out of your day to visit with us today. This has been tremendously helpful!

Appendix H

Family and Consumer Science Teacher Interviews

Table #3
Qualitative Themes and Evidence From Family Consumer Science Teacher Quotations

1. Tell me your thoughts about the vegetable intervention for the Smarter Lunchrooms Movement.

L1: "I think its good that we focused on vegetables because when we talk about my plate the kids always say they don't get enough of that."

L2: "The kids had fun creating the posters, but I felt like I needed to go back a step yet and educate them on what vegetables do for you so that they could really make an intelligent banner."

G1: "I thought it was a fun and creative lesson, I really enjoyed it and my kids really enjoyed it. My kids said that they really like broccoli, and it's not their least favorite vegetable. My kids were really positive about it."

2. Tell me a little bit about your own vegetable consumption.

L1: "I go through spurts, I try to get what I need each day and I do most of the week. The weekends are hard for me; right now I'm training for a marathon so I'm trying to eat the right things."

L2: "I eat all vegetables, I can't think of one vegetable I don't eat and my salads probably have ten vegetables in it. I love dark green vegetables including broccoli, spinach, and asparagus."

G1: "This was really good for me too because I have a hard time eating vegetables. It was a good challenge for me as a teacher to figure out how to make my students eat more and myself, it was a good personal and class goal."

3. Tell me about any challenges in how this intervention worked in your school setting.

L1: "We had some of those signs hanging up in the room and a lot of the kids were like 'ewww broccoli', a lot of kids gave feedback that they didn't like because it focused just on broccoli and not all vegetables. If it was focused on all vegetables the kids would have been more excited about it."

L2: "I didn't have any challenges other than time. Time was a challenge because of meeting, getting the kids to do the intervention, getting the kids to vote on the posters, getting the posters up."

G1: "The biggest thing was the wording of the packet, a lot of the words I had to explain what they meant, mainly in the follow up questions, I had to change questions to ask them what they understand. All of the exercises were great but they didn't have the background of the nutrients of what goes into broccoli so in the future that would be good background before doing the activity but overall they really liked making the posters and getting the school more involved with eating broccoli."

4. How did you engage students in naming vegetables?

L1: "I showed them the examples that were given and they really kind of brainstormed their own ideas and they did a nice job of doing that. I think sixth grade was a good age for this, I don't think my 8th graders would be in to this. If the 8th graders did it wouldn't have been as mentally connected with the activity."

L2: "I did a lot of probing them for questions, giving examples, pushed them to get them to be creative."

G1: "It didn't honestly take very much work when I gave them a sheet and they used the word bank they did it all on their own. I thought it was a great concept. Any time they can take information that is boring and they can make it fun and creative without boundaries they love that, they cant get it wrong."

5. How did you engage students in making signs?

L1: "We brainstormed, read the information on the activity and they took off with it. Some students were very creative."

L2: "Same as the previous question. I did a lot of probing them for questions, giving examples, pushed them to get them to be creative."

G1: "After receiving all the equipment they needed, I wrote out "this is what they need to have on it" and I told them they could use their chrome books and they came up with the funniest most creative things for names. Once I gave them materials and instructions on what I expected of them they did a really good job. About 90% of them took them seriously."

6. How many days did they do the Smarter Lunchrooms Movement activities? How long did they do the activities each day?

L1:

- a) "2 days."
- b) "2 full days to complete the activities."

L2:

- a) "It took two days and it was the entire class period I allowed them to do that."

G1:

- a) "Total, we took 2.5 – 3 days to finish the assignment."
- b) "We devoted one day to the first two exercises and talking about it."
- c) "Another day we devoted to coming up with the cafeteria names."
- d) "They needed another day to make their signs and finish them and hang them in the cafeteria."

7.. How much time did you spend implementing the activities?

L1: "Two Class Periods"

L2: "One class period it took the entire time to just go through the activity. Other class periods it took half of the class period to walk them through the activity."

G1: "3 days."

8. What did you observe about vegetable consumption with your students before implementing this project?

L1: "I did this towards the end of my quarter with my kids so just like I said when we talk about MyPlate vegetables is an area where they all kind of struggle to get what is recommended for them."

L2: "They hate vegetables. It's a food group that many students unfortunately do not eat. They do ask me if corn is one, it's a starchy vegetable. They do not eat vegetables at all. In the cafeteria I observed that they can have two vegetables and they only choose one and they throw it away."

G1: "A lot of them said that they don't mind vegetables, that they just had certain ones that they really disliked. A lot of them said they didn't mind broccoli but they said they don't eat them a lot."

Table #3 Continued

9. What did you observe about vegetable consumption with your students after implementing this project?

L1: "I didn't have a chance to observe the kids because of the quarter change with our classes.

L2: "when the posters were put up students would come in and go EW broccoli who likes broccoli? So I said you know we can't be judgmental and then I told them about this project and students not eating vegetables. What concerns me more is the students that choose ice cream, spaghetti and mashed potatoes, pizza and mashed potatoes, this is a concern for me because of the amount of carbs in it. When I talked to parents about it in open house, they have the same response that you do [is it learned it someplace, from parents, or when they go out to eat it, or why are they set up so that they can have all of their starches]. I ask a lot of students "where is your protein?" because I don't see it on their plates."

G1: "I think if anything it helped raise awareness among the students, mentally it was a reminder on why vegetables were important, since they made the posters they felt like it was important and they wanted to point it out to their friends and families what they did and showed them why it was important with their signs."

10. What, if anything, did you observe with your students with vegetable consumption before this project? After this project?

L1:

- a) Before: I didn't observe anything first hand but they said they didn't eat vegetables before the quarter change.
- b) After: I didn't get a chance to talk to them after the intervention because of the quarter change and I got new students."

L2: "No change observed. They love the cheese sauce with the broccoli, that's a favorite, but steamed broccoli alone they won't eat. They have so many."

G1: "Before the project they mainly complained about the lunchroom meals and how gross they are and how they don't like them. After the project there was a more positive focus on vegetables, coming up with the funny names made them want to promote vegetables and healthy eating. If anything it made them change their attitude about vegetables and made them want to eat them."

Appendix I

Catchy and Appealing Name's for Broccoli – Student Signs

Lux Middle School – Student Signs

Figure 3. Student Signs Displaying Creative Names for Broccoli Displayed on the Salad Bar in Lux Middle School's Cafeteria.



Student Signs Displayed in the Family and Consumer Science Teacher Classroom



Figure 4. Examples of Student Signs Displaying Creative Names for Broccoli Displayed on the Salad Bar at Lux Middle School.



Figure 5. Examples of Student Posters Displaying Creative Names for Broccoli Displayed on the South wall of the cafeteria at Goodrich Middle School.

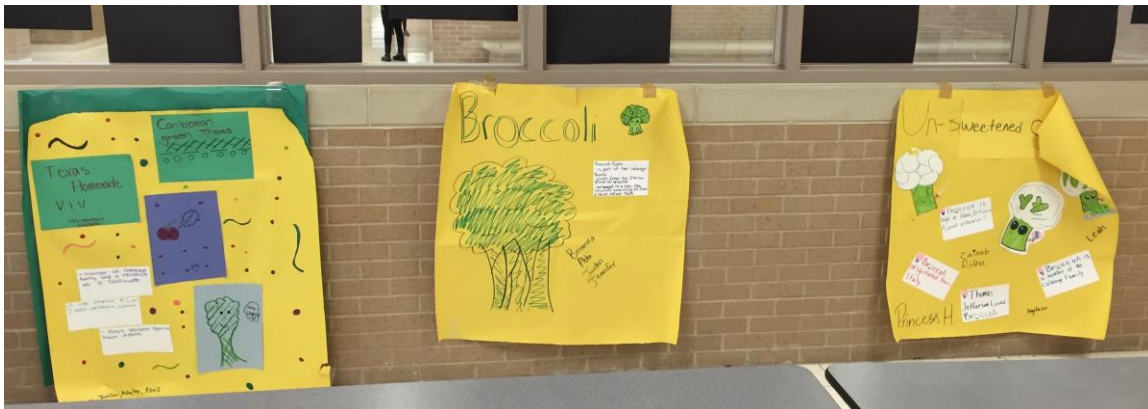
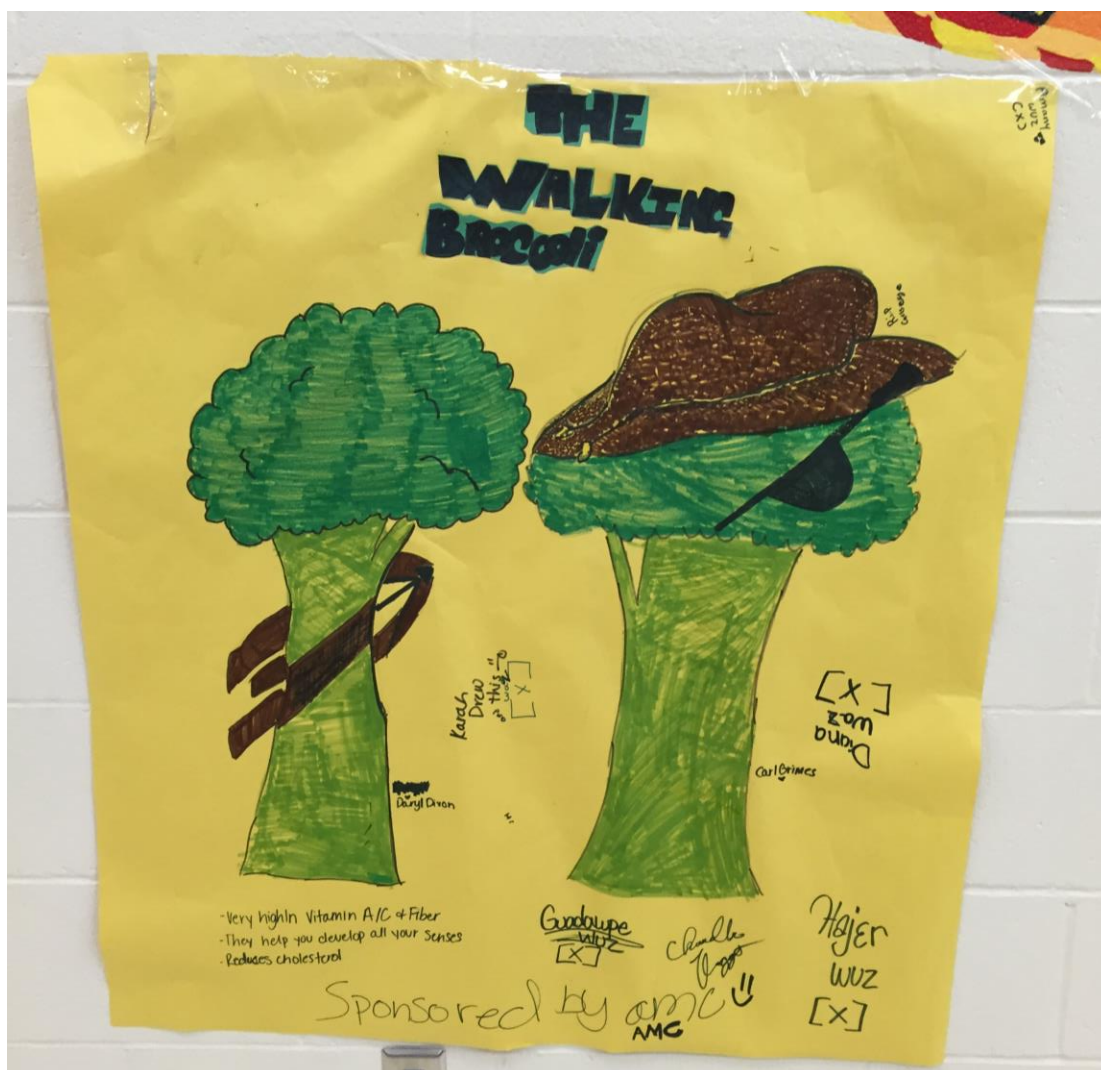


Figure 6. Student Poster Displaying “The Walking Broccoli” displayed on the East wall of the cafeteria at Goodrich Middle School.



Goodrich Middle School – Student Signs Continued

