DEVELOPMENT AND TESTING OF EDUCATION MATERIALS TO INCREASE VISUAL EXPOSURE OF MYPLATE FOODS IN PRESCHOOLERS

A DISSERTATION

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS

FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

IN THE GRADUATE SCHOOL OF THE

TEXAS WOMAN'S UNIVERSITY

DEPARTMENT OF NUTRITION AND FOOD SCIENCES

COLLEGE OF HEALTH SCIENCES

BY

JESSICA BARNES, B.A., B.S., M.S

DENTON, TEXAS

DECEMBER 2016

ACKNOWLEDGEMENTS

I wish to acknowledge and thank those who have supported me throughout this journey.

Dr. Warren, thank you for the phenomenal encouragement, constructive criticism, hope, and endless moral support you have offered during the past 4 years. From you I have learned the value and richness of qualitative data and maintaining sanity and flexibility while implementing studies with children. Thank you for your faith in my idea.

Dr. Imrhan, thank you for being one of my biggest supporters since my days as an undergraduate. You have been a constant source of wisdom, perspective, and encouragement. I appreciate you more than you know.

Dr. DiMarco, thank you for your enthusiasm and constant encouragement. The passion you have for your students and teaching is inspiring.

Dr. Vittrup, words cannot express my gratitude for all of the time and energy you put into this project. Thank you for your invaluable input and your patience as I stumbled to find my way.

Dr. Rose, I cannot thank you enough for your insight and expertise.

Thank you to my amazing husband, Rylan, and children, Ascher, Kellan, Ella, and soon-to-be Avery. You are a constant reminder that life is wonderful.

ABSTRACT

JESSICA BARNES

DEVELOPMENT AND TESTING OF EDUCATION MATERIALS TO INCREASE VISUAL EXPOSURE OF MYPLATE FOODS IN PRESCHOOLERS

DECEMBER 2016

Childcare centers provide a unique place for nutrition education to begin encouraging healthy eating habits in young children. Lack of financial resources allocated to nutrition education can often hinder this process. Nutrition educational books discussing characteristics, origin, and function of the MyPlate food groups may facilitate familiarity and acceptance of foods at a low cost to childcare centers. The purpose of this study was to develop educational MyPlate-based food group books and test whether or not visual exposure to these books would increase consumption of these foods in preschoolers. Books were developed in four distinct phases: initial book development using 4-year-old pre-kindergarteners' input (n=24), pilot testing with 3-year-old preschoolers (n=23), focus group discussion concerning book prototypes with preschool educators (n=24), and review by three experts in child development and nutrition education. The final five books were then tested among preschoolers (n=207) in 17 childcare centers. Participating students at these centers were placed into one of five different intervention groups (one for each food group) or the control group. The intervention group was read their designated food group book once a day for two weeks.

Food intake for all groups was recorded through the use of photographic food diaries for three days, pre-, post- and post-natural environment intervention. A food behavior questionnaire was also sent home to parents during the post-intervention data collection. The photographic food diaries were visually analyzed for percent of one serving consumed for each food group. Intake was analyzed using MANCOVA, with pre-intervention intake treated as the covariate. A good inter-rater reliability score of .702 was established using intra-class correlation. Participants in the dairy and vegetable intervention groups had a significantly higher intake in their corresponding food group compared to the control group. Visual exposure to healthy foods using print media can be an inexpensive and effective way to familiarize young children with healthy foods. This increase in familiarity can lead to increases in consumption that may aid in the development of lifelong healthy eating habits.

TABLE OF CONTENTS

LIST OF TABLES

Table Page

CHAPTER I

INTRODUCTION

Food preference begins at an early age and sets the stage for lifelong eating habits (Drewnowski, 1997). Unfortunately, the time in which food preferences are being established coincides with food neophobia, or fear of new foods, lending itself to high levels of frustration for parents and caregivers at mealtime. Preschoolers require 10-15 exposures to a novel food prior to acceptance (Sullivan & Birch, 1990). The rejection of new foods and flavors by preschoolers during initial trials can be mistaken as an aversion by parents and caregivers, who cease to serve these foods again. Children are then not provided the opportunity to develop a liking for foods (Campbell & Crawford, 2001; Cooke, 2007; Cooke et al., 2004; Skinner, Carruth, Bounds, & Ziegler, 2002), especially if the child refuses to eat novel foods when offered (Carruth & Skinner, 2000). This affects food preference and ultimately the food selection that extends into adulthood (Nicklaus, Boggio, Chabanet, & Issanchou, 2004; Nicklaus, Boggio, Chabanet, & Issanchou, 2005), increasing the risk of chronic disease and obesity if less healthy food choices are favored.

Visual exposure to food through books provides an alternate method of acquainting children with novel foods. Research using picture books of fruits and vegetables has shown promising results (Byrne & Nitze, 2002; Heath, Houston-Price, &

Kennedy, 2010; Houston-Price et al., 2009; Houston-Price, Butler, & Shiba, 2009). Visual exposure studies reporting moderate success primarily focused on fruit and vegetable consumption (Birch, McPhee, Shoba, Pirok, & Steinberg, 1987; Byrne & Nitze, 2002; Heath et al., 2010; Houston-Price et al., 2009; Houston-Price et al., 2009) while foods in the protein, dairy, and grain groups are often not evaluated, leaving a large gap in nutrition education materials.

There is a large increase in obesity rates as preschoolers grow and develop into school-aged children, making them a prime target for nutrition education. Childcare centers provide a point of contact to reach preschoolers, since 61% of children aged 5 and under are in some form of childcare during the week (Laughlin, 2013). Unfortunately, there is often a lack of time and financial resources committed to providing nutrition education in childcare centers (Warren & Barnes, 2013). These factors must be taken into consideration when developing materials to be utilized within this setting. In addition to being cognitively appropriate for the child, educational materials must be inexpensive and teacher friendly. Developing nutrition educational materials for all five food groups in book format could provide inexpensive materials to be used in childcare centers that would help familiarize preschoolers with healthy foods from all food groups.

Objectives

This study had two major objectives. The first was to develop a working prototype that can be used to increase visual exposure of MyPlate in preschoolers. The

second was to test the effectiveness of that prototype based on consumption of MyPlate food groups in preschoolers.

Specific Aims

Book Development and Testing Using a Mixed Method Design

1. Develop educational materials focused on the five MyPlate food groups (protein, grains, dairy, vegetables, fruits) using input from preschool children (3-4-year-olds)
2. Determine the effectiveness of these new materials in increasing acceptance of foods from MyPlate using plate waste analysis.

Input from Experts to Develop Final Revision of MyPlate Books

1. Focus group discussions were conducted to gather input from childcare providers on the books developed in Phase I.
2. Experts in child development provided input on the final iteration of the books to use in Phase III.

Large-Scale Testing of MyPlate® Books

1. Test the effectiveness of the prototypes developed in childcare centers.
2. Initial testing included how standardized book reading for 10 days will impact food intake.
3. Secondary testing evaluated how utilization of these books in a natural environment would impact food intake.

Hypotheses

- Hypothesis 1: Children exposed visually to MyPlate foods through newly developed food group books will increase consumption of these foods compared to the control group after two weeks of standardized readings.
- Hypothesis 2: Children will have further increased consumption of these foods compared to the control group after a 12-week natural teaching environment.

CHAPTER II

REVIEW OF LITERATURE

Food Preference, Childhood Obesity, and Chronic Disease

Food preferences established in young children extend into older childhood and adulthood (Nicklaus et al., 2004; Nicklaus et al., 2005), impacting the risk of chronic disease and obesity if less healthy food choices are favored. Children with a preference for high sugar, high fat, and energy dense foods are more likely to be overweight or obese than those with a preference for healthier food items. Obesity is a global epidemic that has increased drastically throughout the past few decades (World Health Organization, 2000). What was once a condition experienced primarily in adulthood now burdens children in alarming numbers.

Obesity in children is defined as a body mass index (BMI) $\geq 95^{th}$ percentile for age and gender (Centers for Disease Control and Prevention, 2015). Over the past 30 years, childhood obesity rates have more than tripled (Ogden, Carroll, Kit, & Flegal, 2012). Though these rates are beginning to plateau, and even decline within certain age groups, they continue to remain high at an average of 17% of the population of children between the ages of 2 and 19 years old. As children grow older, the rates of childhood obesity tend to increase. Eight and a half percent of children between the ages of 2 and 5 years old are considered obese. This number increases to 17.7% within the 6-to-11-year-old age range and increases further to 20.5% among 12-19-year olds (Centers for Disease

Control and Prevention, 2014). Because of the substantial rise in obesity rates as children transition from preschoolers to school aged children, 2 to 5 year-olds are an important target for nutrition education.

Another demographic particularly afflicted with obesity is children coming from low socioeconomic households. Data from the 2003 and 2007 National Survey of Children's Health indicated a 10% increase in obesity among all children living in the United States during that time frame (Singh, Siahpush, & Kogan, 2010). However, a 23-33% increase was seen in children living in households with low education, low income, and high unemployment. These disparities continued to exist when researchers controlled for various behavioral factors such as excessive television use and lack of physical activity (Singh et al., 2010). In 2010, some declines in rates of obesity among children from low-income families are noted, but this was less than one percent (Pan, Blanck, Sherry, Dalenius, & Grummer-Strawn, 2012). Within the past decade, disparities related to obesity and socioeconomic status have remained ever-present and consistent (Rossen & Schoendorf, 2012).

Alongside an excessive body weight, children experience physiological, psychological, and social issues related to their obesity. Chronic medical conditions that were once labeled adult diseases, such as hypertension, diabetes, and hyperlipidemia, are now being diagnosed in children. Reinehr and Wunsch (2010) reported that the waist circumference of obese children was significantly associated with elevated LDL-cholesterol and triglyceride levels as well as systolic blood pressure and insulin resistance. Obese children are more likely to experience all of these risk factors when

compared to their healthy counterparts (Flechtner-Mors et al., 2012; Ng & Lai, 2004). The presence of these risk factors contributes to the increase in metabolic syndrome seen in children as well (Patino-Fernandez, Delamater, Brito, & Goldberg, 2008; Serap, Mevlut, Inanc, & Ender, 2007). Children, who remain obese as they enter adolescence and adulthood, especially those with the comorbidities listed above, are at a greater risk for premature death (Franks et al., 2010).

Psychological comorbidities appear with childhood obesity, though data relating to depression and anxiety in the presence of obese children is not overwhelmingly clear. Morrison, Shin, Tarnopolsky, and Taylor (2014) used a depression scale for children entering a weight management program and found that as the level of obesity increased, so did the risk of depression. Dockray, Susman, and Dorn (2009) also found a positive association between depression and obesity in children. However, Merikangas, Mendola, Pastor, Reuben, and Cleary (2012) did not find consistent associations when analyzing data from the National Health and Nutrition Examination Survey. Bayer, Rosario, Wabitsch and von Kries (2009) also found no association between obesity and depression, or obesity and anxiety.

Obese individuals are often characterized as lazy, dishonest, lacking in self-control, and lacking in intelligence (Brewis, Wutich, Fallette-Cowden, & Rodriguez-Soto, 2011). This leads to a poor social stigma that is attached to obesity and is one that cannot be hidden. This “fat stigma” contributes to the behavioral problems that are more likely to exist in obese children when compared to non-obese children (BeLue, Francis, & Colaco, 2009; Brewis, 2014). These include, but are not limited to, acting out at

school, poor academic performance, and either being a victim or perpetrator of bullying (Bethell, Simpson, Stumbo, Carle, & Gombojav, 2010; Datar & Sturm, 2004; Farhat, Iannotti, & Simons-Morton, 2010). These behavioral issues, along with psychological and physiological comorbidities seen in obese children can lead to a poorer quality of life, emphasizing the need for interventions designed for young children focusing on prevention of obesity so children do not develop these behaviors. Interventions with a positive impact on healthy food preferences in young children and subsequent behavioral changes could reduce the risk of obesity and related diseases in children.

Food Preference Development

Food preference can be defined as the liking of one food item over another (Birch, 1999). While an increased preference for a specific food often leads to selection, it is not the only factor to consider, especially regarding children, who have minimal control over the foods served to them. The previously accepted "wisdom of the body" theory suggested that children would automatically select foods that their bodies needed if provided an array of healthy options. It is recognized that a child's preference is guided primarily by taste, specifically those that are familiar and those that are sweet (Birch, 1992).

A child's food preference development begins in utero. As they practice swallowing amniotic fluid, a fetus will be exposed to a variety of flavors depending on the maternal diet (Mennella & Beauchamp, 2005). Once born, flavor exposure continues in breastfed infants through taste transmission in the mother's milk. Early exposure to various flavors through breast milk has been shown to lessen food neophobia in toddlers

and increase fruit and vegetable intake in 2-6 year-olds (Cooke et al., 2004; Galloway, Lee, & Birch, 2003; Nicklaus et al., 2005). Nursing infants transition better to solid foods due to flavor exposure in breast milk. Maier, Chabanet, Schaal, Issanchou, and Leathwood (2007) sampled four novel foods with infants and found that breastfed babies consumed significantly more of these foods than formula fed babies. Rosenstein and Oster (1988) observed breastfed versus formula fed infants were more likely to consume peaches for the first time and found breastfed babies responded more positively than formula fed babies when fed peaches. No difference in green bean consumption was found between the two groups. This may be related to innate taste perceptions in infants. Infants are born with an innate preference for sweet taste and distaste for bitter flavors. This is thought to be a genetic defense mechanism as sweet flavors often signify safe foods, whereas bitter tasting foods may be toxic (Desor, Greene, & Maller, 1975). It also explains why children are more apt to consume sweet fruits versus bitter vegetables.

Salt taste perception develops over time, but incorporation of salt into the diet of an infant influences preference for salty taste later on. Stein, Cowart, and Beauchamp (2006) presented infants at 2 and 6 months of age with bottles containing various concentrations of salt solutions and recorded intake. The children were then assessed at 3 to 4 years of age via a parent questionnaire concerning salt-related behaviors such as licking salt off food, adding salt to foods, and eating plain salt. Infants at 2 months did not perceive the presence of salt in solution. At 6 months of age, infants with prior exposure to starchy foods, such as infant cereal, had a significant preference for the greater concentration salt solution than infants who had not yet been exposed to starchy

foods. Once infants with preference for salt reached preschool age, they were more likely to exhibit behaviors such as eating plain salt and licking salt off food.

A child's food preference and selection is determined by a multitude of factors including availability within the environment, eating environment, as well as peer and parent modeling. Parents and caregivers play a large role within the context and environment by either encouraging, modeling, promoting, or hindering the development of healthy food preferences. Parents and caregivers model healthy food behaviors through the foods they choose to serve to their children, how often they choose to serve them, and whether or not parents consume these foods as well. The larger the variety of foods served in the home with increased frequency, the greater the chances are that a child's food preferences will expand. Parent modeling has been shown to be more effective in food preference development when compared to number and volume of foods offered alone (Addesi, Galloway, Visalberghi, & Birch, 2005). This is especially true for fruits and vegetables (Cooke, Wardle, & Gibson, 2003; Gibson, Wardle, & Watts, 1998). Cooke et al. (2003) sent home questionnaires regarding demographic information, parent and child fruit and vegetable intake and parental feeding practices to 564 children between the ages of 2 and 6. They found parent fruit and vegetable intake was the strongest predictor of child intake and concluded it could be related to a variety of factors including modeling, a shared environment, and availability within the home.

Maternal consumption behavior has a strong influence on child food preferences (Rozin, 1991; Rozin, Fallon, & Mandell, 1984; Rozin & Vollmecke, 1986; Skinner et al., 2002). Using both mother and child food preference questionnaires, Howard, Mallan,

Byrne, Magarey, and Daniels (2012) found that toddlers were more likely to enjoy vegetables if their mother also liked vegetables. Lower maternal liking for vegetables was associated with a greater incidence of not trying vegetables among the children. Children between the ages of 3 and 5 have the strongest positive correlation with parent diet (Papas, Hurley, Quigg, Oberlander, & Black, 2009). As children grow up, parental influence on diet weakens while peer and social influences have a greater impact (Wang, Beydoun, Li, Liu, & Moreno, 2011).

Other large influencers of food preference and selection include availability and accessibility of healthy foods in the home (Rasmussen et al., 2006). Parents control what is purchased and prepared for the family and therefore direct what is available within the home (Anzman-Frasca, Savage, Marini, Fisher, & Birch, 2012). The ability of a child to see and obtain healthy foods will increase the likelihood of consumption (Musher-Eizenman et al., 2010). Availability of foods within the home is a large predictor of intake in children who already have a high preference for fruits and vegetables. Accessibility plays a larger role in children who do not have an existing preference (Weber Cullen et al., 2003). Accessible fruits and vegetables are those that are within sight, such as on the counter top or easy to reach within the refrigerator. They are also in a ready-to-eat format such as pre-washed and sliced produce.

A child's taste preference is guided not only by their liking for a food, but also the emotional context around eating and their environment (Benton, 2004). Negative context surrounding foods, such as postprandial nausea or vomiting due to illness, leaves a lasting impression on the child, leading to a decreased preference for a particular food. Parents

with positive attitudes and facial expressions while eating versus silence increase the likelihood that a child will try a new food (Hendy & Raudenbush, 2000).

Parenting style and feeding practices are influential in food preference development. Feeding practices are strategies parents or caregivers use to either encourage or deter consumption of specific foods (Ventura & Birch, 2008). Parenting styles are used throughout child development to describe parent-child interactions across two dimensions: control and responsiveness. These include authoritative, parents who exhibit high control and high responsiveness; authoritarian, parents who exhibit high control and low responsiveness; permissive, parents who exhibit low control and high responsiveness; and neglectful, parents who exhibit low control and low responsiveness. Nutrition education researchers have adapted the concept of parenting styles to incorporate feeding practices (Birch & Fisher, 1998; Faith, Scanlon, Birch, Francis, & Sherry, 2004). Authoritarian parents tell children exactly what and how much to eat, whereas permissive parents may allow children to eat whatever they choose. Authoritative parents provide guidelines without being too restrictive or overbearing and neglectful parents would have a complete disregard for their child's eating habits and wellbeing (Birch & Davidson, 2001; Hughes, Power, Orlet-Fisher, Mueller, & Nicklas, 2005). Sometimes, a parent's feeding style may not necessarily match his or her overall parenting style.

A child's behavioral response relating to food intake is the primary focus of most studies evaluating parent feeding styles. Though parents may have their child's best interest at heart, they often create or exacerbate current problems with their child's food

preferences. Feeding styles that incorporate any form of coercion or reward often increase neophobia (Brown, Ogden, Vogele, & Gibson, 2008; Carruth et al., 1998). In particular, children of authoritarian-style parents, who tend to control the type and volume of foods consumed, tend to lose their innate ability to sense satiety (Satter, 1996). This in turn can lead to overeating, resulting in obesity and an increased risk for chronic disease.

According to data collected through the United States Census Bureau (Laughlin, 2013), 12.5 million children ages 5 and under are in some form of childcare during the week. On average, these children spend approximately 33 hours a week in some type of childcare center. Given the frequency with which childcare providers serve meals to their preschoolers, they may yield a similar level of influence on food selection when compared to parents in the home. Their attitudes towards specific foods may also impact food preference and selection in their students. Though all teachers may not plan or prepare the foods served, they are often present during mealtime and have ample opportunities to model healthy eating habits around the children.

Food Neophobia

Whether taste is innate or developed over time, experience surrounding eating and level of exposure plays a role in whether or not that food becomes preferred or selected by a child. Children are born with a preference for familiar foods and reject new ones (Birch, 1999). This rejection or fear of new food is called “food neophobia.” Food neophobia is thought to be an innate defense mechanism related to when foods were less available and not always safe. With the plentiful food environment available in the U.S,

food availability is no longer a concern, only hindering healthy lifestyles since neophobia peaks when food preferences are being established. The degree of neophobia in a preschooler can affect food consumption into adulthood. Children who are highly reluctant to try new foods have lower acceptance of food variety as adults (Nicklaus et al., 2005). Those who seek variety and strong flavor while young do so as adults as well (Galloway et al., 2003). Repeated taste exposure shifts a child's perspective from new to familiar, increasing the likelihood that a food will be accepted and consumed in the future (Birch, 1999).

Food neophobia can be seen within all food groups among children. Russell and Worsley (2008) conducted a cross-sectional study using children aged 2 to 5 from a variety of socioeconomic groups. They found food neophobia was negatively associated with all five of the food groups, the strongest being vegetables, followed by meat and fruit, respectively. A significant negative correlation between the level of neophobia and variety was found within food preferences. No difference between age and sex was found. This conflicts with Laureati, Bergamaschi, and Pargliarini (2015) who found sex differences in neophobia existed in younger children, but disappeared with age. This research was conducted using an older group of children, possibly explaining the discrepancy.

It is widely accepted that children must have, on average, 10-15 exposures to a novel food prior to its acceptance (Birch & Marlin, 1982; Birch, 1999). This number tends to change with age, type of food, and lessening neophobia (Loewen & Pliner 1999). Sweet foods such as fruit may only take a few exposures prior to acceptance, whereas

children with extreme neophobia may require 27 (Williams, Paul, Pizzo, & Riegel, 2008). Neophobia generally presents itself around the age of 2 and begins to lessen roughly around 9 years of age, where only a few exposures are required to encourage intake of a food item. The number of required exposures changes with age. Infants require only a few exposures, while 2-year-olds need roughly 5-10, and 3-4-year-olds can require up to 15 (Birch & Marlin, 1982; Maier et al., 2007; Sullivan & Birch, 1990). Development of healthy eating habits occurs between the ages of 3 and 4 years. These food habits correlate to food choice in adulthood and can lead to an increase in the risk of chronic disease when a preference for energy dense foods is greater than of nutrient dense ones (Nicklaus et al., 2004; Skinner, et al., 2002).

The rejection of new foods and flavors by preschoolers during initial trials can be mistaken as an aversion by parents and caregivers, who often cease to serve these foods, and children are not provided the opportunity to develop a liking for them (Campbell & Crawford, 2001; Cooke et al., 2003; Cooke et al., 2004; Skinner et al., 2002), especially if the child exhibits poor behavior when offered novel foods (Carruth & Skinner, 2000). Food preference is greatly affected and ultimately the food selection extends into adulthood (Nicklaus et al., 2004; Nicklaus et al., 2005) impacting the risk of chronic disease and obesity if unhealthy food choices are favored and healthy ones are feared. This is a concern for low-income parents, where budgets are tight and serving unwanted food seems wasteful. In this case, the immediate concerns of food cost outweigh the long-term concerns of chronic disease.

Role of Exposure in Food Preference Development

Taste Exposure

The role of repeated taste exposure in the development of food preferences in children has been extensively studied. The notion that preschoolers require, on average, 10-15 exposures to a new food prior to acceptance has been well established by Birch and colleagues (Birch & Marlin, 1982; Birch, 1999). Initially, many of these studies were conducted within laboratory settings, altering the effect of neophobia on the foods. More recently, studies have shifted to more natural environments such as schools and homes (Anzman-Frasca et al., 2012; Lakkakula, Geaghan, Zanovec, Pierce, & Tuuri, 2010; Olsen, Ritz, Kraaij, & Moller, 2012; Wardle et al., 2003).

Lakkakula and colleagues (2010) evaluated the use of repeated taste exposure with vegetables among 360 fourth and fifth grade elementary school students, over a 10 week period. Students were served small servings of carrots, peas, tomatoes, and bell peppers once a week for 10 weeks with lunch and asked to taste each vegetable one at a time. They were told they could spit the vegetable out into a napkin, if desired. A questionnaire regarding consumption of the vegetable and whether or not they liked it was completed by participating students pre- and post-intervention. Participants who reported an initial disliking of the vegetables showed an improvement in liking scores for carrots, peas, and tomatoes, but not for bell peppers. Others who reported liking the vegetables at the start of the study showed no changes in preference post-intervention.

Anzman-Frasca et al. (2012) studied the effects of associated conditioning alongside repeated exposure in school-aged children. The hypothesis of the study was

when vegetables were served with a dip students liked, children would associate the two flavors and liking for vegetables and have greater improvement than repeated exposure alone. There was an improvement in liking for tested vegetables in both the repeated exposure and the associated conditioning group. The children had an increased liking for a vegetable when it is served with dip; however, this did not translate to increased liking when the same vegetable was served alone.

A study conducted by Olsen et al. (2012) produced contrasting results compared to most other repeated exposure studies. Nine- and 11-year-old children underwent two exposure periods. During the first exposure, children were exposed to a liked vegetable, a mixture of liked and disliked, or a disliked vegetable daily for six days during snack time at school. During the second exposure, children were provided all three vegetables every day for six days. Liking for vegetables was tested pre-exposure, mid-exposure, post-exposure, and at a follow-up. The liking for vegetables decreased during exposure and immediately afterwards, but increased at the follow-up. This could possibly be due to children becoming bored with the repetition of snack foods provided.

The effect of repeated exposure in the home has also been studied. Wardle et al. (2003) placed 156 children into 3 different groups: exposure, information or control. Children in the exposure group were served a target vegetable by their parents at home for 14 consecutive days. Parents of children in the information group were provided promotional materials regarding the '5-a-day' campaign recommendations and tips for increasing fruit and vegetable intake, while the control group simply participated in the pre- and post-intervention taste test. All three groups showed some increase in liking for

the target vegetable; however, the exposure group had a significantly greater liking for the target vegetable when compared to the control group. While even minimal exposure has some benefit, the bulk of information merely added to the already established research regarding repeated taste exposure.

An issue that arises with repeated exposure is the parent's ability and willingness to provide the initially rejected foods 10-15 times for the child to become more familiar with them. Carruth, Zieglar, Gordon, and Barr (2004) found that only 19% of mothers offered their children new foods more than six times if they initially rejected it. On average, most mothers provided foods only 3-5 times, limiting the opportunity for familiarity and development of liking and preference. The question remains whether or not children must taste the food or if other types of exposure will augment the development of preference for a specific food.

Visual Exposure

Visual exposure through a variety of media provides another method of acquainting children with food. Exposure to foods through media such as television and advertisements has been studied due to its negative influence with emphasis on the impact of advertising obesogenic foods to children. There is a link between commercial viewing and childhood adiposity (Lobstein & Dibb, 2005). The role of television viewing in changes in intake and food preference has been observed (Boyland et al., 2011; Wiecha et al., 2006). The effect of food and toy commercials on food preference among 6-13 year olds has been examined (Boyland et al., 2011). Children were shown either food or toy commercials along with a television show on two separate occasions. Food

preference was measured using validated questionnaires before and after the intervention. Children who viewed food commercials had a higher preference for refined carbohydrate and fatty foods when compared to those who viewed toy commercials.

The relationship between diet, physical activity, and television viewing among 11-12-year-old children has been measured (Wiech et al., 2006). Anthropometric data was taken and surveys were used to assess diet, activity and television viewing. With every one-hour increase in television viewing, there was an increase in 167 kilocalories per day. Consuming an extra 167 kilocalories over basal metabolic requirements each day would lead to an approximate gain of 17 pounds each year, possibly moving children towards obesity. It is important to consider that television is not the only visual media where children are exposed to food. Between billboard ads, magazines, vending machines, etc., children are constantly in contact with food.

Researchers have begun to examine if possible positive benefits of consumption are associated with visual exposure to nutrient dense foods such as fruits, vegetables, and other foods encouraged with MyPlate. Houston-Price et al. (2009) used books to test visual exposure with toddlers. The purpose was to determine whether children would be more likely to taste unfamiliar foods after reading specially designed books. Parents were provided with one of two books and were instructed to read to their toddlers 5 minutes daily for 2 weeks. After the two-week reading period, the children underwent a recorded taste test and researchers found the toddlers were more likely to taste the exposed foods, whether or not they were familiar to them. Though this does not equate to food

acceptance, visual exposure may reduce the innate neophobia and may potentially decrease the number of taste exposure trials needed for food acceptance.

Osborne and Forestell (2012) directly compared taste exposure and visual exposure within the homes of children between the ages of 4 and 8. Parents of children testing taste exposure were given a list of fruits and vegetable to offer once a day for eight days. Those in the visual exposure group were given two books, one discussing the health effects of consuming fruits and vegetables and the other solely providing pictures. These books were read on alternating days for eight days. Testing took place in a laboratory setting where children were offered a fruit and vegetable buffet. Each child was tested individually and leftover foods were weighed to determine the amount consumed. Both repeated and visual exposure could lead to an increase in fruit consumption, but not vegetables.

Students exposed to an entertainment storybook about carrots consumed more carrots than those who had no exposure, further supporting the use of visual exposure (De Droog, Buijzen, & Valkenburg, 2014). Unfortunately, children exposed to the carrot book did not consume significantly more other vegetables than the non-exposed group. This implies the need for books or other media that focus on food groups as a whole versus one specific food alone.

Given the cost of frequent and consistent exposure to new foods, convincing parents and caretakers to consistently offer potentially unwanted and uneaten foods creates a challenge for healthcare providers. If visual exposure can assist taste exposure in familiarizing children with new foods, some of the financial challenges in development

of healthy eating habits may be alleviated. Use of print media, specifically books, provides a potentially effective and inexpensive way of exposing children to healthy foods in both the home and childcare settings.

Common Learning Theories Used In Nutrition Education

A plethora of nutrition education curricula have been developed to encourage healthy eating habits in children. In the past, nutrition education was centered purely on information dissemination (Contento, 2011). Formerly, the thought was that people would know what to do with information once received. Rarely did nutrition education material take into consideration motivators of behavioral change, how individuals think and learn, and developmental stages of children. As the field has progressed, more attention is being paid to curricula based on learning and development theories (Bartholomew, Parcel, Kok, & Gottlieb, 2001; Contento, 1981).

In children, it is especially crucial to consider cognitive level and developmental stage. Preschool children are what Piaget classified as "pre-operational" thinkers (Piaget, 1962). They are often egocentric and have difficulty understanding how objects transition from one thing to another. At this age, nutritionally, how foods break down into nutrients that affect growth of the body would be difficult to understand. Creating educational materials focusing on the concepts of growth that are understood at this age would prove far more effective than those centered on the abstract idea of health.

Piaget (1962) believed it was important to discover how an individual learns before teaching is attempted. Preschoolers in particular learn by incorporating new concepts with knowledge they understand to construct a new level of information. They

do this through the complementary processes of assimilation and accommodation. When learning through assimilation of knowledge, the preschooler will incorporate their new perceptions into their existing knowledge base. Accommodation requires that the child alter their existing knowledge base to understand the new information being presented (Piaget, 1952). Nutrition education curricula designed for preschoolers should incorporate the existing knowledge and language used by this age group to allow children to connect the dots and grasp new concepts effectively.

In developing curricula for preschoolers, their environment must be taken into consideration as well. Alfred Bandura's (1977) Social Cognitive Theory is often used throughout nutrition education programs because of its holistic approach. The theory attempts to explain the acquisition and development of behavior through observation. Unlike the theories posited before him, Bandura believed that individuals play a role in their behavior choices (Bandura, 1977). How they feel, what they believe and what they think will ultimately affect how they behave (Bandura, 1986).

The Social Cognitive Theory attempts to explain how new behaviors are acquired, why humans choose to perform or not perform them, and how they are impacted by the environment and personal factors. The theory utilizes the principles of reciprocal determinism, which is the combination of environmental, cognitive, and personal factors and observation acting interdependently, leading to human behavior acquisition and utilization (Bandura, 1986). Bandura believed "people are partly the products of their environments, but by selecting, creating, and transforming their environmental circumstances they are producers of their environment as well" (Bandura, 2000, p. 75).

When a behavior is observed, the environment in which it occurred, personal factors such as beliefs and emotions, and cognitive factors affect how the behavior is processed and whether or not it will be utilized in the future. These factors act interdependently, but can do so to varying degrees. One factor may exert a greater influence on the individual over the others. This effect may be time dependent as well (Green & Piel, 2010).

Urie Bronfenbrenner's (1979) Ecological Systems Theory is also frequently used as a construct for nutrition education. According to Bronfenbrenner, there are multiple levels of influence on an individual's behavior, including: 1) the individual level, which incorporates personal attitudes, thoughts, knowledge and behavior; 2) the microsystem, or interpersonal system, includes the individual relationships where there is frequent contact with the child; 3) the mesosystem, or institutional level, includes the relationships between the individual's microsystems; 4) the exosystem, or community, are systems that impact the child but they are not directly a part of them; and finally 5) the macrosystem, or structures and systems, which includes the built environment and public policy (Bronfenbrenner, 1979). A constant interaction exists between an individual and factors across all levels of the Ecological Systems model. The social environment shapes and is constantly shaped by the individual. In order for behavior change to occur, it must be supported by all levels of the environment (Townsend & Foster, 2011). In the Ecological Systems Theory, creating a program whose goal is to increase healthy behaviors would not only approach the individual, but encourage parents and teachers to model healthy behaviors, encourage schools to provide healthy foods and increase recess time, enable communities to build safe sidewalks and parks, and also encourage public officials to

develop supportive policies. This way, healthy behaviors are truly encouraged and enabled.

Impact of Existing Curricula

Given the widespread obesity among children in the United States and the high risk of chronic disease these children face, a vast number of nutrition education curricula have been developed in efforts to reverse this trend. Curricula have been created for implementation both in the home and childcare settings. Child based curricula incorporate a variety of topics that are aimed towards increases in knowledge base including healthy versus non-healthy foods, garden education and more (Heim, Stang, & Ireland, 2009; Koch, Waliczek, & Zajicek, 2006; McAleese & Rankin, 2007; Parmer, Salisbury-Glennon, Shannon, & Struempler, 2009; Robinson-O'Brien, Story, & Heim, 2009; Witt & Dunn, 2012)

A large number of preschool children take part in some form of regular childcare throughout the week. Childcare centers provide nutrition educators with access to a large number of children, teachers, and in some cases, control over foods served, making childcare centers an excellent location to implement and test curricula.

Preschoolers, by their own nature, present obstacles that must be considered when developing a curriculum. They typically have a short attention span, limiting lengthy lessons; they multitask poorly and do not fully understand abstract concepts such as what it means to be "healthy." Neophobia is another major concern with the preschool age group. Many nutrition programs attempt to combat neophobia by utilizing food tasting with positive results. Programs that emphasize new foods and expose kids through tasting

or sensory evaluation have been shown to increase willingness to try (Bellows & Anderson, 2006; Kannan et al., 2011; Witt & Dunn, 2012). *FruitZotic* (Kannan et al., 2011) is a program that specifically incorporated hands on sensory lessons that allowed children to touch, feel and smell exotic fruits. The *FruitZotic* creators also incorporated brief lessons and food-related storybooks into their curriculum. As a result, children were willing to sample the novel fruit and parents even reported increased willingness to try foods at home.

Over the past decade, the use of garden-based nutrition education programs has increased within schools and communities. While gardens have been shown to improve behavior and social skills in some students, a large body of research has focused on the impact of garden-based nutrition education programs and intake of fruits and vegetables in children (DeMarco, Relf, & McDaniel, 1999; Lineberger & Zaijicek, 2000; McAleese & Rankin, 2007; Parmer et al., 2009;). These programs are commonly used as a tool to increase the knowledge and understanding of, self-efficacy in selection, and a preference for and consumption of fruits and vegetables within children (Robinson-O'Brien et al., 2009).

Using garden-based curricula, an increase in knowledge is often seen among study participants, but yields mixed results regarding preference and intake of fruits and vegetables. Parmer and colleagues (2009) found an increase in vegetable selection and consumption during school lunch observations among second-graders who participated in a 28-week garden-enhanced nutrition curriculum. McAleese and Rankin (2007) showed an increase in fruit and vegetable intake among sixth graders after a 12-week intervention

using 3-day food records. Conversely, Lineberger and Zajicek (2000) did find an increase in preference for vegetables; however, there was no significant increase in fruit and vegetable intake. Koch et al. (2006) observed no significant improvement in fruit and vegetable preference post intervention using a garden-based curriculum. These studies utilized various intervention durations, age groups, and measurement tools, all of which possibly contribute to discrepancies in the results.

In efforts to improve the impact of gardening programs, educators added a cooking component incorporating food products harvested. After a 2.5-year intervention, Gibbs et al. (2013) applied a mixed methods approach for data collection, with inconsistent results. Parents that participated in focus groups reported an increase in their child's willingness to try new foods. Parent responses using quantitative measures showed no significant difference pre- and post-intervention. Education during a summer YMCA cooking and gardening camp aimed to increase children's self efficacy in making healthier choices by increasing their knowledge base and understanding of health benefits and cooking methods of fruits and vegetables (Heim et al., 2009). Instructors both encouraged children to be their own agents of change by asking for fruits and vegetables at home and involved parents through newsletters and challenges at home. At the conclusion of the study, children reported an increase in fruits and vegetables consumption and preference. While children improved the asking component, there was no corresponding increase in availability of fruits and vegetables in the home (Heim et al., 2009). An inadequate home environment can be a limitation to healthy behavior change in children.

Existing Gaps in Nutrition Education for Preschoolers

A key component often lacking in current curricula is the teaching of all five food groups. Fruit, whole grains, and vegetable intake are associated with reduction in chronic disease risk, yet American school children do not consume enough servings of foods from these food groups. Therefore, most nutrition education available for children focuses on their consumption. Russell and Worsley (2008) found that neophobia was negatively associated with all five of the food groups. Nutrition education curricula should make efforts to reduce neophobia in all of these food groups.

An additional gap present in current curricula is the use of abstract concepts to teach nutrition to children in the preschool age group. Children in the preoperational stage of thinking do not adequately understand the abstract idea of "health." Using terminology that children know and can relate to, such as growth and strength, would help the nutrition message come across to the audience clearer. Incorporating the thoughts and ideas of children themselves during the development process could clarify the message nutrition educators wish to get across.

Two key barriers to nutrition education implementation in the childcare setting include both lack of time and financial resources (Warren & Barnes, 2013). These factors must be taken into consideration when developing materials to be utilized within this setting. In addition to being cognitively appropriate for the child, curricula must be inexpensive and easy for any teacher to use in his or her particular learning environment. Age appropriate, food-group books designed with the help of preschoolers may help

alleviate these barriers while providing visual exposure of healthy foods to young children.

CHAPTER III

METHODOLOGY

Five books, each depicting a separate MyPlate food group, were developed and tested in five separate phases over the course of two years. These phases include 1) development of the prototype with the help of 4-year-old preschoolers; 2) pilot testing with 3-year-old children; 3) focus groups with preschool educators; 4) a review of the prototype with an expert panel; and 5) large scale testing using preschoolers in childcare centers. Books were revised between each phase depending on input provided by participants. The Institutional Review Board (IRB) at Texas Woman's University approved all study protocols. All IRB documents can be found in Appendix A.

Prototype Development

Participants and Recruitment

A childcare center in North Texas agreed to be a host center for this phase of the study. Twenty-four preschoolers between the ages of 4 and 5 were recruited to participate through an informational letter and consent form (Appendix B). Eight of the participants were male (33%) and 16 were female (67%). Parents providing consent returned the signed form to the school. Children with any mental disability that would prohibit them from participating in activities were excluded.

Methods

According to Piaget's Cognitive Development Theory, children learn partly through assimilation of new ideas into their pre-existing knowledgebase (Piaget, 1952). Throughout book development, group discussions and activities with the preschoolers were conducted in efforts to understand what concepts and perceptions preschool children had regarding food and health. Hands-on exercises, games, drawings, and picture guided discussions provided additional content and language used by preschoolers to describe these concepts. The descriptive words children used and ideas regarding the origin and functions of the foods were incorporated into the books. Researchers hoped using preschoolers' input would help other children assimilate new concepts learned within the books. To close gaps found in participating children's knowledge on the relationship between foods and health, the books focused on growth and strength since these are ideas children understand and are familiar with (Lytle et al., 1997).

Prototype development began with the vegetable book. After introductions the children were given a sheet of paper with various realistic food pictures and asked to circle the vegetables. If the children could not identify the food, the researcher told them the name of the item, but not which food group it belonged with. After assessing their baseline, the primary researcher used a variety of activities, detailed in Table 3.1, to identify appropriate terminology, concepts, and pictures to be used in the book.

Table 3.1

Activities Conducted to Create the Vegetable Book and Corresponding Preschooler Responses

Activity Description	Preschooler Response/Researcher Comments
The preschoolers were shown individual pictures of asparagus, beets, and broccoli. They were asked to identify and describe them.	Asparagus • Only one preschooler was able to identify this vegetable. • Descriptive words: tastes green, yummy, salty, looks yummy, crunchy, hard. Beets • No one could identify this vegetable; however, one child stated, "we have those in our garden." • Descriptive words: roots, bombs, yummy, purple, soft, tastes gross. Broccoli • Majority of preschoolers were familiar with broccoli. • Descriptive words: Eew, salty, soft, yummy, crunchy, feels like a tree, looks like a tree, tastes like a tree, makes me big and strong, I like it, hard, I like it with ranch.
A variety of vegetables were brought in to allow the preschoolers to see, feel, and smell them. Although they were instructed not to eat them, the occasional vegetable was licked. Children were exposed to the vegetables one at a time and students were asked to describe them. After being passed around, they were then cut in half.	Beets: • Description: purple, hard, smells gross • The preschoolers were excited to touch it and even more excited when the juices colored their hands purple. • The preschoolers did not make comments about eating beets. Brussels sprouts: • Description: green, crunchy, "looks like leaves," squishy (referring to the inside), hard (referring to the outside). • Only one student made a comment about eating this vegetable.

(Continued)

The preschoolers were asked to describe the differences between the whole form and the cut form.	Eggplant: • Description: purple (outside), green (inside), other children argued that the inside was white, squishy (referring to the inside), hard (referring to the outside), smells like a cucumber. • No one made comments about eating this vegetable. One preschooler was able to identify it. Okra: • Preschoolers were not able to identify whole okra, but many could once cut into smaller pieces. • Description: soft, "what are these seeds," "this looks like a machine gun" (referring to the cut pieces), smells like applesauce. Tomato: • All of the preschoolers were able to identify this vegetable. Many students reported liking tomatoes. Others made disgusted faces. • Description: red, has seeds, hard (outside), squishy (inside), soft. • A few of the children licked the cut piece of tomato and said they liked it. Radish: • The preschoolers were able to identify radishes. • Many reported that they had radishes growing in the school's community garden; however, many were unfamiliar with the taste and texture. No one reported having actually eaten a radish before. • Description: hard, red, purple, white (inside), "smells good." Mushroom: • Approximately half of the preschoolers accurately identified this vegetable. • Description: looks like a cowboy hat, smells nasty, dirty, feels soft, feels squishy.

(Continued)

	• A few children tried to lick the inside of the mushroom. Some reported eating and liking them. Potato: • All of the preschoolers were able to identify this vegetable. They all appeared excited to see what seems to be one of their favorites. • Description: "I like potatoes," hard, gets soft (referring to cooking), "I like potato chips," "my mommy makes mashed potatoes!" • After the mashed potato statement, all of the students excitedly talked about how their Mommies cooked potatoes. The general consensus was that they like them mashed. Bell pepper: • Most students were able to identify the bell pepper, but used the term "pepper." • A few of the children stated that they didn't like peppers because they are spicy. I explained that some peppers are spicy, but that the ones I brought were not. • Description: hard, green, (students were able to name the colors of the other pepper – red, orange, yellow), smells good. • Again, some preschoolers licked the inside of the pepper. • Many of them tried to pull out the seeds and keep them.
The preschoolers were asked to draw a picture of where they thought vegetables came from. After the drawing time, they showed the picture to the class and described their drawing.	The preschoolers described their pictures as: • A store and a carrot • A Tomato • Target • Radish, carrot, and a store • Store and radish • Kroger • House and a mouse • Store and a baby

(Continued)

	• Radishes and a garden • Tomatoes and a garden • Strawberries, tomatoes, grapes, and Target • Golf, Mom, and Dad • Store, dog eating a mushroom • Kroger • Target, the student then said that she buys strawberries and tomatoes there – but she didn't draw a picture of them. • Granddaddy's house, radishes, carrots, grapes • Rocks, dirt, a car When probed further, most of the children understood that vegetables grew in a garden or farm; however there was gap in their knowledge base as to how the foods made it into the store.
Book content on the origin of fruits and vegetables included a section on gardening since not all children have access to a garden. Group discussions using pictures, determined whether students could grasp the growth cycle through pictures versus an actual garden. Children were shown various pictures of farming and harvesting phases and asked to describe them.	Children were first shown pictures of two different gardens. They were asked what these were. Responses include: Class: Hey! That looks like our garden! Researcher: Do you guys get to go to the school garden? Class: Yeah! Researcher: Who has a garden at home? 6 students raised their hands Researcher: What do you grow in your gardens? Class: Tomatoes, radishes, "I just planted strawberries." Researcher: Do you get to eat the vegetables you grow? Class responses: Yeah (multiple), I don't like the radishes, I eat the tomatoes. Researcher: Where else do you get vegetables? Class: Target, Kroger, Wal-Mart. Researcher: And where do they get their vegetables? Class: (no response)

(Continued)

	Researcher: (showing first farm picture – which are displayed in order) What is this here? Class: A farm! Researcher: Farmers can grow A LOT of vegetables! See how much (pointing to the fields in the picture). Class: Wow! After showing the second picture, which was of a field, the kids were not sure what it was. After showing the final picture: Class: Look! There's a tractor! Me: And what does the tractor do? Class: Helps the farmer take care of the animals. Me: Could it help the farmers with the vegetables too? Class: Yes! The children were able to discuss and identify pictures that depict how to care for and harvest vegetables, including water and picking.
The children were shown variety of pictures of how vegetables were grown in nature: on vines, bushes, or grown from the ground.	Many of the preschoolers understood that some vegetables grew directly from the ground. From the photos, they were able to identify the asparagus (1/2 of the class), carrots, radishes, and potatoes. They could not identify the onions. Phrases used: • "They shoot up from the ground" • "They look like rockets" (referring to the asparagus) • "I like those carrots" • "We have radishes in our garden" • "I like to eat potatoes" • "Those look dirty" (Referring to the potatoes) The students were less understanding about vegetables growing on vines and bushes.

(Continued)

	The preschoolers were able to identify all of the peppers (just as peppers, not giving specifics), the tomatoes, and the peas. One child was able to identify the eggplant. No one recognized the artichoke. The preschoolers talked about different colors and characteristics of the vegetables they remembered. Once they recognized the eggplant, the children remembered that they were white inside. They also recalled that the tomatoes were juicy on the inside and that they could be squished.

To verify the clarity of vegetable pictures intended for the book, the preschoolers played a color sorting game. The preschoolers were asked to sit in a circle and researchers set out pieces of red, yellow, purple, green, white, and orange construction paper in the center. They were given a picture of a vegetable and we went around the circle, taking turns describing their vegetable. The children were then asked to identify the vegetable and the color, and place it in the correct group. The majority of pictures used were clear and the children were able to identify the vegetable and the color. Only the picture of the sweet potato needs changing, as the inside appeared white instead of orange.

The children were also shown a series of pictures involving children playing, visiting the doctor, and also growing. They were able to accurately describe each photo in terms of the gender of the child, the setting, and what the child was doing. Any ambiguous photographs were eliminated as candidates for the books.

The development of the grain book prototype immediately followed the completion of the vegetable book. Activities were conducted in a similar manner to that of the vegetable book prototype book development in order to gauge the preschoolers' preconceived notions about grains and grain foods, learn what type of language they may use regarding these foods, and understand how they view the origin and function of these foods. Table 3.2 describes these activities and the preschoolers' responses.

Table 3.2

Activities Conducted to Create the Grain Book and Corresponding Preschooler Response

Activity Description	Preschooler Response/Researcher Comments
Various examples of grains and grain foods were passed around from child to child, in order for them to feel, smell, and visually inspect. Comments were recorded.	Wheat flour: • That looks like sand • It's dirt • This one is brown AP flour: • Oh, a white one Cornmeal: • Yellow sand! • It feels like cornbread • This one is rough (when comparing to the all-purpose and wheat flours) • You can make cornbread! Researcher: Does anyone cook with his or her mommy or family? (lots of hands raised and "yes" responses) • I used flour to make something yesterday. • You can make tortillas • I made brownies White and wheat bread: • Researcher: What is the difference in color of these two breads?

(Continued)

	• Students: One is brown and one is white. • Researcher: Do you think one is better than the other? • Students: The white one is better. • One girl: No, the brown one is better. • Researcher: Why do you think the white one is better? • Students: It tastes better. Oatmeal: Students had a difficult time guessing this product • These look like seeds! • Students: Can you give us a clue? • Researcher: Sometimes you eat this at school in the morning. It looks very different when it is cooked. • Students: It's oatmeal! • Researcher: What does oatmeal feel like when you eat it? • Students: It's mushy. • Students: Sometimes it is crunchy though. • Researcher: Like this? (brought out granola) • Students: Yeah, like this. • (Bags of granola and raw oatmeal were passed around for students to inspect the texture.) Pasta shells: • What is that? • Oh, that's like noodles! • They have swirly ones too! • These are hard. • Researcher: That's right. This pasta is not cooked, so it's hard. What happens when you cook it? • Students: It gets soft. Spaghetti: • Noodles! • Spaghetti! Popcorn: • Popcorn! • That smells good!

(Continued)

	• You don't eat the seeds. They are too hard. Tortilla: • A tortilla! • They have corn ones too! • My mommy makes those. I help. Graham Cracker: • Crackers! • Those are squares! Ritz cracker: • Circle ones! Granola bar: • A bar. • A granola bar Nutrigrain bar: • A breakfast bar. • We have those here.
The preschoolers were shown various pictures depicting grains and grain foods.	They had difficulty recognizing the individual grains, with the exception of rice. They were able to recognize the foods made from grains. Preschooler Descriptions: Wheat in a field: • That looks like grass • We have those in our garden Cornmeal: • Looks like sand • Popcorn • Cornbread • Little seeds Buckwheat: • Looks like s'mores • Like chocolate chips • Seeds • Chips Oats: • Flakes • Seeds • Oatmeal – soft, hot, mushy, made with water or milk

(Continued)

	Wheat: • That looks like seeds Rice: • Rice! • I like rice! • My mommy makes rice Wheat flour: • Sand • That looks dirty • You can see the dirt Pasta: • Macaroni and cheese • Those are noodles • Those look different Dried corn: • Popcorn! • You can make cornbread from corn! Hard Corn tortilla • Ooh, a crunchy one • It's yellow • That one's made from corn
The book focuses on the energy that grains provide the body for activities. I asked the children to draw a picture of them taking part in an activity. The children described their drawings to the class.	Drawing results: • Playground, playing baseball • A tomato and the store Target (I think this student mixed up the previous drawing I had them create) • A scene from the movie Tangled, the student described Mother Gothel, Rapunzel, the tower, and told the story • Playing soccer • A picture of the student and a friend walking. The friend was not present on that day, and the student wanted to make them feel better. • Daddy taking care of me and Ms. Tracy, my Mommy and a baby in her tummy • Me and Daddy playing baseball • Bugs, a robot, and a t-rex (I asked what they were doing in the drawing and the student said "playing") • Balls • Ladybugs

(Continued)

	• A baby • Ladybug and a granola bar • Picking a flower for Mommy • Pushing a carriage, playing dominoes • Soccer • Me, my mom picked a flower and gave it to a friend • Me and my Mom • A Dinosaur • A Star Using the word "activity" confused the children. They also mixed up previous lessons from the vegetable book and a recent classroom lesson about insects. When asked directly "what is an activity," students responded with: • Art • Playing at the park • Playing baseball • Running • Swimming • A volcano • Jogging When asked "what is energy," students responded with: • Breathing • Sitting • Resting • Exercising • Sleeping • Bouncing
The preschoolers were shown pictures of kids playing various sports, playing on the playground, riding bikes, hopscotch, and kids holding weights. They were asked to describe what was happening in these photographs.	For the most part, they were able to accurately describe all of the activities that they saw in the pictures. When the children saw pictures of children holding dumbbells, they yelled out "muscles" versus what was actually occurring.

(Continued)

	One of the hopscotch pictures was a picture on dark cement and the students stated that the kids were playing at night.
The preschoolers were shown a variety of pictures relating to school and learning.	When viewing the first picture of a teacher and student, the children exclaimed that they were doing a project. They described the remaining pictures using terms like "learning," "drawing a picture," and "painting".

Throughout the grain book development, any pictures that did not appear to be clear to the children were excluded as options for the book. The excluded photographs were replaced with alternatives and viewed by the children for clarity. This process continued until all of the necessary photographs were determined.

The third book to be developed was the protein book. Before reviewing any pictures, the preschoolers were asked about the definition of a protein. Responses included: protein shake, protein vitamin, protein gummies, protein gummy bears, and chicken. Given the nature of protein foods and the host school's "No Peanut Products" policy, researchers were unable to bring in food examples and had to rely solely on pictures for descriptive language. Table 3.3 demonstrates the pictures shown and the comments made by the children.

Table 3.3

Pictures of Protein Foods Shown to Preschoolers and Their Corresponding Response

Nuts, Beans, Seeds	
Peanuts	• Peanuts! • I can't have peanuts • What are those? (Referring to the cracked shell) • They are crunchy
Peanut Butter	• Peanut butter! • With berries (referring to pictures of peanuts with red skins) • Making a peanut butter sandwich • Ooh…bananas and apples (kids got distracted by other foods in the picture)
Pistachios	• Those are pistachios
Bowls of nuts	• Can you eat those? (the nuts still had shells on them) • Look…acorns • Researcher: We don't eat the shell. What do you need to do to get the part we eat? • Students: crack it!
Almonds	• Peanuts! • No, almonds!
Sunflower seeds	• Wood chips • Students didn't recognize these without the shells
Chickpeas	• Corn! • Those look like rocks! • Students laughed at the name garbanzo beans
Kidney beans	• Yay, jelly beans! • Have you had beans in hot sauce?

(Continued)

Baked beans	• I like those beans • I don't • When you eat beans at school, they are soft
Eggs	
White eggs on straw	• Eggs! • Those are in a nest!
White and brown eggs in a carton	• Researcher: What color are they? • Students: white, brown, pink, red, green (note that this lesson took place after Easter weekend) • Researcher: Did you guys dye eggs this weekend for Easter? • Many students responded with a yes and proceeded to tell me when, where and what color. • Researcher: Did any of you eat the eggs? • Students: Yes! • Researcher: What do you do to eat the eggs? • One girl bangs a banging motion on the ground and says "you do this and then you open it." • Researcher: What does it taste like? • Students: It is yummy, it is crunchy, no it is soft, the outside is crunchy
Hard boiled eggs	• They looked like that!
Fried eggs	• Those still have seeds in it (referring to the yolk)
Scrambled eggs	• That looks like chicken soup
Meat/Poultry	
Chicken legs	• Chicken legs • I eat those • They are too crunchy • You don't eat the bones, just the cover
Grilled tilapia	• Grilled chicken • I eat fish sticks

(Continued)

Meats	
Deli meat	• Burritos (they were rolled) • NO! that's meat • We eat those on bread
Steak	• Grilled chicken • Why is it so dark?
Sausage	• Chicken • Sausage • I like sausage • That looks like hot dogs
Hamburgers on a grill	• Chicken • Kids had a hard time identifying
Meatballs (on pasta)	• Mac and cheese • That's pasta, that's a grain • Researcher: But what is on top of the pasta? • Students: Meatballs! • I like meatballs!

The children had the most difficulty differentiating between the photographs of various types of meats, which may not necessarily be due to picture quality. Efforts were made to find alternative pictures; however, the children continued to struggle to identify the meat products. Pictures were labeled in the book in efforts to enhance understanding.

The children were shown additional pictures identifying the origin of protein foods. The children had an apparent understanding that meats, fish, and eggs came from animals; however, the extent of that understanding was unclear. For this age group, extending their knowledge beyond basic simplicity to include the slaughter of animals

can be traumatic and was decided to be unnecessary for the purposes of these books. The book message regarding protein food origin was kept very simple and kid-friendly.

The children had the opportunity to take part in a dairy foods taste test at the beginning of the dairy book development. Samples of low-fat vanilla yogurt, cottage cheese, and cheese cubes were brought in for the children to sample. The first food sampled was the cottage cheese. Prior to tasting, they were asked to describe it. Students responded with: it looks like mud, it looks like dirt, it's lumpy, do I have to eat it, and is that cheese in there? The majority of preschoolers tried a small taste of the cottage cheese, though a small handful refused. When asked to describe it, they stated: it tastes like dirt, oh! It tastes good, it tastes like cheese, because that's cheese in there, and it's lumpy. The next item to be tested was yogurt. The children were asked to describe what the yogurt looks like. Responses included: it's smooth, it looks good, can we eat it now, and it's white. All participating children tasted the yogurt. Many finished the serving they were given and requested a second helping. When asked what it tastes like, they responded: it's so good, I like yogurt, I ate all mine, and it's smooth, not like the cottage cheese. Most of the children described the cheese as being harder than the yogurt and cottage cheese. They also made note of its orange color.

The preschoolers were asked to draw a picture to describe where our dairy foods come from. Their responses are listed below:

- Me and my mommy at the milk store, we are getting milk.
- Pink milk and different colored milk. (me: How do we get pink milk? Student: From strawberries!)
- Vegetables, protein, and dairy at the Kroger store. We buy yogurt at Kroger, but not cottage cheese.

- Ice cream truck, and this is an ice cream machine.
- This is a store with cheese, and milk and more milk.
- You get it to plant it.
- This is cheese, from Target.
- This is my store, with trees and our milk.
- This is a door that goes inside and outside. I forgot to draw hair. This is milk.
- This is my Aunt's house and this is milk.
- This is a door, with scribbles and me picking up milk.
- This is me getting milk with my sister. We are at a store. Here is a cart of cheese sticks, a cart of square cheese, and a cart of milk. My sister is helping me.
- These are tomatoes growing.
- Here is milk. (Researcher: And were do we get our milk? Student: I don't know.)
- This is me and daddy picking a tomato. This is mommy picking milk out of the fridge.
- This is milk and a carrot.
- I went to the store, but it was closed so I went to the zoo. (The students were going to the zoo later in the week as a field trip).
- This is a machine making milk and yogurt.

Similar to what was seen in the previous food groups, the children referred back to where foods are purchased. After a lengthy discussion and probing by the researcher, one or two of the children finally mentioned that milk originally comes from cows. As with most of the food groups, there is a gap in knowledge regarding food production and procurement.

The preschoolers were able to adequately describe pictures depicting dairy foods, cows on dairy farms, milking a cow, and health activities related to dairy foods. A small portion of photographs were not initially clear to the children. For example, they described a picture of orange cheese wheels as clementine oranges. These photographs were eliminated as possible candidates and replaced with alternatives to be used in the books.

The final book to be developed was the fruit book. With the exception of a kiwi, the children did not have any difficulty identifying the fruits that were brought in examine. Similar to before, they were very interested in passing the foods around and seeing them cut open. The majority of responses towards the fruits were positive. When asked where fruits come from, the preschoolers initially responded incorrectly, but because of the previous work done with vegetables, the children quickly remembered how the produce was planted and harvested.

Stock photography was used to increase the quality of pictures. Potential pictures to be used in the books were viewed and discussed by the children. Any picture that was unclear was removed as a candidate and an alternative was found. This process was repeated until all of the necessary pictures were determined.

After collecting input from the preschool students for 15 weeks, prototypes for the 5 food group books were created. The books averaged 20 pages long and included a variety of pictures and text. Content within each book covered characteristics, origin, and function of a specific food group. Efforts were made to include a variety of ethnicities when using pictures of adults and children, so all children could relate to the content provided. Initial prototypes were then pilot tested.

Prototype Pilot Test

Participants and Recruitment

Twenty-five preschoolers in two separate 3-year-old classes were recruited from the same childcare center where prototype development took place. Pilot test participants were from a separate class than those involved in development and had minimal

interaction with prototype development participants during meal and playtime. Thirteen participants were male (52%) and 12 were female (48%). An informational letter and consent form (Appendix C) were sent home with the preschoolers and returned signed upon parent approval. Children with any mental or physical disability that would prohibit them from comprehending the books or consuming the foods provided during testing were excluded from this phase of the study. Participant demographic information is displayed in Table 3.4.

Table 3.4

Demographics of Preschool Children Participating in Prototype Development.

	Control (*n*)	Experimental (*n*)
Total	12	13
Gender		
Male	6	7
Female	6	6
Race		
African American	1	1
Asian	1	0
Caucasian	6	11
Hispanic	2	1
Other	2	0

Methods

Two classes participated in this phase of the study; one class was the intervention group, and the other was the control. Preschoolers in the experimental group were read each of the 5 books separately, once a day for 10 school days, Monday through Friday. Teachers were encouraged to answer student questions, but to limit deviation from the

text as much as possible. Preschoolers in the control group continued their normal daily activities.

Prior to the start of reading of each MyPlate book and at the end of the designated reading time frame, preschoolers in both the control and experimental groups took part in an aggregate plate waste analysis (PWA) of the food group being assessed (Chu et al., 2011). Each food group was tested individually on separate days. Aggregate plate waste was collected each time the foods tested were served and measured using a digital scale.

The PWA took place during the normal lunch hour. Foods being tested were prepared by the school's cook and were either served in addition to the students' typical lunch or as a substitution. Children were served the standard serving size and allowed to request additional servings, which were documented. Researchers had no control over the meals served at the participating childcare center. The majority of the studied foods were served in addition to the planned meals. In the case of the grain foods tested, breads were switched on sandwich day. Percent consumption of each food item tested was determined using the following equation (Chu et al., 2011):

$$\% \text{ Consumption} = \frac{(\text{Weight per serving} \times \text{Number of servings}) - \text{total plate waste}}{(\text{Weight per serving} \times \text{Number of servings})} \times 100\%$$

Statistical Analyses

Data were analyzed using SPSS version 23 (IBM, Armonk, New York). Due to limited sample size, descriptive statistics were used to evaluate changes in intake related

to book exposure. Values for mean percent consumption of each food tested pre- and post-intervention can be seen in Table 3.5.

Table 3.5

Mean Percent Consumption of One Serving During Plate Waste Analysis

Food Group	Measure of Food Acceptance	Control *M*(*SD*)	Experimental *M*(*SD*)	Difference
Vegetable (frozen broccoli)	Mean Percent Consumption Pre-Intervention	23.35 (2.42)	67.78 (7.04)	-44.43
	Mean Percent Consumption Post-Intervention	39.04 (3.37)	84.70 (7.31)	-45.66
	Change in Percent Consumption	15.68	16.92	
Grains (whole grain bread)	Mean Percent Consumption Pre-Intervention	58.85 (0.82)	91.37 (1.28)	-32.52
	Mean Percent Consumption Post-Intervention	22.66 (0.24)	73.67 (0.77)	-51.02
	Change in Percent Consumption	-36.19	-17.70	
Protein (pinto beans)	Mean Percent Consumption Pre-Intervention	51.09 (2.47)	76.73 (3.72)	-25.64
	Mean Percent Consumption Post-Intervention	40.23 (2.42)	68.65 (4.13)	-28.42
	Change in Percent Consumption	-10.86	-8.08	
Dairy (non-fat vanilla yogurt)	Mean Percent Consumption Pre-Intervention	71.83 (6.95)	81.73 (7.90)	-9.91
	Mean Percent Consumption Post-Intervention	84.29 (4.80)	91.77 (5.23)	-7.47
	Change in Percent Consumption	12.47	10.03	

(Continued)

Fruit (grapes)	Mean Percent Consumption Pre-Intervention	101.22 (13.01)	98.68 (12.8)	-2.54
	Mean Percent Consumption Post-Intervention	93.68 (6.81)	90.68 (6.61)	-2.87
	Change in Percent Consumption	-7.54	-7.87	

Preschoolers exposed to the vegetable book had a 16.92% increase in mean percent consumption of broccoli post-intervention compared to pre-intervention. A similar increase (15.68%) in broccoli percent consumption can be seen in the control group post-intervention compared to pre-intervention. Similar differences in intake between the experimental and control group can be seen both pre- and post-intervention. A greater number of additional servings was requested from preschoolers in the experimental group; five additional servings were requested compared to one request in the control group. This would not be directly reflected within the percent consumption measure that was analyzed.

Substituting partial wheat bread with 100% whole wheat bread had a substantial negative impact on intake in both student groups post intervention. This reduction was less in the experimental group when compared to the control (17.70% vs. 36.19%). Intake of this food could have been affected by the change in the meals served at the childcare center because students were served a grilled cheese sandwich at the pre-intervention PWA and a ham and cheese sandwich at the post-intervention PWA.

Canned pinto beans were tested as the protein food alongside the students' typical Friday meal consisting of a sandwich, fruit, vegetable, and 1% milk. A decline in the

intake of pinto beans was observed in both control and intervention groups (10.86% and 8.08 % respectively). Because these foods were served in addition to the traditional lunch meal, decline in intake may reflect a preference for other served foods or possibly satiety.

Non-fat vanilla yogurt was used to test increased acceptance of dairy foods. Consumption in both the control and intervention groups increased (12.47% and 10.03% respectively). In both meals, the preschoolers were served milk and a form of cheese, which were not accounted for in this study.

The students were provided grapes in addition to their lunch meal to test acceptance of fruit foods. During the pre-intervention PWA, the students exhausted the researcher's supply of grapes. This resulted in 101.22% consumption for the control group and 98.68% consumption in the experimental. Had enough produce been available, the results would most likely look different. Despite purchasing extra grapes for the post-intervention PWA, results indicated a decline in consumption for both the control and intervention groups (7.54% and 7.87 respectively). These findings may not be reflective of the students' actual preference.

Focus Group with Preschool Educators

Participants and Recruitment

Focus groups were conducted with two different groups of preschool educators following collection of the plate waste data: one with the preschool teachers whose classes were involved in the development and testing of the prototypes, the other with North Texas preschool educators. Consent was provided for all participants (Appendix D).

Methods

Initial focus group. All teachers involved in either the development or pilot testing of the books were invited to participate in a focus group. Five of the seven teachers participated. All teachers were female, of Caucasian (80%) or of African American (20%) descent, and had a range of 5 to 27 years of experience. They were asked to describe their experience with the classroom book readings, as well as their students' response to these readings and discussion of the information contained in the prototypes. The questioning route for this focus group can be found in Table 3.6. The focus group was digitally recorded and later transcribed verbatim. Transcripts were analyzed for over arching themes.

Table 3.6

Focus Group Questioning Route for Teachers Involved in Prototype Development and Pilot Testing

Introductory Question	Just to make sure, all of you were in the classroom during the development or reading of the books. Correct? Have you ever been a part of the development of educational materials that used input from students?
Key Questions	How do you feel that using student input impacted the final product? Have any of you ever used similar educational materials? If so, can you tell us about your experience(s) with those materials? How effective did you feel these materials were? How do you feel that materials of this nature could benefit your students?

(Continued)

	How would you gauge the appropriateness of the developed materials to the age and cognitive level of your students? During the readings of the books, how did the children react to the content? Did you notice any changes in behavior during meal and snack time? What are potential barriers to obtaining materials such as these? Administrative standpoint (time, cost, logistics) Educational standpoint (knowledge base, format of lectures and activities) In your opinion, would these materials be something other preschools or child-care centers would use?
Closing Questions	Is there anything else you would like to discuss regarding the development of the books or the books themselves?

Teachers involved in the book testing indicated that the book was developed at an appropriate cognitive level and creative enough to hold the students' attention. After reading the books for two weeks, teachers reported students continued to be engaged and excited about readings. One teacher stated:

> *"I think they really paid attention to them. I guess they were worded well enough for them to understand it, but they really paid attention when we read these, and they don't always pay attention."*

According to the teachers, the books were simple enough for the children to remember. Near the end of the two-week timeline, children could complete the sentences. The large, colorful pictures were easy for the children to see and understand.

Teachers of the intervention group shared students increased willingness to try various foods. One teacher stated:

> *"Something to relate to other than, other than we're just saying 'okay eat your protein,' you know it's in the book. If we had something for lunch that was in the book, it was 'hey we had this in our book, let's try it' you know. You know, take bites."*

Teachers voiced concern over the potential cost of the books and indicated their use would be dependent on the budget of the childcare center. The books could be incorporated into already existing nutrition education programs or used as a starting point for centers lacking a curriculum.

Secondary Focus Group: Nineteen North Texas preschool educators, 16 females and 3 males, were recruited using a mailed flyer (Appendix E) to participate in the second round of focus groups to gather input on the cognitive appropriateness of the books, areas needing improvement, and clarity of content and photographs. Interested educators contacted the primary investigator via email and signed up for their desired date and time. Each educator signed a consent form (Appendix D) upon arrival. Four focus groups were conducted before researchers began to experience data saturation. The questioning route can be found in Table 3.7. The focus groups were digitally recorded and later transcribed verbatim. Transcripts were analyzed for overarching themes.

Table 3.7

Preschool Educator Focus Group Questioning Route

Introductory Question	Do any of you provide nutrition education to your students? What kind of programs or curriculum have you used in the past? What type of information is usually given to students? For those of you who do not use a formal curriculum, do you discuss nutrition-related topics at all with your students? If so, how do you present this information?
Key Questions	How do you feel that these books would benefit your students? How would you gage the appropriateness of these books to the age and cognitive level of your students? How do you feel that your students would react to the information given within the books? If you could make changes to these books, what would they be and why? If these books were to be tested in your center, which food would you use? Why? a. Grains? b. Vegetable? c. Fruit? d. Dairy? e. Protein?
Closing Questions	Do you have any additional comments regarding the books? This could be related to content, visual appeal, format, etc.

Participants within the focus groups felt that the books were age- and cognitively appropriate for preschoolers between the ages of 3 and 4. It was also suggested that a 2-year-old could possibly benefit from the books. Though the child would be too young to

fully comprehend the information discussed within the books, he or she would have early visual exposure to the colorful pictures.

The educators provided multiple suggestions for book improvement. One suggestion was to alter phrases within the books to a question format in order to engage the preschooler. For example, instead of "some vegetables look like trees and hats" the wording was changed to "did you know that some vegetables look like trees and hats." Educators felt that if children were not paying attention, posing a question would help to re-engage them.

The limited number of pictures with ethnic diversity was mentioned during the focus groups. The preschool educators felt that the children would relate better to the concepts within the books if they saw pictures of other children who look similar. Attempts were made to include more ethnically diverse photographs.

Educators also proposed additional topics that they felt should be added to the book content. These included portion sizes, recipes, and a focus on foods that should be avoided. These topics are better suited for parent nutrition education.

Review of Prototype by Expert Panel

An expert panel, consisting of two child development specialists and one expert in nutrition education, reviewed the prototypes for age and cognitive appropriateness of the books. Panel members reviewed copies of the five books and provided written comments. Members of the expert panel agreed the books were cognitively appropriate for preschool aged children, suitable for a preschooler's short attention span and could facilitate the acceptance of novel foods. Overall, reviewers felt that topics and organization of the

books were well developed. The pictures used were colorful, engaging, and of high quality.

Reviewers did voice concerns. The books contain a large number of food pictures and it could be possible for children to walk away from the readings with the idea that they need to consume food in general to be healthy and misunderstand the connection between the food groups and health. There were also pictures of questionably less healthy foods.

All comments and suggestions obtained from the focus groups and expert panel review were taken into consideration during revision of the prototype. Final prototypes can be seen in appendices F-J. The final prototypes were used during the phase five large scale testing.

Testing of Final Prototype

Participants and Recruitment

A blast email (Appendix K) was sent to approximately 1,000 potential host childcare centers located throughout three North Texas counties. Both licensed childcare and licensed home care centers were recruited. Twenty eligible centers responded and agreed to be host locations for this study. Five additional centers responded with interest but were unable to participate due to time constraints, relocation to another city, or lacked children within the recruitment age-range. Informational letters and consent forms (Appendix L) were sent home with 1,145 students between the ages of 3 and 5. Of the 20 potential host centers, 3 did not receive any returned consent forms and were removed

from the study. Two hundred and seven preschoolers from the remaining 17 centers received parental consent.

Preschoolers consumed one to two meals and one snack at the participating centers. Meals were prepared and served in one of the following four ways:

- Family style: Food was prepared at the school kitchen and delivered to the classroom or cafeteria. Preschoolers either served themselves or were responsible for serving their classmates.
- Meals delivered and served in prepared portions: Food was prepared and pre-portioned in the school kitchen. Preschoolers were served standard serving sizes.
- Meals delivered in bulk and proportioned by staff: Meal items were prepared in the school kitchen and placed on the table in large serving bowls. Either the teachers or aides were responsible for serving the preschoolers.
- Meals brought in from home: Parents or caregivers planned and packed meals for the preschooler.

All of the snacks provided were prepped by the center and served within the classrooms.

Nine of the 10 host centers that prepared meals onsite participated in the Child and Adult Food Care Program (CAFCP). CAFCP guidelines require that childcare centers provide one serving of milk, one serving fruit or vegetables, and one serving of grains at breakfast. The lunch meal must include one serving of milk, two servings of fruits or vegetables, one serving of grains, and one serving of meat or a meat alternative. Snacks must include two of the four options: one serving of milk, one serving of fruit or

vegetable, one serving of grain, and one serving of meat or meat alternative (United States Department of Agriculture [USDA], 2015). The one participating center that prepared meals for children but did not participate in the CAFCP stated that they did attempt to include all five food groups in their meals, but were not under strict obligation to do so. The preschoolers in the remaining childcare centers brought their lunch meal in from home. Center directors stated that they encouraged healthy meals packed by caregivers, but there were no nutrition policies or guidelines regulating the foods brought to school. The distribution of participating preschoolers and childcare centers are detailed below in Table 3.8 regarding type of childcare center they attended, the meal serving style, meal preparation, and center participation with CAFCP.

Table 3.8

Description of Participating Childcare Centers

	Preschooler Population *n(%)*	**Number of Participating Centers**
Childcare Center		
Licensed Home Care Center	8(4.34)	3
Licensed Childcare Center	176(95.65)	14
Center Serving Style		
Family Style	17(9.24)	2
Meals Delivered and Served in Prepared Portions	56(30.43)	6
Meals Delivered in bulk and portioned by Staff	26(14.13)	2
Meals brought in From Home	85(46.20)	7
Center Meal Preparation		
Meals Prepared at the Childcare Center	98(53.26)	10
Meals Packed from Home	86(46.74)	7

(Continued)

Participation in CAFCP			
	Yes	90(48.91)	9
	No	94(51.09)	8

To minimize interaction between groups, host centers were randomly placed into either the control group (n=37) or one of five intervention groups: exposure to the dairy (n=31), fruit (n=41), grain (30), protein (n=38), or vegetable (n=30) book. The preschooler group was dependent upon the center they attended.

The average age of all participants was 3.98 years (*SD*=.63), the range was 3 to 5 years of age. Age distribution between intervention groups can be seen in Table 3.9 Analysis of variance indicated a significant difference in age between the grain and protein book intervention groups, $F(1, 38) = 8.384$, $p = 0.006$. There were no other significant age differences. Demographic and socioeconomic information for preschool participants of the large scale testing can be seen in Table 3.9. A significant difference in ethnic distribution exists between the fruit intervention group and the control group, $F(1, 64) = 9.4$, $p = 0.003$.

The mean household income for all groups was $86,744 (*SD*=20,162). The protein book intervention group had a significantly lower household income compared to all other groups except the control group, $F(1, 34) = 3.95$, $p = .055$.

Table 3.9

Phase V Participant Demographic and Socioeconomic Information

	Overall	Control	Dairy	Fruit	Grain	Protein	Vegetable
Participant *(n)*							
	184	31	27	37	27	33	29
Average Age (years) *M(SD)**							
	3.98 (.63)	4.06 (.47)	3.78 (.81)	4.07 (.58)	4.32 (.67)	3.70 (.66)	3.83 (.51)
Gender *(n)*							
Male	91	16	12	23	11	18	11
Female	93	15	15	14	16	15	18
Ethnicity *(n)***							
Hispanic/ Latino	25	8	5	0	5	2	5
Non-Hispanic/ Latino	159	23	22	37	22	31	24
Race *(n)*							
Asian	18	2	6	4	0	2	4
Black	22	13	3	0	3	3	0
Native Hawaiian/ Pacific Islander	2	0	0	2	0	0	0
White	134	16	18	28	24	27	21
Other	8	0	0	3	0	1	4
Median Hold Income** *M(SD)*							
	$86,744 (20,162)	$86,667 (11,457)	$94,118 (15,835)	$91,333 (16,344)	$88,261 (17,749)	$69,130 (29,219)	$91,250 (12,959)

* A significant difference in age existed between the protein group and the grain group (significance set at *p-value* = .04).
** A significant difference in the distribution of ethnicity existed between the fruit group and the control group (significance set at *p-value* = .003).
***A significant difference in household income existed between the protein group and all other groups with the exception of the control group (significance set at *p-value* < 0.05).

Intervention

Part one: standardized book reading. Childcare centers were assigned to one of six different groups: fruit, vegetable, grain, protein, dairy, or control. In cases where multiple classrooms in one school were participating, classes were assigned to the same book, limiting interaction between the six groups. Preschoolers in the control group completed their typical daily classroom activities without any deviation from their schedule. Classroom teachers in the intervention group read their assigned food group book to students once a day for two weeks (Monday-Friday) in the preschoolers' classroom. Each reading took between 10 and 20 minutes, depending on the teacher's style and the preschoolers' level of participation. Teachers were instructed to read at a similar time each day and to not stray too much from the text. Preschoolers whose parents did not provide consent were either brought to another classroom to participate in alternative activities or provided an alternative activity by the classroom teacher.

Part two: natural teaching environment. Immediately following the standardized book reading, teachers were instructed to use their designated book as often and however they chose for 12 weeks. This intervention is designed to mimic a real life setting in which the books would most likely be utilized by childcare centers in the future. Whenever teachers utilized the books in their classroom, they were asked to document how the books were used and why they chose this method using forms provided (Appendix M).

Measures

Data collection. Data were collected from parents of participating children and the childcare center at three separate time points: pre-intervention, post-standardized intervention, and post-natural environment intervention. To assess food intake, a three-day photographic food diary was collected at each time point. Both parents and teachers were instructed to take a picture of the preschooler's meals, before and after consumption. They were asked to collect photographs during each meal and snack for two weekdays and one weekend day. During this time frame, teachers collected photographs for meals and snacks served at the childcare center and parents collected photographs of meals and snacks served in the home. Participating schools were provided a digital camera. Parents were asked to use their cell phones and email photographs to researchers. Photographs were reviewed and analyzed for the percent of one serving consumed within each food group. This allowed researchers to account for small servings and extra portions. Pre-intervention data collection also included a demographic data questionnaire for families (Appendices N-O).

Post-standardized intervention also included a brief questionnaire, developed by the researcher (Appendix P), inquiring into the child's asking behavior for the five food groups at home. Parents were also asked to note if their child discussed any of the topics taught throughout the book. Though consumption may or may not change after exposure to the food group books, simply talking about the books may indicate a positive change in perception and attitudes of the child.

Data collection during the post-natural environment time point included the three-day photographic food diary and the child behavior questionnaire.

Statistical analysis. All data was analyzed using SPSS version 23 (IBM, Armonk, New York). Previous research has shown that individuals with prior nutrition training can accurately assess intake through direct observation of meals (Farris et al. 2014; Richter et al., 2012). This study utilized a doctoral-level registered dietitian and two senior level dietetic students with food service experience for data analysis. Photographs taken during pre, post, and delayed post data collection time points were analyzed for percent consumption of one serving for each separate food group. Photographs were visually evaluated and compared to photographs of established serving sizes for preschoolers (Appendix Q). After a single coder completed the initial photograph analysis, a subset of data was rated using a fully crossed design by the two additional coders (Cicchetti, 1994). Inter-rater reliability (IRR) was analyzed using mixed effect, two-way model intra-class correlation (ICC). The IRR score of .702 for the subset of data was generalized to the entire sample (Hallgren, 2012) (Appendix R). Mean intakes from the three-day food diaries at the three separate collection time points were compared using MANCOVA measures. Pre-intervention data was considered a covariate in the analysis. Statistical significance was set at *p-value* <0.05.

CHAPTER IV

RESULTS

Post-Intervention Dietary Intake

Foods provided to preschoolers during data collection were analyzed for the percent of one serving consumed. Photographs taken during each photographic food diary were compared to reference pictures of established preschooler portion sizes. Protocol and reference pictures used can be seen in appendix U. Intake data is presented as the percent of one preschooler portion size consumed.

Table 4.1 displays the unadjusted mean for pre- and post-intervention dietary intake for the control group and each intervention group within their corresponding food group. Values are presented as the average portion of one preschool serving size consumed. Analysis of variance indicated a significant difference in pre-intervention intake of grain foods between the control group and the grain book exposure group, $F(1, 58) = 10.32$, $p = .002$, $\eta_p^2 = .156$. No other significant differences in pre-intervention intake were seen.

Table 4.1

Unadjusted Means for Pre and Post-Intervention Intake Portion of One Serving Size Consumed

Food Group Tested	Intervention Group	Pre-Intervention *M(SD)*	Post-Intervention *M(SD)*	Change Value
Dairy	Control	0.51 (0.41)	0.39 (0.33)	-0.12
	Dairy Book Exposure	0.61 (0.31)	0.73 (0.34)	0.12
Fruit	Control	0.62 (0.40)	0.52 (0.46)	-0.10
	Fruit Book Exposure	0.70 (0.34)	0.77 (0.35)	0.07
Grain	Control	0.68 (0.34)	0.69 (0.49)	0.01
	Grain Book Exposure	0.92 (0.20)	0.93 (0.38)	0.01
Protein	Control	0.65 (0.38)	0.52 (0.40)	-0.13
	Protein Book Exposure	0.78 (0.35)	0.80 (0.30)	0.02
Vegetable	Control	0.23 (0.30)	0.10 (0.15)	-0.13
	Vegetable Book Exposure	0.24 (0.24)	0.31 (0.29)	0.07

A multivariate analysis of covariance (MANCOVA) was performed to determine the main effect of book exposure on post-intervention intake of the five food groups (DV) across all six intervention groups (IV) after adjusting for pre-intervention intake. In the event of a significant F value, a post hoc Bonferroni was used for multiple comparisons of between-subject effects. The multivariate tests indicated that pre-intervention grain intake (Pillai's Trace = .02, $F(5,149) = 0.714$, $p=.614$, $\eta^2_p=.02$) and pre-intervention protein intake (Pillai's Trace = .04, $F(5,149) = 1.18$, $p=.332$, $\eta^2_p=.04$) did not adjust the outcome and were therefore removed from the analyses.

The MANCOVA did indicate a significant main effect of book exposure on post-intervention intake while controlling for pre-intervention intake measures, Pillai's Trace = .36, $F(25, 765) = 2.374$, $p< .001$, $\eta^2_p=.07$. The tests of between-subjects effects

indicated a significant association between the intervention groups and post-intervention intakes for vegetable ($F(5, 153) = 4.905$, $p < .001$, $\eta_p^2 = .138$). There was no significant main effect of book exposure on post-intervention intake of grain ($F(5, 153) = 1.138$, $p = .343$, $\eta_p^2 = .036$), protein ($F(5, 153) = 2.443$, $p = .037$, $\eta_p^2 = .074$), dairy ($F(5, 153) = 2.986$, $p = .013$, $\eta_p^2 = .089$), or fruit ($F(5, 153) = 2.646$, $p = .025$, $\eta_p^2 = .080$).

Pairwise comparisons with Bonferroni corrections denoted a significant difference in vegetable intake between the control group (M=.10, SD=.15) and participants exposed to the fruit (M=.53, SD=.31, p<.001) and protein books (M=.46, SD=.35, p=.003).

Analyses of covariance (ANCOVA) were used to test the first hypothesis that preschoolers visually exposed to the MyPlate food groups through the developed books would have an increased consumption of these foods compared to the control group after two weeks of standardized readings. In the analyses, pre-intervention intake served as the covariate. When analyses indicated a significant F ratio, *post-hoc* Bonferroni comparisons were performed. Adjusted post-test means, standard errors, and *post hoc* pairwise comparison results can be seen in table 4.2. Adjusted post-test intake means were based on initial differences in pre-intervention intake (adjusted pre-intervention dairy intake mean = .57, adjusted pre-intervention protein intake mean = .70, adjusted pre-intervention vegetable intake mean = .24, adjusted pre-intervention grain intake mean = .8080, and adjusted pre-intervention fruit intake mean = .68).

Table 4.2

Post Hoc Results and Adjusted Post-Intervention Mean Intakes for Analyzed Food Groups

Food Group Tested	Intervention Group	Adjusted Mean	Std. Error	*Mean Difference*	*p*
Dairy	Control Dairy Book Exposure	0.40 0.73	0.06 0.07	.33	.001*
Grain	Control Fruit Book Exposure	0.74 0.87	0.09 0.09	.133	.32
Fruit	Control Grain Book Exposure	0.55 0.74	0.07 0.07	.19	.07
Protein	Control Protein Book Exposure	0.55 0.77	0.06 0.06	.22	.02
Vegetable	Control Vegetable Book Exposure	0.10 0.31	0.04 0.04	.21	.001*

*Significance set at $p<.01$

The ANCOVA indicated a significant main effect between the control and dairy intervention groups on post-intervention dairy consumption while controlling for pre-intervention dairy intake, $F(1, 53) = 12.9$, $p = .001$, $\eta_p^2 = .205$. The control group consumed significantly less dairy compared to the dairy book exposure group.

A significant difference can be seen in post-intervention intake of vegetables between the control and vegetable intervention group when controlling for pre-intervention intake, $F(1, 51) = 11.44$, $p = .001$, $\eta_p^2 = .189$. Preschoolers exposed to the

vegetable food group book had a greater intake in vegetables compared to the control group after the two week standardized readings.

No significant differences are seen between the control and intervention groups for protein, fruit, and grain intake when controlling for pre-intervention intake of the respective food groups.

Though the ANCOVA indicated significant differences in post-intervention intake between the control group and both the dairy and vegetable intervention groups in regards to their respective food groups, a decline in intake is seen within the control group from pre- to post-intervention across these food groups. It is unclear as to whether the significant differences in post-intervention intake are related to book exposure or a decline in the control group intake. A repeated measures ANOVA was performed to investigate the effects of both treatment group (control and intervention) and time (pre-intervention and post-intervention) on food intake.

The repeated measures ANOVA indicated that time alone did not have a significant main effect on dairy intake, (Pillai's Trace < .001, $F(1, 51) = 0.01$, p=.92, η^2_p<.001); however, a main effect can be seen between data collection time points and treatment group (Pillai's Trace = .09, $F(1, 51) = 4.817$, p=.033, η^2_p=.09). Paired samples t-tests were used to analyze differences between the intervention groups at the separate time points. Only the differences in mean intake between the post-intervention control and post-intervention dairy book exposure group were significant, $t(30) = 3.46$, p=.002.

The repeated measures ANOVA indicated that time alone did not have a significant effect on vegetable consumption, (Pillai's Trace = .013, $F(1, 50) = .637$, p =

.429, η_p^2 = .013). A significant main effect can be seen between time of data collection and book exposure, (Pillai's Trace = .10, $F(1, 50) = 5.39$, $p = .024$, $\eta_p^2 = .10$). Results from paired samples t-test indicate a significant decline in vegetable consumption within the control group from pre- to post-intervention, $t(36) = 2.741$, p=.009. The increase in vegetable consumption within the vegetable book exposure group was non-significant, $t(30) = -.418$, p=.678.

Post-Intervention Behavior Changes

The child behavior questionnaire was sent home after the two-week standardized readings at the childcare centers. Parents were asked to respond to a series of questions related to how often their child requested to eat foods from specific food groups and whether or not the child was willing to try new foods. Parents were also asked a series of questions related to topics that were found within the books to determine whether the children were attempting to discuss newly learned concepts in the home. Using ANOVA measures, there were no significant differences found between the intervention groups in asking behavior for any of the food groups or discussion of book content. Data in Table 4.3 report the average number of times during the two-week intervention that preschoolers asked for foods within one of the five food groups or discussed topics found within the books.

Table 4.3

Frequency in Which Intervention Groups Asked for Various Foods and Discussed Book Contents During Exposure to Food Group Books

		Dairy	Fruit	Grain	Protein	Vegetable
Willingness to try New Foods*						
	Yes	81.8	79.2	70.6	76.5	76.5
	No	18.2	20.8	29.4	23.5	23.5
Frequency: Asked for More Fruit *M(SD)*		4.2 (.87)	4.2 (1.2)	3.4 (1.3)	4.4 (.94)	3.9 (.97)
Frequency: Asked for More Vegetables *M(SD)*		2.1 (1.1)	2.3 (1.1)	2.2 (1.3)	2.7 (1.4)	3.1 (1.1)
Frequency: Asked for More Dairy *M(SD)*		4.4 (1.2)	4.1 (.95)	4.2 (1.1)	4.6 (.86)	4.0 (1.2)
Frequency: Asked for More Grains *M(SD)*		3.6 (1.3)	3.4 (1.2)	3.6 (1.2)	4.4 (1.3)	3.2 (1.4)
Frequency: Asked for More Protein *M(SD)*		3.5 (1.3)	3.0 (1.2)	3.4 (1.3)	3.6 (1.2)	3.8 (1.1)
Frequency: Talked about New Foods *M(SD)*		2.0 (1.0)	2.1 (1.1)	1.6 (.70)	2.5 (1.4)	2.2 (1.3)
Frequency: Talked about Food Origin *M(SD)*		2.0 (.58)	2.0 (.90)	2.4 (1.0)	2.3 (1.1)	2.3 (1.2)
Frequency: Talked about How Food Affects the Body *M(SD)*		2.4 (.98)	2.9 (1.6)	2.4 (1.0)	2.4 (1.4)	2.6 (1.4)

*Answers provided in percent

The child behavior questionnaire provided parents and caregivers the opportunity to offer candid comments regarding their child's behavior during the two-week intervention period, yielding additional qualitative data. Comments were predominantly positive:

> *"Though she still prefers grains and dairy, she is starting to talk about protein."*
>
> *"This project seems to have given him an awareness of food types and the importance of food to our health."*

"My child has been very interested in pointing out food groups."

"I think this was a beneficial area of education."

A few comments related directly to concepts taught within the books. One concept within the grain book focuses on the ability of grain foods to provide energy required for learning and playing. A parent of one preschooler within the grain group reported that her child *"talks about food giving him energy."* A similar scenario can be seen with a preschooler in the fruit group whose parent reports "*he made comments about a fruit book and that he needs fruit to grow and play with friends"* and another participant who stated *"Can you give me fruit everyday so I can be like Flash?" (*Flash is a DC Comics superhero with speed power). Statements cannot be generalized to the entire group given the nature of qualitative data and small number of responses; however, they do provide additional rich context to the quantitative data.

Natural Environment Book Utilization

Childcare center teachers reported utilizing the books in a variety of different ways during the natural environment exposure phase of this study. Of the 17 participating centers, 9 centers provided detailed descriptions of their methods, two centers reported that the children became bored with the book and they chose not to use it, and six centers chose not to fill out the given form. A description of the different methods used and comments made by teachers regarding preschooler response to the books can be found below in Table 4.4.

Table 4.4

Methods Utilized During Natural Exposure Environment and Teacher Perspective of Preschooler Responses

Method Description	Preschooler Response
The book was placed in the classroom reading center and children were allowed free access.	"I saw many of my students enjoying the book at morning and afternoon reading centers." "Quite frequently, I would see the kids looking at the book. They would "read it" to each other and talk about the pages in the book." "The kids "read" the book often and at lunch sometimes when we get to talking about healthy food, they will comment that grains are healthy." "The children would pick up the book and recall the healthy food and what they eat that is included in the book." "A few of the children picked up the book and pretended to read it to themselves." "They enjoyed taking turns and reading it to themselves." "They remembered phrases from when I had done the reading and were saying them out loud to themselves."
Re-read the book to the students.	"I re-read the book to the class. They now have an appreciation for healthy foods." "I read the book to them and asked them questions about the book to see how much they remembered. It is surprising how much they have retained and learned about grains and that they are good for their body." "We reviewed the book and the different food groups during class." "The book helped expose them to some fruits they normally don't have."

(Continued)

Teachers led a discussion regarding content and pictures within the book.	"We went page by page and just talked about the things on each page. They told me what they remembered about different grains and why they were good for them." "I would have them identify fruits by the pictures." "The children enjoy talking about their favorite fruits and why it is important for them."
Engagement during lunchtime.	"The kids would point out items they are eating at lunch that they saw in the book."
Rotated placement of the book on individual rest mats for quiet time	"I placed it on individual cots during rest time. I alternated children and those that never picked it up during other times began reading through with great interest."
Play with food models	"Kids played in the play kitchen and sorted the fruit and vegetable food models. They liked to use the vegetable book as a reference." "We made a salad in the play kitchen using food models and our vegetable book." "We matched food models with the pictures in our book."

Post-Natural Environment Dietary Intake

Attrition rate between initial sign-up and post-natural environment exposure data collection was 62.3%. Sample size and attrition rate for individual intervention groups are displayed in table 4.5. Participant dropout was due to misunderstanding of time commitment involved, lack of teacher engagement, change in center directors, and school closings during the summer.

Table 4.5

Sample Size at Data Collection and Project Attrition Rate

	Initial Consent *(n)*	Pre-Intervention *(n)*	Post-Intervention *(n)*	Post-Natural Environment Exposure *(n)*	Total Attrition Rate (%)
Control Group	37	31	29	13	64.9
Dairy Group	31	27	25	7	77.4
Fruit Group	41	37	34	25	39.0
Grain Group	30	27	25	9	70.0
Protein Group	38	33	30	0	100
Vegetable Group	30	29	25	24	20.0
Total *(n)*	207	184	168	78	62.3

Due to the high attrition rate and smaller sample seizes, descriptive statistics were used to analyze the second hypothesis that preschoolers visually exposed to the MyPlate food groups through the developed books would have further increased consumption of these foods compared to the control group after 12 weeks of book exposure in a natural environment. Table 4.6 displays the unadjusted means for pre-intervention, post-intervention, and post-natural environment exposure dietary intake for the control group and each intervention group within their corresponding food group. Values are presented as the portion of one preschool serving size consumed.

Table 4.6

Mean Intake Values for Portion of One Serving Size Consumed

Food Group Analyzed	Intervention Group	Pre-Intervention *M(SD)*	Post-Intervention *M(SD)*	Post-Natural Environment Intervention *M(SD)*
Dairy	Control	.51(.41)	.39(.33)	.10(.21)
	Dairy Book Exposure	.61(.31)	.73(.34)	.89(.12)
Fruit	Control	.62(.40)	.52(.46)	.54(.43)
	Fruit Book Exposure	.70(.34)	.77(.35)	.73(.42)
Grain	Control	.68(.34)	.69(.49)	.32(.35)
	Grain Book Exposure	.92(.20)	.93(.38)	1.0(.16)
Protein	Control	.65(.38)	.52(.40)	___
	Protein Book Exposure	.78(.35)	.80(.30)	
Vegetable	Control	.23(.30)	.10(.15)	.13(.33)
	Vegetable Book Exposure	.24(.24)	.31(.29)	.27(.32)

Preschoolers in both the grain and dairy book exposure groups continued to have an increase in dairy and grain foods, respectively, after 12-week natural environment intervention. Grain intake increased by 8% of one serving compared to post-intervention intake, while dairy intake increased by 16%. Fruit and vegetable intake at the post-natural environment decreased compared to the post-intervention intake (both 4%). However, post-natural environment intake remained higher than pre-intervention intake with a 3% increase seen in both groups.

All host centers assigned to the protein intervention group failed to complete the study. One center failed to take pictures after meals were eaten that are required for

analysis of consumption. A second center appointed a new director who no longer wished to participate, and the final center closed for the summer and failed to tell investigators. No dietary records were available for analysis from these three centers.

Post-Natural Environment Behavior Changes

The child behavior questionnaire was sent home after exposure to the food group books in a natural environment. Data are reported in Table 4.7 as the average number of times during the two-week intervention that preschoolers asked for a specific food group or discussed topics found within the books. No differences were seen between post-intervention and post-natural environment exposure in any of the five food groups.

Table 4.7

Asking Behavior of Intervention Groups During Exposure to Food Group Books in a Natural Environment

	Dairy	Fruit	Grain	Protein	Vegetable
Frequency: Asked for More Fruit	4.4 (1.0)	4.7 (.47)	3.5 (.71)	___	4.2 (.98)
Frequency: Asked for More Vegetables	2.9 (1.2)	3.1 1.2)	1.5 (.71)	___	3.0 (1.3)
Frequency: Asked for More Dairy	4.7 (.60)	4.7 (.65)	4.0 (1.4)	___	4.2 (1.3)
Frequency: Asked for More Grains	3.8 (1.3)	4.5 (.82)	3.0 (.00)	___	3.7 (.82)
Frequency: Asked for More Protein	3.1 (1.4)	3.8 (1.3)	2.5 (.71)	___	3.5 (1.0)
Frequency: Talked about New Foods	2.5 (1.2)	2.3 (.79)	1.5 (.71)	___	2.2 (1.3)
Frequency: Talked about Food Origin	2.8 (1.2)	2.2 (.98)	2.0 (.00)	___	2.4 (1.14)
Frequency: Talked about How Food Affects the Body	3.4 (1.1)	2.1 (.83)	2.0 (1.4)	___	2.8 (1.2)

Parents were afforded a second opportunity to provide candid comments regarding their child's behavior during the final two weeks of the natural environment exposure period. Few comments were provided to gain insight to the preschoolers' behavior. A parent with a preschooler in the fruit book intervention group stated that her child "still grumbles about some foods put on her plate, but she eats more items than she did before this project." Another parent with a preschooler in the vegetable book intervention group stated that her child "was all about healthy eating during the first phase of the study. He appears to have lost that initial interest and has not really asked for new foods."

CHAPTER V

DISCUSSION

Prototype Development

A unique aspect of the MyPlate food group books developed within this study is the inclusion of all five food groups. The majority of books utilized in research regarding visual exposure have centered on increasing familiarity of fruits and vegetables, often specifically one fruit or one vegetable (De Droog et al., 2014; Houston-Price et al. 2009; Osborne & Forestell, 2012). This heavy focus on fruit and vegetable intake is related to their role in the risk reduction of chronic diseases such as cancer, cardiovascular disease, and diabetes. Fruits and especially vegetables are also targeted due to high levels of neophobia found in children. Research regarding visual exposure to the remaining three food groups, diary, grain, and protein is limited. Children have shown neophobic tendencies towards meat and other protein foods, indicating a need for alternative exposure methods (Russell & Worsley, 2008). Exposure to all five food groups is important for increasing familiarity towards and acceptance of a variety of foods needed for the development of a healthy diet.

The books developed in this study incorporated preschoolers' language, ideas, and current conceptual understanding in the making of the five MyPlate food group books. During the book development process, great care was taken in documenting reactions and comments to the foods, pictures, and concepts presented to the preschoolers. As often as

possible, preschooler input was included in the books. Researchers hoped that by incorporating the preschoolers' current knowledge base and ideas in with new information, they would be engaged and would grasp the new knowledge being presented. During the pilot testing intake of the foods tested may not have significantly increased, but educators taking part in the pilot study noted that the children were highly engaged while reading the books and initiated food discussions during mealtimes. Incorporating the thoughts and language of preschool children may have helped in increasing this acceptance.

The MyPlate food group books developed not only included all five food groups, but multiple foods within each group as well. While this is important in maximizing the amount of exposure possible within a minimal amount of materials and time, there was concern with the panel of experts over the large amount of food presented. Because of the large number of individual foods presented, there is the possibility that children could walk away with the notion that they just need to consume food for growth and strength. Moving forward, the development of a sixth book that the uses the MyPlate teaching tool to piece together the separate food groups could potentially alleviate that concern. This book should be centered on why consuming foods from all of the food groups are important for growth and strength.

Final Prototype Testing

This study adds to the growing body of literature regarding the impact of visual exposure on food intake. Intake increased from pre- to post-intervention in all intervention groups and their corresponding food groups. This increase, however, was not

significant. The changes in fruit consumption post book exposure are contrary to the findings of Osborne and Forestell (2012) for fruit intake, whereby intake significantly increased post-book exposure. In this study, the degree of change in intake was not significant at a mean increase of 7% of one serving. Preschoolers in the vegetable book exposure group also experienced a non-significant increase in intake, similar to the findings of Osborne and Forestell (2012) and incongruous with those of De Droog et al. (2014) and Houston-Price et al. (2009).

The difference in results could be related to the manor of testing used. In previous studies (De Droog et al., 2014; Houston-Price et al., 2009; Osborne & Forestell, 2012) testing after visual exposure occurred in a laboratory setting, providing foods that were directly discussed within the books. This study attempted to look at day-to-day intake of foods in the preschooler's natural environment. This being the case, researchers did not attempt to control the foods being served, potentially contributing to the lack of significant change in food intake.

Food preference prior to intervention could potentially impact the post-intervention intake. Researchers used the ANCOVA measures, treating the pre-intervention intake as a covariate in the analyses. The ANCOVA did indicate significant differences between the control group and the dairy and vegetables groups' in intake for their respective food groups. When reviewing intake data from pre- and post-intervention, the control group had a decline in intake for all food groups except the grain group between pre-and post-intervention. The significant post-intervention differences in

intake between the control group and the diary and vegetable groups may be related to the decline in control group intake and not book exposure.

Preschoolers have been shown to have neophobic tendencies towards protein foods, specifically meat (Russell & Worsley, 2008). Though insignificant, the book exposure group did exhibit a small increase in intake of protein foods from pre- to post-intervention and had greater intake when compared to the control group. Most importantly are the parent and teacher comments in regards to this food group. Teachers noted that the preschoolers were pointing out protein foods during meals and discussing them. One parent stated that their preschooler was *"starting to talk about protein more*." These are important advancements in increasing the familiarity and acceptance of protein foods.

With preschool aged children, increasing acceptance of a new food may not initially be displayed in the form of increased intake. Parents and teachers reported several comments that their preschoolers either made statements or exhibited actions that reflected a growing acceptance of new foods. This increase in discussions and positive attitudes towards a food may indicate a potential for behavior change. Though significant improvement in food intake was not seen in all food groups, their attitudes and behavior towards the different foods indicate an increase in familiarity and acceptance. Given more time, it is possible that an increase consumption of these foods may be seen.

It is unlikely that books used naturally in a classroom would be read in a manner similar to the standardized reading phase of the large scale testing. This study attempted to look at changes in intake after long-term exposure in a standard setting. Teachers were

allowed to use the books in a manner and frequency of their choosing. Many teachers found creative ways of using the books, beyond simply reading the text to their preschoolers. The preschoolers often were allowed to help lead in the exposure. When teachers placed the books in reading centers, some reported that they would find preschoolers play-reading the books to their classmates. On their own, the children would discuss the pictures and recite lines of text that they remembered. In another example, teachers provided food models in play kitchens and the children began to sort the foods into groups, using their book as a reference. The preschooler reactions to the books when given a chance to explore them on their own indicate possible increased acceptance of these foods that may not be reflected within the quantitative data.

Due to high attrition rate, photographic food diary data retrieved from that post-natural environment collection prohibit any meaningful inferential analysis. The dairy and grain book exposure groups did see an increase in consumption between the post-intervention and post-natural environment time points (16% of one serving and 7% of one serving respectively). The fruit and vegetable groups had a decline in intake (4% of one serving and 3% of one serving respectively). None of the protein groups participated in the final data collection. This unfortunately limits the ability to assess the effectiveness of these newly developed materials from a long-term perspective.

After the 12-week natural environment, one parent did state that her child's enthusiasm declined during this time frame. She reported that her child increasingly discussed foods throughout the two-week standardized reading phase, where the child was exposed on a daily basis, but this behavior ceased throughout the natural-

environment phase. Although this is only one parent's statement, incorporating new ways of continued engagement should be considered. If these materials are to be expanded further, formal lessons that incorporate a variety of age appropriate activities should be developed.

The childcare centers are in a unique position in regards to nutrition education. Children attending these centers often eat two meals and one snack throughout the day in the presence of their teachers. These teachers have an opportunity to provide nutrition education to their students on a regular basis and in a very natural way. During mealtimes, teachers could initiate discussions regarding the types of foods served and how they help their bodies. This would be a very efficient and inexpensive way to incorporate some nutrition into the lives of their preschool students. The caveat, however, would be the knowledge base of the teachers. The teachers would need some form of nutrition education prior to teaching their preschoolers.

Limitations

Dietary intake data remains a major limitation in most nutrition research. These methods come with innate limitations and food diaries are no different. Individuals collecting the data must be knowledgeable regarding portion sizes and can often rely on memory, thereby occasionally providing inaccurate food intake records. Researchers in this study attempted to minimize these limitations by utilizing before and after photographs of meals. This reduced the reliance on memory and placed the burden of portion size analysis on the trained researcher. This method has its own limitations, including subjectivity and potential bias. Researchers attempted to establish inter-rater

reliability (IRR) and exhibited overall good intra-class correlation score of 0.702. However, the decision to establish IRR came after the data had initially been analyzed. Had the IRR been established *a priori*, a higher scored could have been exhibited, further reducing the impact of this limitation.

An additional limitation includes the lack of differentiation between foods of lower and higher nutritional quality. The books utilized in this study covered food groups as a whole, and not individual food items. Therefore, when analyzing photographs for intake analysis, any protein food counted as a serving of protein, meaning that chicken nuggets were equivalent to baked chicken breast. Junk foods such as chips, cookies, and cakes were excluded from analysis. Further studies should incorporate overall nutritional quality of the food.

The largest study limitation is the overall attrition rate of 62.3%. The methodology of the large scale study relied heavily on teacher and parent involvement. Between the initial consent and pre-intervention data collection, 11% of the sample was lost largely due to a misunderstanding of the time commitment. Participant dropout between post-intervention and post-natural environment data collection was largely due to unmotivated teachers, who no longer wished to take part in the study. Teachers who were not adequately motivated reported that they attempted to read the books during the natural environment phase but did not continue, stating that the children were bored. They also failed to provide photographs of the student meals during the final data collection. Motivated teachers found creative ways to expose the preschoolers without directly reading to them. These methods included placing books in the reading centers

and allowing the children to freely peruse them, discussion of book contents and pictures, rotating the book among preschoolers during rest time, and incorporating food models and play.

Much of nutrition education, especially in young children, relies on teacher and parent involvement. There is not always a large budget for assistant researchers or costly incentives; therefore, researchers must become more creative in their methodology to reduce the workload of parents and teachers. Advances in technology may aid in this process. Researchers in this study attempted to reduce the work of parents and teachers by opting for a photographic versus pen-and-paper food diary, though this was not enough to prohibit a high attrition rate. Moving forward, studies using these books in classrooms could consider an electronic version of the book that would provide a short break for educators. This could be in the form of videos of book readings that the teacher could show the class as a whole or possibly an e-book version for the computer or tablet. As a benefit to researchers, an electronic book would also help reduce the cost of book printing and provide an easy version to test within homes in the future.

Areas for Future Research

While this study adds a new component to the body of literature regarding visual exposure, it failed to effectively look at long-term effects of the books on dietary habits. Moving forward, additional long-term studies are needed to determine if repeated visual exposure to these food group books has a lasting impact on dietary habits. Given the time commitment involved, the methodology should incorporate changes to help maintain participation.

A unique aspect of the prototypes developed was the incorporation of all five food groups, though the books were tested individually. Future studies should look at the effectiveness of the book set as a whole on food intake.

Future studies regarding the effectiveness of visual exposure to these food group books should consider how they impact repeated taste exposure. A potential effect of visual exposure may be that the number of necessary taste exposures declines, rather than significantly impacting changes in intake. If these books reduce the number of repeated taste exposure required for the acceptance of a novel food, this could help to decrease the burden of cost and potentially frustrations felt by caregivers when serving foods.

CHAPTER VI

CONCLUSION

Using book media to visually expose children to healthy foods can provide childcare centers with inexpensive and educator friendly nutrition education materials. Insignificant increases were seen in intake; however, qualitative responses from parents and educators suggest an increase in acceptance of foods in the five food groups. A large attrition rate (62.3%) inhibited an attempt to determine the impact of visual exposure after a longer time frame. In analyzing the data available from remaining participants, no significant difference between intervention and control groups was found, indicating a need for developing another iteration of the current materials.

Future studies utilizing these nutrition educational materials should include hands-on, age-appropriate activities, fictional stories, and staff education. Children of this age group need play-type activities to learn and help them understand how this new knowledge fits into their current conceptual thinking. Educating teachers who are present during meal times could also help to provide the children with constant education and experiences in their day-to-day life. These newly developed MyPlate Food Group Books are a promising start to impactful nutrition educational materials.

REFERENCES

Addessi, E., Galloway, A.T., Visalberghi, E., & Birch, L. (2005). Specific social influences on the acceptance of novel foods in 2-5-year-old children. *Appetite*, *45*(3), 264-271. doi: 10.1016/j.appet.2005.07.007.

Anzman-Frasca, S., Savage, J., Marini, M.E., Fisher, J.O., & Birch, L.L. (2012). Repeated exposure and associative conditioning promote preschool children's liking of vegetables. *Appetite*, *58*, 543-553. doi: 10.1016/j.appet.2011.11.012.

Bandura, A. (1977). *Social Learning Theory*. Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (1986). *Social Foundations of Thought and Action: A Social Cognitive Theory*. Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (2000). Exercise of Human Agency Through Collective Efficacy. *Current Directions in Psychological Science, 9*(3), 75-78. http://dx.doi.org/10.1111/1467-8721.00064.

Bartholomew, L.K., Parcel, G.S., Kok, G., & Gottlieb, N.H. *Intervention Mapping: Designing Theory and Evidenced-Based Promotion Programs.* Boston, IL: McGraw-Hill, 2001.

Bayer, O., Rosario, A., Wabitsch, M., & von Kries, R. (2009). Sleep duration and obesity in children: is the association dependent on age and choice of the outcome parameter? *Sleep*, *32*, 1183-1189. Retrieved from: http://www.journalsleep.org.

Bellows, L. & Anderson, J. (2006). The Food Friends: Encouraging preschoolers to try new foods. *Young Children,* 61(3), 37-39.

BeLue, R., Francis, L., & Colaco, B. (2009). Mental health problems and overweight in a national representative sample of adolescents: effects of race and ethnicity. *Pediatrics*, *123*(2), 697-702. http://dx.doi.org/10.1542/peds.2008-0687.

Benton, D. (2004). Role of parents on the determination of the food preferences of children and the development of obesity. *International Journal of Obesity, 28*, 858-869. http://dx.doi.org/10.1038/sj.ijo.0802532.

Bethell, C., Simpson, L., Stumbo, S., Carle, A., & Gombojav, N. (2010). National, state, and local disparities in childhood obesity. *Health Affairs, 29*(3), 347-356. http://dx.doi.org/10.1377/hlthaff.2009.0762.

Birch, L.L. (1992). Children's preferences for high-fat foods. *Nutrition Review, 50*, 249-252. http://dx.doi.org/10.1111/j.1753-4887.1992.tb01341.x.

Birch, L.L. (1999). Development of food preferences. *Annual Review of Nutrition*, *19*, 41-62. http://dx.doi.org/10.1146/annurev.nutr.19.1.41.

Birch, L.L. & Davidson, K.K. (2001). Family environment factors influencing the developing behavioral controls of food intake and childhood overweight. *Pediatric Clinics of North America, 48*, 893-907. http://dx.doi.org/10.1016/s0031-3955(05)70347-3.

Birch, L.L. & Fisher, J.P. (1998). Development of eating behaviors among children and adolescents. *Pediatrics*, *101*, 539-549. Retrieved from: http://www.pediatrics.org.

Birch, L.L. & Marlin, D.W. (1982). I don't like it; I never tried it. Effects of exposure on two-year-old children's food preferences. *Appetite: Journal for Intake Research, 3*, 353-360. http://dx.doi.org/10.1016/s0195-6663(82)80053-6.

Birch, L.L., McPhee, L., Shoba, B.C., Pirok, E., & Steinberg, L. (1987). What kind of exposure reduces children's food neophobia? Looking vs. tasting. *Appetite, 9,* 171-178. http://dx.doi.org/10.1016/s0195-6663(87)80011-9.

Boyland, E.J., Harrold, J.A., Kirkham, T.C., Corker, C., Cuddy, J., Evans, D., … Halford, J.C.G. (2011). Food commercials increase preference for energy-dense foods, particularly in children who watch more television. *Pediatrics*, *128*, 93-100. http://dx.doi.org/10.1542/peds.2010-1859.

Brewis, A. (2014). Stigma and the perpetuation of obesity. *Social Science & Medicine*, *118*, 152-158. http://dx.doi.org/10.1016/j.socscimed.2014.08.003.

Brewis, A., Wutich, A., Fallette-Cowden, A., & Rodriguez-Soto, L. (2011). Body norms and fat stigma in global perspective. *Current Anthropology*, *52*, 269-276. http://dx.doi.org/10.1086/659309.

Bronfenbrenner, U. (1979). *The Ecology of Human Development: Experiments by Nature and Design*. Cambridge, MA: Harvard University Press.

Brown, K.A., Ogden, J., Vogele, C., & Gibson, E.L. (2008). The role of parental control practices in explaining children's diet and BMI. *Appetite*, *50,* 252-259. http://dx.doi.org/10.1016/j.appet.2007.07.010.

Byrne, E. & Nitze, S. (2002). Preschool children's acceptance of a novel vegetable following exposure to messages in a storybook. *Journal of Nutrition Education and Behavior, 34,* 211-214. http://dx.doi.org/10.1016/s1499-4046(06)60095-x.

Campbell K. & Crawford D. (2001) Family food environments as determinants of preschool-aged children's eating behaviors, implications for obesity prevention policy. A review. *Australian Journal of Nutrition and Dietetics, 58*(1), 129-136. Retrieved from: http://ezproxy.twu.edu:2680/WileyCDA/.

Carruth B. & Skinner J. (2000). Revisiting the picky eater phenomenon. Neophobic behaviors of young children. *Journal of the American College of Nutrition*, 19(6), 771-780. http://dx.doi.org/10.1080/07315724.2000.10718077.

Carruth, B.R., Skinner, J., Houck, K., Moran, J.D.I., Coletta, F. & Ott, D. (1998). The phenomenon of "picky eater": a behavioral marker in eating patterns of toddlers. *Journal of the American College of Nutrition, 17*, 180-186. http://dx.doi.org/10.1080/07315724.1998.10718744.

Carruth, B.R., Zieglar, P.J., Gordon, A., & Barr, S.I. (2004). Prevalence of picky eaters among infants and toddlers and their caregivers' decisions about offering a new food. *Journal of the American Dietetic Association*, *104*, 57-64. http://dx.doi.org/10.1016/j.jada.2003.10.024.

Centers for Disease Control and Prevention. (2015). Defining Childhood Obesity. Retrieved from: https://www.cdc.gov/obesity/childhood/defining.html

Centers for Disease Control and Prevention. (2014). Childhood Obesity Facts. Retrieved from: www.cdc.gov/obesity/data/childhood.html

Chu, Y.L., Warren, C.A., Sceets, C.E., Murano, P., Marquart, L., & Reicks, M. (2011). Acceptance of two US Department of Agriculture commodity whole-grain products: a school-based study in Texas and Minnesota. *Journal of the American Dietetic Association*, *111*,1380-1384. http://dx.doi.org/10.1016/j.jada.2011.06.003.

Cicchetti, DV. (1994). Guidelines, criteria, and rules of thumb for evaluating normed and standardized assessment instruments in psychology. *Psychological Assessment, 6*(4); 284-290. http://dx.doi.org/10.1037//1040-3590.6.4.284.

Contento, I.R. (1981). Children's thinking about food and eating. A Piagetian-based study. *Journal of Nutrition Education, 13*, S86-S90. http://dx.doi.org/10.1016/s0022-3182(81)80017-9.

Contento, I.R. (2011). *Nutrition Education: Linking Research, Theory, and Practice*. Sudbury, MA: Jones and Bartlett Publishers, LLC.

Cooke L. (2007). The importance of exposure for healthy eating in children. A review article. *Journal of Human Nutrition & Dietetics, 20*(4), 294-301. http://dx.doi.org/10.1111/j.1365-277x.2007.00804.x.

Cooke L., Wardle J., & Gibson E.L. (2003). Relationship between parental report of food neophobia and everyday food consumption in 2-6 year old children. *Appetite*, *41*, 205-206. http://dx.doi.org/10.1016/s0195-6663(03)00048-5.

Cooke L.J., Wardle J., Gibson E.L., Sapochnik M., Sheiham A., & Lawson M. (2004). Demographic, familial and trait predictors of fruit and vegetable consumption by pre-school children. *Public Health Nutrition, 7*(2), 295-302. http://dx.doi.org/10.1079/phn2003527.

Datar, A. & Sturm, R. (2004). Childhood overweight and parent- and teacher- reported behavior problems: evidence from a prospective study of kindergarteners. *Archives of Pediatrics and Adolescent Medicine, 158*, 804-810. http://dx.doi.org/10.1001/archpedi.158.8.804.

De Droog S.M., Buijzen M., & Valkenburg P.M. (2014) Enhancing children's vegetable consumption using vegetable-promoting picture books. The impact of interactive shared reading and character-product congruence. *Appetite*, *73*, 73-80. http://dx.doi.org/10.1016/j.appet.2013.10.018.

DeMarco, L., Relf, P.D., & McDaniel, A. (1999). Integrating gardening into the elementary school curriculum. *HortTechnology, 9*(2), 276-281. Retrieved from: http://horttech.ashspublications.org/content/9/2/276.

Desor, J.A., Greene, L.S., & Maller, O. (1975). Preferences for sweet and salty in 9-15-year-old and adult humans. *Science*, *190*, 686-687. http://dx.doi.org/10.1126/science.1188365.

Dockray, S., Susman, E., & Dorn, L. (2009). Depression, cortisol reactivity, and obesity in childhood and adolescence. *Journal of Adolescent Health*, *45*, 344-350. http://dx.doi.org/10.1016/j.jadohealth.2009.06.014.

Drewnowski, A. (1997). Taste preferences and food intake. *Annual Review of Nutrition*, *17*, 237-253. http://dx.doi.org/10.1146/annurev.nutr.17.1.237.

Faith, M.S., Scanlon, K.S., Birch, L.L., Francis, L.A., & Sherry, B. (2004). Parent-child feeding strategies and their relationships to child eating and weight status. *Obesity Research*, *12*, 1264-1272. http://dx.doi.org/10.1038/oby.2004.212.

Farhat, T., Iannotti, R., & Simons-Morton, B. (2010). Overweight, obesity, youth, and health-risk behaviors. *American Journal of Preventive Medicine*, *38*(3), 258-267. http://dx.doi.org/10.1016/j.amepre.2009.10.038.

Farris, A.R., Misyak, S., Duffy, K.J., Davis, G.C., Hosig, K., Atzaba-Poria, N….Serrano, E.L. (2014). Nutritional Comparison of Packed and School Lunches in Pre-Kindergarten and Kindergarten Children Following the Implementation of the 2012-2013 National School Lunch Program Standards. *Journal of Nutrition Education and Behavior*, *46*, 621-626. http://dx.doi.org/10.1016/j.jneb.2014.07.007.

Flechtner-Mors, M., Thamm, M., Wiegand, S., Reinehr, T., Schwab, K.O., Kiess, W., … Holl, R.W. (2012). Comorbidities related to BMI category in children and adolescents: German/Austrian/Swiss Obesity Register APV compared to the German KiGGS study. *Hormone Research in Paediatrics*, *77*, 19-26. http://dx.doi.org/10.1159/000334147.

Franks, P., Hanson, R., Knowler, W., Sievers, M., Bennett, P., & Looker, H. (2010). Childhood obesity, other cardiovascular risk factors, and premature death. *New England Journal of Medicine, 362*(6), 485-493. http://dx.doi.org/10.1056/nejmc1002801.

Galloway, A.T., Lee, Y., & Birch, L.L. (2003). Predictors and consequences of food neophobia and pickiness in young girls. *Journal of the American Dietetic Association, 103*, 692-698. http://dx.doi.org/10.1053/jada.2003.50134.

Gibbs, L., Staiger, P.K., Johnson, B., Block, K., MacFarlane, S., Gold, L., … Ukoummne, O. (2013) Expanding children's food experiences: The impact of a school-based kitchen garden program. *Journal of Nutrition Education and Behavior*, *45*, 137-146. http://dx.doi.org/10.1016/j.jneb.2012.09.004.

Gibson, E.L., Wardle, J., & Watts, C. (1998). Fruit and vegetable consumption, nutritional knowledge and beliefs in mothers and children. *Appetite*, *31*, 205-228. http://dx.doi.org/10.1006/appe.1998.0180.

Green, M. & Piel, J.A. (2010). *Theories of Human Development: A Comparative Approach.* New York, NY: Pearson Education, Inc.

Hallgren, KA. (2012). Computing Inter-Rater Reliability for Observational Data: An Overview and Tutorial. *Tutorials of Quantitative Methods in Psychology, 8*(1), 23-34. Retrieved from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3402032/.

Heath, P.M., Houston-Price, C., & Kennedy, O.B. (2010). Can visual exposure impact on children's visual preferences for fruits and vegetables? *Proceedings of the Nutrition Society*, *69,* E422. http://dx.doi.org/10.1017/s0029665110002855.

Heim, S., Stang, J., & Ireland, M. (2009). A garden pilot project enhances fruit and vegetable consumption among children. *Journal of the American Dietetic Association*, *109*, 1220-1226. http://dx.doi.org/10.1016/j.jada.2009.04.009.

Hendy, H.M. & Raudenbush, B. (2000). Effectiveness of teacher modeling to encourage food acceptance in preschool children. *Appetite*. *34*, 1-76. http://dx.doi.org/10.1006/appe.1999.0286.

Houston-Price, C., Burton, E., Hickinson, R., Inett, J., Moore, E., Salmon, K., & Shiba, P. (2009). Visual exposure elicits positive visual preferences in toddlers. *Journal of Experimental Child Psychology*, *104,* 89-104. http://dx.doi.org/10.1016/j.jecp.2009.04.001.

Houston-Price C., Butler L., & Shiba P. (2009). Visual exposure impact on toddlers' willingness to taste fruit and vegetables. *Appetite*, *53*, 450-453. http://dx.doi.org/10.1016/j.appet.2009.08.012.

Howard, A.J., Mallan, K.M., Byrne, R., Magarey, A., & Daniels, L.A. (2012). Toddlers' food preferences. The impact of novel food exposure, maternal preferences and food neophobia. *Appetite*, *59*, 818-825. http://dx.doi.org/10.1016/j.appet.2012.08.022.

Hughes, S.O., Power, T.G., Orlet-Fisher, J., Mueller, S., & Nicklas, T.A. (2005). Revisiting a neglected construct: parenting styles in a child-feeding context. *Appetite*, *44*, 83-92. http://dx.doi.org/10.1016/j.appet.2004.08.007.

Kannan S., Smith R., Foley C., Del Sole S., White A., Sheldon L.A., … Severin S. (2011). *FruitZotic*: A sensory approach to introducing preschoolers to fresh exotic fruits at head start locations in Western Massachusetts. *Journal of Nutrition Education and Behavior*, *43*(3), 205-206. http://dx.doi.org/10.1016/j.jneb.2010.09.010.

Koch, S., Waliczek, T.M., & Zajicek, J.M. (2006). The Effect of a summer garden program on the nutritional knowledge, attitudes, and behaviors of children. *HortTechnology*, *16*(4), 620-625. Retrieved from: http://horttech.ashspublications.org/content/16/4/620.

Lakkakula, A., Geaghan, J., Zanovec, M., Pierce, S., & Tuuri, G. (2010). Repeated taste exposure increases liking for vegetables by low-income elementary school children. *Appetite*, *55*, 226-231. http://dx.doi.org/10.1016/j.appet.2010.06.003.

Laughlin, L. (2013). Who's Minding the Kids? Childcare Arrangements: Spring 2011. Current Population Reports, U.S. Census Bureau. Retrieved from: http://www.census.gov/content/dam/Census/library/publications/2013/demo/p70-135.pdf.

Laureati, M., Bergamaschi, V., & Pargliarini, E. (2015). Assessing childhood food neophobia: Validation scale in Italian primary school children. *Food Quality and Preference, 40*, 8-15. http://dx.doi.org/10.1016/j.foodqual.2014.08.003.

Lineberger, S.E. & Zajicek, J.M. (2000). School gardens: Can a hands-on teaching tool affect students' attitudes and behaviors regarding fruits and vegetables? *HortTechnology, 10*(3), 593-597. Retrieved from: http://horttech.ashspublications.org/content/10/3/593.

Lobstein, T. & Dibb, S. (2005). Evidence of a possible link between obesogenic food advertising and child overweight. *Obesity Reviews*, *6*, 203-208. http://dx.doi.org/10.1111/j.1467-789x.2005.00191.x.

Loewen, R. & Pliner, P. (1999). Effects of prior exposure to palatable and unpalatable novel foods on children's willingness to taste other novel foods. *Appetite*, *32*, 351-366. http://dx.doi.org/10.1006/appe.1998.0216.

Lytle, L.A., Eldridge, A.L., Kotz, K., Piper, J., Williams, S., & Kalina, B. (1997). Children's interpretation of nutritional messages. *Journal of Nutrition Education*, *29*, 128-136. http://dx.doi.org/10.1016/s0022-3182(97)70177-8.

Maier, A., Chabanet, C., Schaal, B., Issanchou, S., & Leathwood, P. (2007). Effects of repeated exposure on acceptance of initially disliked vegetables on 7-month-old infants. *Quality and Preference*, *18*, 1023-1032. http://dx.doi.org/10.1016/j.foodqual.2007.04.005.

McAleese, J.D. & Rankin, L.L. (2007). Garden-based nutrition education affects fruit and vegetable consumption in sixth-grade adolescents. *Journal of the American Dietetic Association*, *107*, 662-665. http://dx.doi.org/10.1016/j.jada.2007.01.015.

Mennella, J.A. & Beauchamp, G.K. (2005). Understanding the origin of flavor preferences. *Chemical Senses, 30*(Suppl. 1), i242-i243. http://dx.doi.org/10.1093/chemse/bjh204.

Merikangas, A.K., Mendola, P., Pastor, P.N., Reuben, C.A., & Cleary, S.D. (2012). The association between major depression and obesity in US adolescents: results from 2001-2004 National Health and Nutrition Examination Survey. *Journal of Behavioral Medicine, 35*, 149-154. http://dx.doi.org/10.1007/s10865-011-9340-x.

Morrison, K., Shin, S., Tarnopolsky, M., & Taylor, V. (2014). Association of depression and health related quality of life with body composition in children and youth with obesity. *Journal of Affective Disorders*, *172*, 18-23. http://dx.doi.org/10.1016/j.jad.2014.09.014.

Musher-Eizenman, D.R., Young, K.M., Laurene, K., Galliger, C., Hauser, J., & Wagner Oehlhof, M. (2010). Children's sensitivity to external food cues: how distance to serving bowl influences consumption. *Health Education Behavior*, *37*, 186-192. http://dx.doi.org/10.1177/1090198109335656.

Nicklaus S., Boggio V., Chabanet C., & Issanchou, S. (2004) A prospective study of food preferences in childhood. *Food Quality and Preference, 15*, 805-818. http://dx.doi.org/10.1016/j.foodqual.2004.02.010.

Nicklaus S., Boggio V., Chabanet C., & Issanchou, S. (2005) A prospective study of food variety seeking in childhood, adolescence and early adult life. *Appetite, 44*, 289-297. http://dx.doi.org/10.1016/j.appet.2005.01.006.

Ng, K. & Lai, S. (2004). Application of anthropometric indices in childhood obesity. *Southern Medical Journal, 97*, 566-570. http://dx.doi.org/10.1097/00007611-200406000-00011.

Ogden, C., Carroll, M., Kit, B., & Flegal, K. (2012). Prevalence of obesity and trends in body mass index among US children and adolescents, 1999-2010. *Journal of the American Medical Association*, *307*, 483-490. http://dx.doi.org/10.1001/jama.2012.40.

Olsen, A., Ritz, C., Kraaij, L.W., & Moller, P. (2012). Children's liking and intake of vegetables: A school-based intervention study. *Food Quality and Preference*, *23*, 90-98. http://dx.doi.org/10.1016/j.foodqual.2011.10.004.

Osborne, C.L. & Forestell, C.A. (2012). Increasing children's consumption of fruit and vegetables: Does the type of exposure matter? *Physiology & Behavior, 106*(3), 362-368. http://dx.doi.org/10.1016/j.physbeh.2012.01.006.

Pan, L., Blanck, H., Sherry, B., Dalenius, K., & Grummer-Strawn, L. (2012). Trends in the Prevalance of Extreme Obesity Among US Preschool-Aged Children Living in Low-Income Families, 1998-2010. *Journal of the American Medical Association*, *308*(24), 2563-2565. http://dx.doi.org/10.1001/jama.2012.108099.

Papas, M.A., Hurley, K.M., Quigg, A.M., Oberlander, S.E., & Black, M.M. (2009). Low-income, African-American adolescent mothers and their toddlers exhibit similar dietary variety patterns. *Journal of Nutrition Education and Behavior*, *41*(2), 87-94. http://dx.doi.org/10.1016/j.jneb.2008.01.005.

Parmer, S.M., Salisbury-Glennon, J., Shannon, D., & Struempler, B. (2009). School gardens: An experiential learning approach for a nutrition education program to increase fruit and vegetable knowledge, preference, and consumption among second-grade students. *Journal of Nutrition Education and Behavior*, *41*, 212-217. http://dx.doi.org/10.1016/j.jneb.2008.06.002.

Patino-Fernandez, A., Delamater, L.S., Brito, A., & Goldberg, R. (2008). A prospective study of weight and metabolic syndrome in young Hispanic children. *Childrens Health Care*, *37*, 316. http://dx.doi.org/10.1080/02739610802437558.

Piaget, J. (1952). *The Origins of Intelligence in Children*. New York, NY: Norton.

Piaget, J. (1962). *Play, dreams, and imitation in Childhood*. New York, NY: Norton.

Rasmussen, M., Krolner, R., Klepp, K.I., Lytle, L., Brug, J., Bere, E., & Due, P. (2006). Determinants of fruit and vegetable consumption among children and adolescents: a review of literature. Part I: quantitative studies. *International Journal of Behavioral Nutrition and Physical Activity, 3*, 22. doi:10.1186/1479-5868-3-22.

Reinehr, T. & Wunsch, R. (2010). Relationships between cardiovascular risk profile, ultrasonographic measurement of intra-abdominal adipose tissue, and waist circumference in obese children. *Clinical Nutrition*, *29*, 24-30. http://dx.doi.org/10.1016/j.clnu.2009.06.004.

Richter, S.L., Vandervet, L.M., Macaskill, L.A., Salvadori, M.L., Seabrook, J.A., & Dworatzek, P.D. (2012). Accuracy and Reliability of Direct Observation of Home-Packed Lunches in Elementary Schools by Trained Nutrition Students. *Journal of the Academy of Nutrition and Dietetics*, *112*, 1603-1607. http://dx.doi.org/10.1016/j.jand.2012.07.010.

Robinson-O'Brien, R., Story, M., & Heim, S. (2009). Impact of garden-based youth nutrition intervention programs: A review. *Journal of the American Dietetic Association*, *109*, 273-280. http://dx.doi.org/10.1016/j.jada.2008.10.051.

Rosenstein, D. & Oster, H. (1988). Differential facial responses to four basic tastes in newborns. *Child Development*, *59*, 1555-1568. http://dx.doi.org/10.2307/1130670.

Rossen, L. & Schoendorf, K. (2012). Measuring health disparities: trends in racial-ethnic and socioeconomic disparities in obesity among 2-18-year old youth in the United States, 2001-2010. *Annals of Epidemiology*, *22*, 698-704. http://dx.doi.org/10.1016/j.annepidem.2012.07.005.

Rozin, P. (1991). Family resemblance in food and other domains: The family paradox and the role of parental congruence. *Appetite*, *16*, 93-102. http://dx.doi.org/10.1016/0195-6663(91)90035-q.

Rozin, P., Fallon, A., & Mandell, R. (1984). Family resemblance in attitudes to food. *Developmental Psychology*, *20*, 309-314. http://dx.doi.org/10.1037//0012-1649.20.2.309.

Rozin, P. & Vollmecke, T.A. (1986). Food likes and dislikes. *Annual Review of Nutrition*, 6, 433-456. http://dx.doi.org/10.1146/annurev.nutr.6.1.433.

Russell, C.G. & Worsley, A. (2008). A population-based study of preschoolers' food neophobia and its association with food preferences. *Journal of Nutrition Education and Behavior, 40*, 11-19. http://dx.doi.org/10.1016/j.jneb.2007.03.007.

Satter, E.M. (1996). Internal regulation and the evolution of normal growth as the basis for prevention of obesity in children. *Journal of the American Dietetic Association*, *96*, 860-864. http://dx.doi.org/10.1016/s0002-8223(96)00237-4.

Serap, S., Mevlut, B., Inanc, C., & Ender, S. (2007). Metabolic syndrome in childhood obesity. *Indian Pediatrics*, 44, 657-662

Singh, G., Siahpush, M., & Kogan, M. (2010). Rising Social Inequalities in US Childhood Obesity, 2003-2007. *Annals of Epidemiology*, *20*, 40-52. http://dx.doi.org/10.1016/j.annepidem.2009.09.008.

Skinner, J.D., Carruth, B.R., Bounds, W., & Ziegler, P. (2002). Children's food preferences. A longitudinal analysis. *Journal of the American Dietetic Association, 102*, 1638-1647. doi: 10.1016/S0002-8223(02)90349-4.

Stein, L.J., Cowart, B.J., & Beauchamp, G.K. (2006). Salty taste acceptance by infants and young children is related to birth weight: a longitudinal analysis of infants within the normal birth weight range. *European Journal of Clinical Nutrition, 60*, 272-279. http://dx.doi.org/10.1038/sj.ejcn.1602312.

Sullivan, S.A. & Birch, L.L. (1990). Pass the sugar, pass the salt. Experience dictates preference. *Developmental Psychology*, *26*, 546-551. http://dx.doi.org/10.1037/0012-1649.26.4.546.

Townsend, N. & Foster, C. (2011). Developing and applying a socio-ecological model to the promotion of healthy eating in school. *Public Health Nutrition*, 16, 1101-1108. http://dx.doi.org/10.1017/s1368980011002655.

Ventura, A.K. & Birch, L.L. (2008). Does parenting affect children's eating and weight status? *International Journal of Behavioral Nutrition and Physical Activity*, *5*, 15. http://dx.doi.org/10.1186/1479-5868-5-15.

United States Department of Agriculture. (2015). Child Care Meal Patterns. Accessed at: http://www.fns.usda.gov/sites/default/files/Child_Meals.pdf.

Wang, Y., Beydoun, M., Li., J., Liu, Y., & Moreno, L. (2011). Do children and their parents eat a similar diet? Resemblance in child and parental dietary intake—systematic review and meta-analysis. *Journal of Epidemiological Community Health*, *65*(2),177-189. http://dx.doi.org/10.1136/jech.2009.095901.

Wardle, J., Cooke, L., Gibson, L., Sapochnik, M., Sheilham, A., & Lawson, M. (2003). Increasing children's acceptance of vegetables: a randomized trial of parent-led exposure. *Appetite*, *40*,155-162. http://dx.doi.org/10.1016/s0195-6663(02)00135-6.

Warren C. & Barnes J. (2013). The Bienestar/NEEMA early childhood obesity and diabetes prevention program: a formative assessment. *Journal of Nutrition Education and Behavior, 45*(4S),S75-S76. http://dx.doi.org/10.1016/j.jneb.2013.04.196.

Weber Cullen, K., Baranowski, T., Owens, E., Marsh, T., Rittenberry, L., & de Moor, C. (2003). Availability, accessibility, and preferences for fruit, 100% fruit juice, and vegetable influence child's dietary behavior. *Health Education and Behavior*, *30*(5), 615-626. http://dx.doi.org/10.1177/1090198103257254.

Wiecha, J., Peterson, K.E., Ludwig, D.S., Kim, J., Sobol, A., & Gortmaker, S.L. (2006). When children eat what they watch: Impact of television viewing on dietary intake in youth. *Archives of Pediatrics and Adolescent Medicine, 160*, 436-442. http://dx.doi.org/10.1001/archpedi.160.4.436.

Williams, K.E., Paul, C., Pizzo, B., & Riegel, K. (2008). Practice does make perfect. A longitudinal look at repeated visual exposure. *Appetite*, *51*, 739-742. http://dx.doi.org/10.1016/j.appet.2008.05.063.

Witt, K. & Dunn, C. (2012). Increasing fruit and vegetable consumption among preschoolers: Evaluation of "Color Me Healthy". *Journal of Nutrition Education and Behavior,* 44(2), 107-113. http://dx.doi.org/10.1016/j.jneb.2011.01.002.

World Health Organization (2000). Obesity: preventing and managing the global epidemic. Retrieved at: http://www.who.int/nutrition/publications/obesity/WHO_TRS_894/en/

APPENDIX A

Institutional Review Board Documentation

TEXAS WOMAN'S UNIVERSITY
DENTON DALLAS HOUSTON

Institutional Review Board
Office of Research and Sponsored Programs
P.O. Box 425619, Denton, TX 76204-5619
940-898-3378 FAX 940-898-4416
e-mail: IRB@twu.edu

February 1, 2013

Dr. Cynthia A. Warren
Department of Nutrition & Food Sciences

Dear Dr. Warren:

Re: Development and Testing of Educational Materials to Increase Visual Exposure of MyPlate Foods in Preschoolers (Protocol #: 17240)

The above referenced study has been reviewed by the TWU Institutional Review Board (IRB) and appears to meet our requirements for the protection of individuals' rights.

If applicable, agency approval letters must be submitted to the IRB upon receipt PRIOR to any data collection at that agency. A copy of the approved consent form with the IRB approval stamp is enclosed. Please use the consent form with the most recent approval date stamp when obtaining consent from your participants. A copy of the signed consent forms must be submitted with the request to close the study file at the completion of the study.

This approval is valid one year from January 18, 2013. Any modifications to this study must be submitted for review to the IRB using the Modification Request Form. Additionally, the IRB must be notified immediately of any unanticipated incidents. If you have any questions, please contact the TWU IRB.

Sincerely,

Rhonda R. Buckley

Dr. Rhonda Buckley, Chair
Institutional Review Board - Denton

cc. Ronald Hovis, Department of Nutrition & Food Sciences

Institutional Review Board
Office of Research and Sponsored Programs
P.O. Box 425619, Denton, TX 76204-5619
940-898-3378
email: IRB@twu.edu
http://www.twu.edu/irb.html

DATE: October 2, 2014

TO: Ms. Jessica Barnes
Department of Nutrition & Food Sciences

FROM: Institutional Review Board - Denton

Re: Approval for Testing of Educational Materials to Increase Visual Exposure of MyPlate Foods in Preschoolers (Protocol #: 17811)

The above referenced study has been reviewed and approved at a fully convened meeting of the Denton Institutional Review Board (IRB) on 9/5/2014. This approval is valid for one year and expires on 9/5/2015. The IRB will send an email notification 45 days prior to the expiration date with instructions to extend or close the study. It is your responsibility to request an extension for the study if it is not yet complete, to close the protocol file when the study is complete, and to make certain that the study is not conducted beyond the expiration date.

If applicable, agency approval letters must be submitted to the IRB upon receipt prior to any data collection at that agency. A copy of the approved consent form with the IRB approval stamp is enclosed. Please use the consent form with the most recent approval date stamp when obtaining consent from your participants. A copy of the signed consent forms must be submitted with the request to close the study file at the completion of the study.

Any modifications to this study must be submitted for review to the IRB using the Modification Request Form. Additionally, the IRB must be notified immediately of any adverse events or unanticipated problems. All forms are located on the IRB website. If you have any questions, please contact the TWU IRB.

cc. Dr. Shane Broughton, Department of Nutrition & Food Sciences
Dr. Cynthia Warren, Department of Nutrition & Food Sciences
Graduate School

Institutional Review Board
Office of Research and Sponsored Programs
P.O. Box 425619, Denton, TX 76204-5619
940-898-3378
email: IRB@twu.edu
http://www.twu.edu/irb.html

DATE: December 18, 2014

TO: Ms. Jessica Barnes
Nutrition & Food Sciences

FROM: Institutional Review Board - Denton

Re: Notification of Approval for Modification for Testing of Educational Materials to Increase Visual Exposure of MyPlate Foods in Preschoolers (Protocol #: 17811)

The following modification(s) have been approved by the IRB:

1. Changed the original family information form which did take into accout nontraditional family units. "Caregiver Information" is used versus mother or father information.
2. Expanding recruitment areas to include Collin and Tarrant Counties.

cc. Dr. Cynthia Warren, Nutrition & Food Sciences

APPENDIX B

Prototype Development Informational Letter and Consent Form

January 28, 2013

Dear CARE Child Development Center Parents,

We are excited to be working with your child's class in the upcoming months on developing nutrition educational materials for preschoolers. A doctoral nutrition student from Texas Woman's University will visit your child's class two to three times a week in the upcoming months. During this time, your child's class will be engaged in informal discussions, playtime and activities revolving around the different MyPlate food groups. Throughout our visits to CARE Child Development Center, we hope to not only gain insight to the children's thoughts and perceptions about food but hopefully teach them about how healthy foods can help their bodies grow as well.

If you wish for your child to participate, please sign and return the consent form provided. If you do not wish for you child to participate, they will be engaged in other school activities during our visits.

If you have any questions about this research project, please contact:

Cynthia A. Warren, PhD
Assistant Professor
Department of Nutrition and Food Sciences
Texas Woman's University
email: CWarren2@twu.edu
Office: (940) 898-2647

Sincerely,

Cynthia Warren, PhD

TEXAS WOMAN'S UNIVERSITY
CONSENT TO PARTICIPATE IN RESEARCH

Title: Development and Testing of Educational Materials to Increase Visual Exposure of MyPlate Foods in Preschoolers

Investigator: Cynthia Warren, Ph.D.....cwarren2@twu.edu (940) 898-2647
Co-Investigator: Jessica Barnes, MS, RD, LD.....jessica.L.barnes@gmail.com

Explanation and Purpose of the Research

The purpose of this study is to develop educational materials regarding MyPlate foods (fruits, vegetables, grains, dairy and protein) using input from preschool children. Acceptance and consumption of foods from MyPlate will then be tested, after repeated visual exposure to these materials in your child's classroom, using plate waste analysis. Your child has been asked to be a part of this study because they attend CARE Child Development Center in Richardson (TX).

Description of Procedures
Educational materials will be developed using photographs of foods and input from preschoolers at CARE Child Development Center. During development of the educational materials, your child will be exposed to various pictures relating to fruits, vegetables, dairy, grains and proteins, as well as content surrounding it's growth, harvesting or function in the body. Through the use of play, informal focus group discussions, and activities with your child, the researchers will gain insight to their language and thoughts that will be incorporated into the books.

The materials developed will be tested using the students in your child's class. There will be five different books containing information regarding the different food groups (fruits, vegetables, proteins, dairy, and grains) that will be tested. Your child will be read each book by their classroom teacher, one at a time, for a period of two weeks. Before and after exposure to the materials, your child will participate in plate waste analysis. During this analysis, foods from a specific food group will be measured before and after consumption to determine the effectiveness of the educational materials on children's consumption of these foods.

Potential Risks
There is a potential loss of confidentiality. However, no information about your child, such as his or her name, will be shared with anyone outside the study. Confidentiality will be protected to the extent that is allowed by law. All records of the study will be kept locked in the researcher's office in the Old Main Building at TWU and will be destroyed within five years from the end of the study by shredding the documents.

There is a potential risk of loss of anonymity due to the nature of group discussions. However, all information will be collected anonymously; therefore, the information your child provides cannot be linked to their name or personal information.

Approved by the
Texas Woman's University
Institutional Review Board
Date: 1-18-13

_____
Initials

There is a potential risk of coercion to participate. However, you and your child will be free to decline participation at any time. If at any time your child feels tired (fatigue) or uncomfortable (emotional discomfort), their teacher will comfort your child. Your child's participation or lack of participation, will not impact your child's experiences at the school, nor will it impact their relationship with researchers or TWU.

There is a potential risk of your child feeling uncomfortable working with researchers during playtime, focus groups and plate waste analysis. If this happens, your child will be allowed to leave at any time during the research process.

The researchers will try to prevent any problems that could happen because of this research study. However, TWU does not provide medical services or financial assistance for injuries that might happen because your child is taking part in this research.

Participation and Benefits

Participation is voluntary. A decision not to participate will not affect the current or future relationship with your child's school or Texas Woman's University. Your child will receive a $10 gift certificate to Barnes and Noble for participation in this study.

Questions Regarding the Study

You will be given a copy of this signed and dated consent to keep. If you have any questions about this study, you can call the researcher listed at the top of this form. If you have any questions about the way this study has been conducted. You may contact the Texas Woman's University Office of Research and Sponsored Programs at 940-898-3378 or by e-mail at:

By signing this document, you give consent for your child to participate in this study.

_____ _____

Your child's name Date

_____ _____

Parent/Guardian Signature Date

Approved by the
Texas Woman's University
Institutional Review Board
Date: 1-18-13

APPENDIX C

Prototype Pilot Test Informational Letter and Consent Form

January 28, 2013

Dear CARE Child Development Center Parents,

We are excited to be working with your child's class in the upcoming months as we test nutrition educational materials for preschoolers. Your child's class will be read a book providing information on one of the MyPlate food groups once a day for two weeks. Before and after the reading of these books, consumption of a specific food will be evaluated. The foods being tested will be served during your child's normal lunch and will appear as a regular food item on their plate.

If you wish for your child to participate, please sign and return the consent form provided. If you do not wish for you child to participate, they will be engaged in other school activities during the readings of the books and data from their food consumption will not be collected.

If you have any questions about this research project, please contact:

Cynthia A. Warren, PhD
Assistant Professor
Department of Nutrition and Food Sciences
Texas Woman's University
email: CWarren2@twu.edu
Office: (940) 898-2647

Sincerely,

Cynthia Warren, PhD

TEXAS WOMAN'S UNIVERSITY
CONSENT TO PARTICIPATE IN RESEARCH

Title: Development and Testing of Educational Materials to Increase Visual Exposure of MyPlate Foods in Preschoolers

Investigator: Cynthia Warren, Ph.D.....cwarren2@twu.edu (940) 898-2647
Co-Investigator: Jessica Barnes, MS, RD, LD.....jessica.L.barnes@gmail.com

Explanation and Purpose of the Research

The purpose of this study is to develop educational materials regarding MyPlate foods (fruits, vegetables, grains, dairy and protein) using input from preschool children. Acceptance and consumption of foods from MyPlate will then be tested, after repeated visual exposure to these materials in your child's classroom, using plate waste analysis. Your child has been asked to be a part of this study because they attend CARE Child Development Center in Richardson (TX).

Description of Procedures
Educational materials will be developed using photographs of foods and input from preschoolers at CARE Child Development Center. During development of the educational materials, your child will be exposed to various pictures relating to fruits, vegetables, dairy, grains and proteins, as well as content surrounding it's growth, harvesting or function in the body. Through the use of play, informal focus group discussions, and activities with your child, the researchers will gain insight to their language and thoughts that will be incorporated into the books.

The materials developed will be tested using the students in your child's class. There will be five different books containing information regarding the different food groups (fruits, vegetables, proteins, dairy, and grains) that will be tested. Your child will be read each book by their classroom teacher, one at a time, for a period of two weeks. Before and after exposure to the materials, your child will participate in plate waste analysis. During this analysis, foods from a specific food group will be measured before and after consumption to determine the effectiveness of the educational materials on children's consumption of these foods.

Potential Risks
There is a potential loss of confidentiality. However, no information about your child, such as his or her name, will be shared with anyone outside the study. Confidentiality will be protected to the extent that is allowed by law. All records of the study will be kept locked in the researcher's office in the Old Main Building at TWU and will be destroyed within five years from the end of the study by shredding the documents.

There is a potential risk of loss of anonymity due to the nature of group discussions. However, all information will be collected anonymously; therefore, the information your child provides cannot be linked to their name or personal information.

Approved by the
Texas Woman's University
Institutional Review Board
Date: 1-18-13

_____
Initials

There is a potential risk of coercion to participate. However, you and your child will be free to decline participation at any time. If at any time your child feels tired (fatigue) or uncomfortable (emotional discomfort), their teacher will comfort your child. Your child's participation or lack of participation, will not impact your child's experiences at the school, nor will it impact their relationship with researchers or TWU.

There is a potential risk of your child feeling uncomfortable working with researchers during playtime, focus groups and plate waste analysis. If this happens, your child will be allowed to leave at any time during the research process.

The researchers will try to prevent any problems that could happen because of this research study. However, TWU does not provide medical services or financial assistance for injuries that might happen because your child is taking part in this research.

Participation and Benefits

Participation is voluntary. A decision not to participate will not affect the current or future relationship with your child's school or Texas Woman's University. Your child will receive a $10 gift certificate to Barnes and Noble for participation in this study.

Questions Regarding the Study

You will be given a copy of this signed and dated consent to keep. If you have any questions about this study, you can call the researcher listed at the top of this form. If you have any questions about the way this study has been conducted. You may contact the Texas Woman's University Office of Research and Sponsored Programs at 940-898-3378 or by e-mail at:

By signing this document, you give consent for your child to participate in this study.

_____ _____
Your child's name Date

_____ _____
Parent/Guardian Signature Date

Approved by the
Texas Woman's University
Institutional Review Board
Date: 1-18-13

APPENDIX D

Focus Group Recruitment Flyer and Informational Letter

Volunteers Needed!

To participate in a **Focus Group discussion**

Concerning nutrition education materials to be used child care centers

Research participants will receive a $20 gift card to Target and FREE FOOD!

Saturday, March 1st or

Saturday, March 8th

To participate in one of the 90-minute focus group discussions come at **8 am** or **10 am**

Old Main Building on TWU campus, room 300 – see map

RSVP: twu.child.care.research@gmail.com

There is potential loss of confidentiality in all email, downloading, and internet transactions

January 28, 2013

Dear CARE Child Development Center Teachers,

We have enjoyed working with your classes over the past few months during our development and testing of nutrition educational materials. We would like hear your input on the project overall, how you feel it has affected the students and also provide input on the final products, the books that were developed. Please join us for a focus group on _____ at _____. We will provide some treats as a thank you for your time and input.

This focus group is completely voluntary. We hope that you will come and provide your insight.

If you have any questions about this research project, please contact:

Cynthia A. Warren, PhD
Assistant Professor
Department of Nutrition and Food Sciences
Texas Woman's University
email: CWarren2@twu.edu
Office: (940) 898-2647

Sincerely,

Cynthia Warren, PhD

APPENDIX E

Focus Group Consent Form

TEXAS WOMAN'S UNIVERSITY
CONSENT TO PARTICIPATE IN RESEARCH

Title: Development and Testing of Educational Materials to Increase Visual Exposure of MyPlate Foods in Preschoolers

Investigator: Cynthia Warren, PhD, (940) 898-2647, cwarren2@twu.edu
Co-Investigator: Jessica Barnes, MS, RD, LD.....jessica.L.barnes@gmail.com

Explanation and Purpose of the Research

The purpose of this study is to gather input from childcare providers regarding previously developed nutrition education materials for preschoolers. You have been asked to participate because you an employee of a child care center in Denton County, TX.

Description of Procedures

As a participant in this study, you will be asked to spend approximately 90 minutes of your time in a focus group discussion with other child care staff. You will be asked to review previously developed food group books for preschoolers. Following that time, you will be asked to offer your thoughts, concerns and opinions related to the material's cognitive level, appropriateness of information covered and overall likeability. This focus group discussion will be audio recorded and then transcribed verbatim. Hand written notes will also be taken during the discussion.

Potential Risks

All information is collected anonymously; therefore, the information you provide cannot be linked to your name or personal information. However, due to the nature of focus group discussions, anonymity cannot always be assured.

This study is confidential; meaning none of the information collected from you will not have your name linked to it. There is a potential risk of loss of confidentiality in all e-mail, downloading, and internet transactions. Confidentiality will be protected to the extent that is allowed by law.

You are free to refuse any question you do not feel comfortable answering (emotional discomfort) or you feel tired (fatigues). You may leave the focus group discussion at any time.

All records of the study will be kept locked in the researcher's office in the Old Main Building at TWU and will be destroyed within five years from the end of the study by shredding the documents. Information collected from you may be reported in scientific journals or in conference presentation but your name or any other identifying information will not be included.

Participation and Benefits

Participation is voluntary. At the end of the focus group, you will be given a $20 gift card. A decision not to participate will not affect your current or future relationship with Texas Woman's University.

Questions Regarding the Study

You will be given a copy of this signed and dated consent to keep. If you have any questions about this study, you can call the researcher at listed at the top of this form. If you have any questions about the way this study has been conducted, you may contact the Texas Woman's University Office of Research and Sponsored Programs at 940-898-3378 or by e-mail at: irb@twu.edu.

By signing this document, you give your consent to participate in this study.

_____

Participant's signature

_____

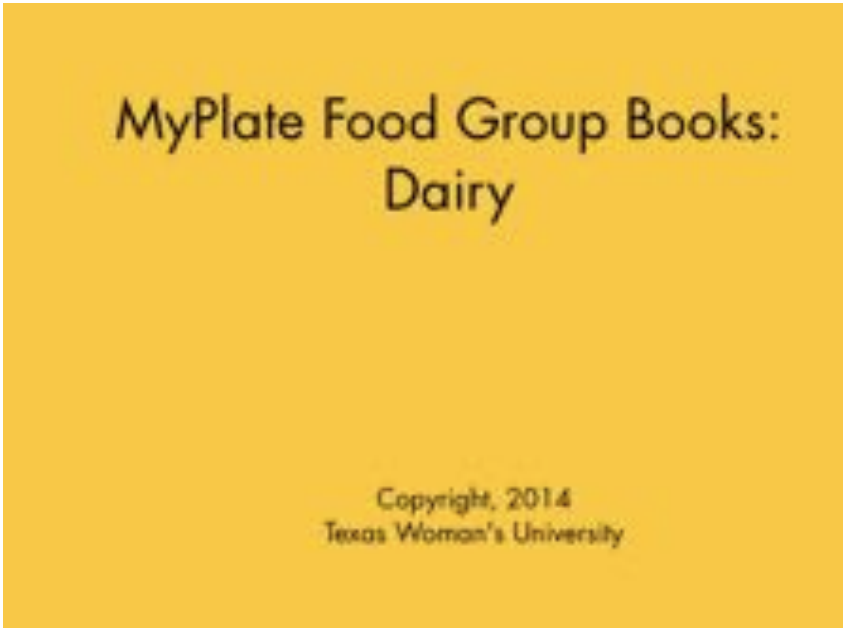
Date

APPENDIX F

Final Dairy Book


Dairy

Cover


MyPlate Food Group Books:
Dairy
Copyright, 2014
Texas Woman's University

Dairy foods help make a healthy plate.
We need to eat and drink them every
day to help our bodies grow!

2

We drink some dairy foods,
like milk.

3

And we eat others,
like cheese, yogurt and cottage cheese

4

Even though all of our dairy foods are made from milk, they can have very different tastes and textures.

5

Some dairy foods are lumpy,
like cottage cheese.

Others are smooth.

Yogurt

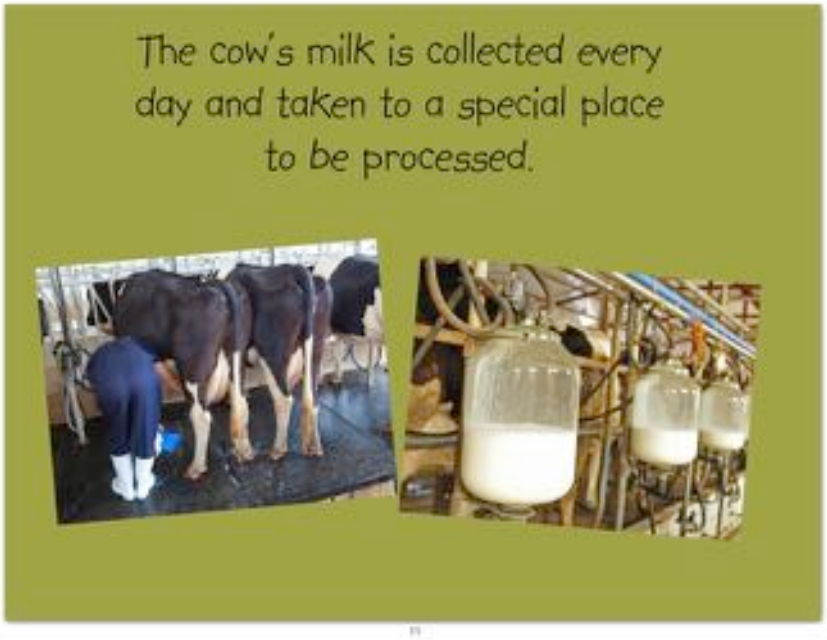
Milk

Ice cream


Some can be a little bit chewy.
Cheese


Most of the dairy foods we eat or drink come from milk made by cows.


Dairy farmers take care of
the cows.

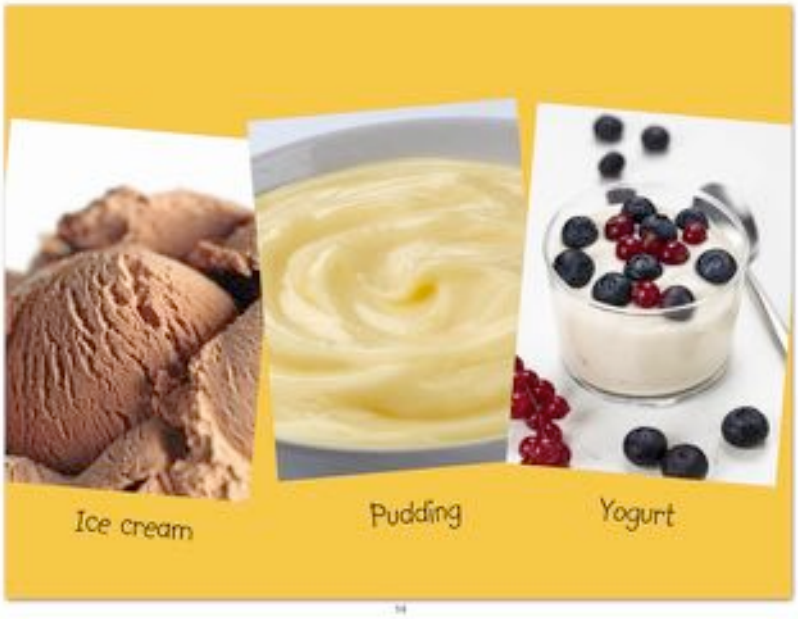

The cow's milk is collected every
day and taken to a special place
to be processed.


After processing, milk can be sold in a store.

12


Milk is also used to make other dairy foods.
Cheese sticks
Cheese cubes
Cottage cheese

13


Ice cream
Pudding
Yogurt


Dairy foods like ice cream and pudding have a lot of sugar. Instead of eating these foods every day, they should be special treats.

Eating and drinking dairy foods helps our bodies grow and stay strong!

16

Did you know that we have 206 bones in our bodies? We need calcium from dairy to help them grow big and strong!

17

Our teeth also need nutrients from dairy foods to stay strong.

The vitamins and minerals from dairy foods help our muscles move so we can exercise and play with our friends.

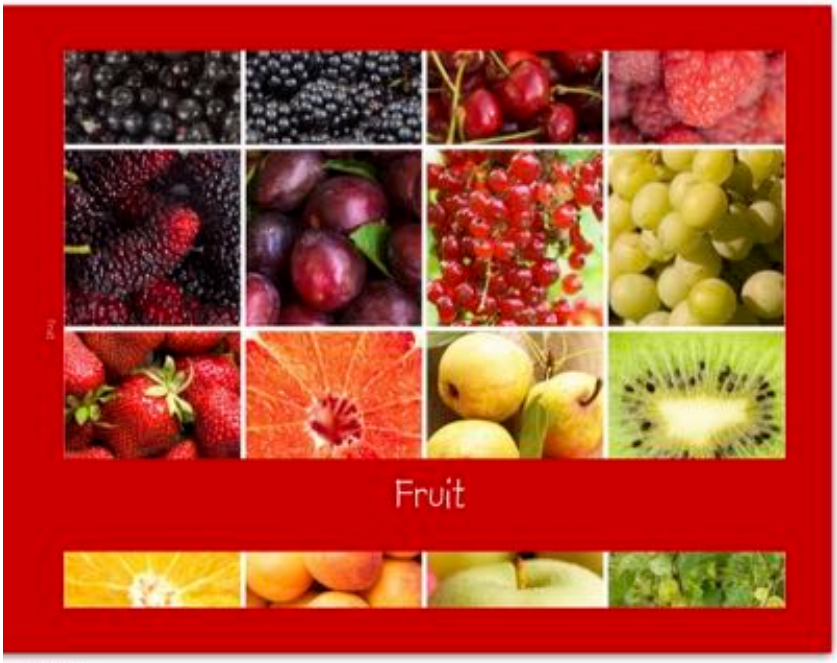
20


Fruits
Grains
Dairy
Vegetables
Protein
ChooseMyPlate.gov
Remember to eat dairy foods every day to help your body grow!

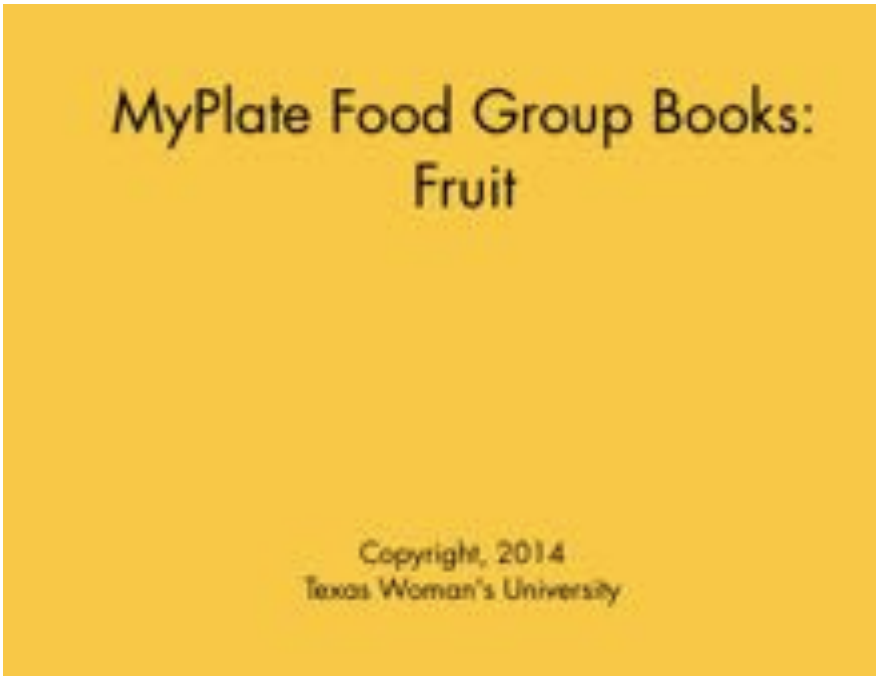
21

APPENDIX G

Final Fruit Book


Fruit

Cover


MyPlate Food Group Books:
Fruit
Copyright, 2014
Texas Woman's University

Fruits help make a healthy plate. We need to eat them every day to help our bodies grow!

2

There are many kinds of fruit for us to eat.
They come in all different colors, shapes, and sizes.
Each fruit has a different taste and texture too!

3

4

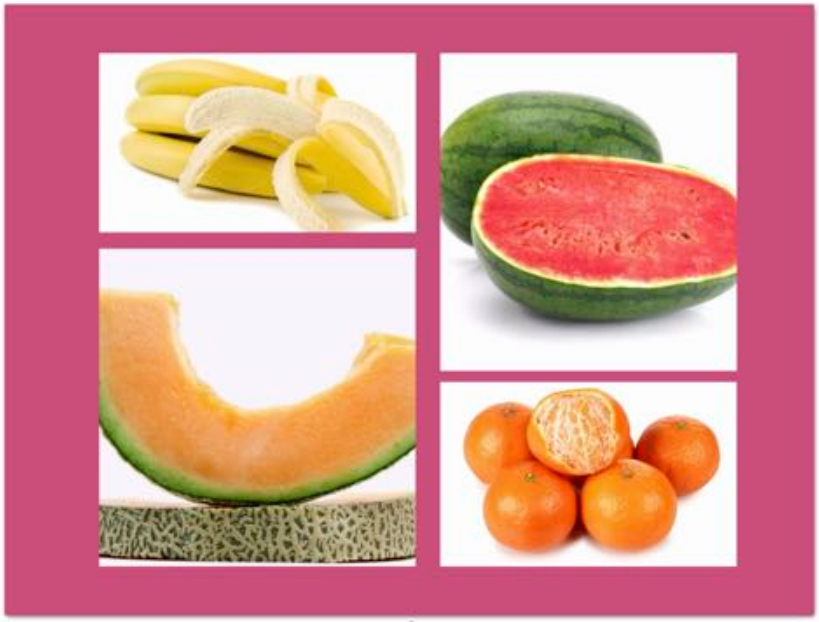
5

6

7

Did you know that
some fruits need to
have their peels taken
off before we can eat
the inside part?

8



9


Some fruits have their water taken out to make dried fruit for us to eat.
When grapes are dried, they turn into raisins!
10


We can also take out the juice of different fruits for us to drink.
11


Fruits come in many colors, just like a rainbow.
We need to eat all of the different colored fruits to help our bodies grow!

12


Some fruits have seeds on the inside and others have seeds on the outside.

13

We plant the seeds to grow more fruit!

14

Some fruits grow on trees.

Orange tree

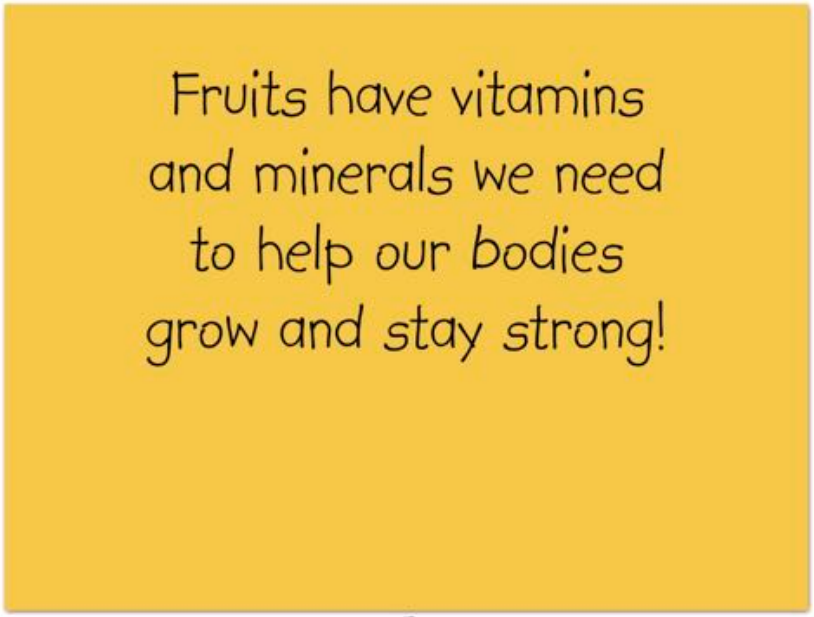
Peach tree

Apple tree

15


Others grow on bushes and vines.
Blackberry bush
Strawberry plant
Picking berries
Watermelon vine
Canteloupe vine
Grape vine

16


Fruits have vitamins
and minerals we need
to help our bodies
grow and stay strong!

17

18

Fruits also have fiber to keep our tummies full and hearts healthy.

They give us lots of energy so we can learn in school and play with our friends!

19

20


Fruits
Grains
Dairy
Vegetables
Protein
ChooseMyPlate.gov
Remember to eat fruit every day to help your body grow!

21

APPENDIX H

Final Grain Book

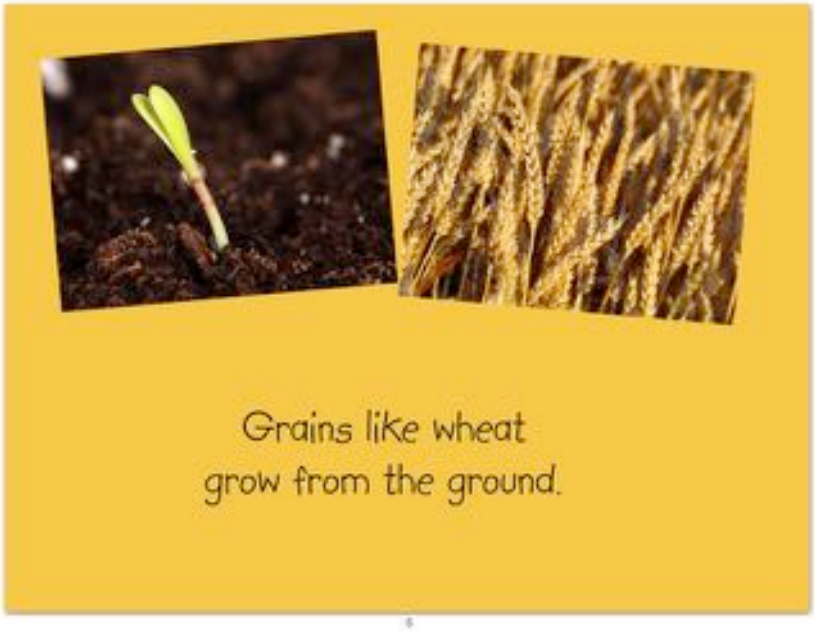
Cover

MyPlate Food Group Books: Grain


Fruits
Grains
Dairy
Vegetables
Protein
ChooseMyPlate.gov
Grains help make a healthy plate.
We need to eat them
every day to help our bodies grow!


There are lots of different grains
we can cook and eat. These are just a few
Wheat
Rice


Oats
Buckwheat
Corn


Grains like wheat
grow from the ground.

Once the grains are big enough,
they can be harvested by farmers
and used to make foods for us to eat!

Grains of wheat
are ground into flour
to make foods like
pasta, bread, cereal,
and more.

Pasta

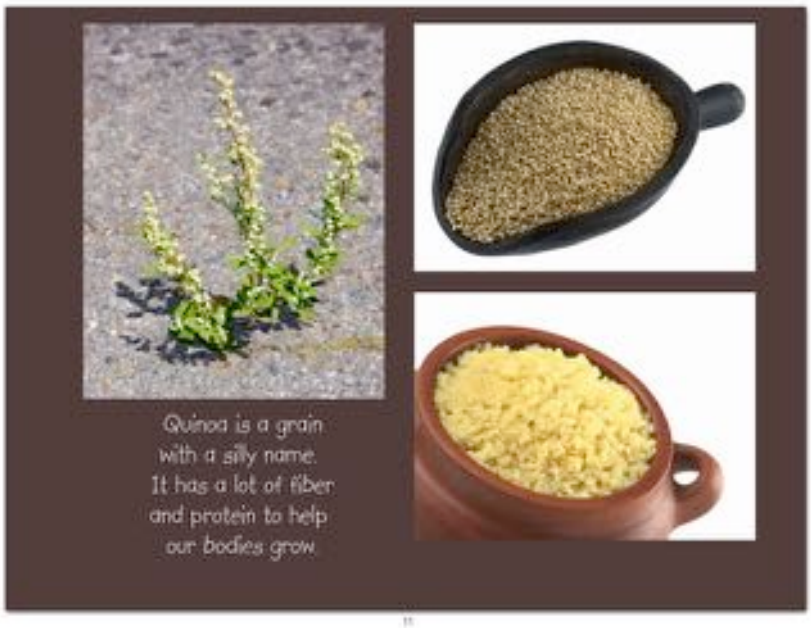
Bread

Cereal


After oats are picked, they can be used to make foods like oatmeal and baked in breads and granola bars.
Oatmeal
Raw oats for baking
Granola Bars
8

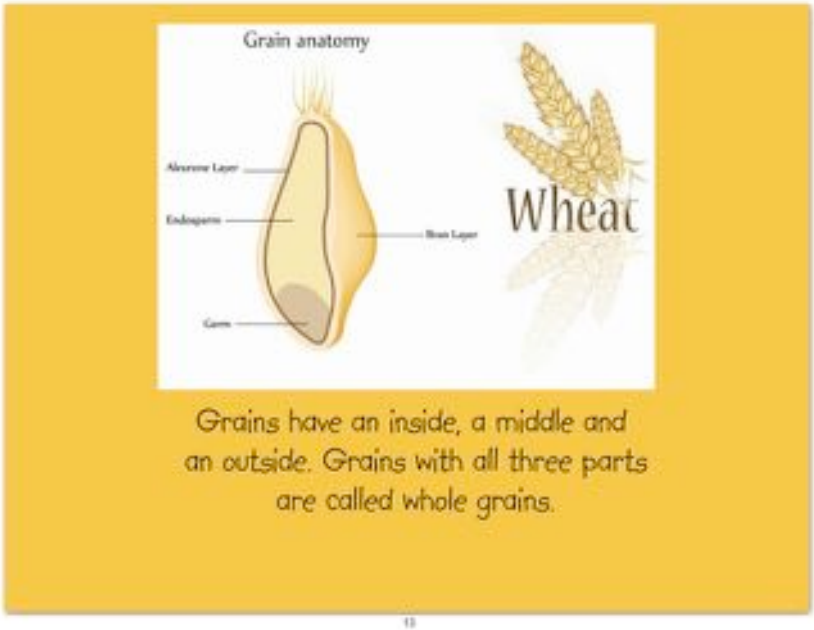

Corn can be dried and popped into popcorn. It can also be ground into cornmeal and used to make corn tortillas or cornbread
Corn tortilla
Popcorn
Cornbread
9


Rice is hard when harvested.
When you cook it in water,
it softens so you can eat it. Rice can also
be used to make noodles.
White rice
Brown rice
10


Quinoa is a grain
with a silly name.
It has a lot of fiber
and protein to help
our bodies grow.
11


Here are a few more examples of grain foods.

12


Grain anatomy
Wheat
Grains have an inside, a middle and an outside. Grains with all three parts are called whole grains.

13

Sometimes, parts of the grain are taken away before it is turned into food. Foods made with whole grains are the healthiest of the grain foods.

Whole grain foods can be darker than grain foods that are not whole. Can you tell which bread is made from whole grains?

14

Whole grain foods have many vitamins and minerals to help our bodies grow.

They also have fiber.
It is important to eat fiber to help keep our hearts and tummies healthy.

The next page has more examples of whole grain foods.
Starting from the top: popcorn, brown rice, whole wheat rolls, and whole wheat pasta.

15


Grains give us energy to help our bodies move and play!

Grains keep our
tummies full
so we can focus
and learn in school.

20


Fruits
Grains
Dairy
Vegetables
Protein
ChooseMyPlate.gov
We need to eat whole grains every day to help our bodies grow!

21

APPENDIX I

Final Protein Book

Cover

MyPlate Food Group Books: Protein

Proteins help make
a healthy plate.
We need to eat protein every day
to help our bodies grow!

2

There are a lot of foods
that contain protein,
but foods containing
the most protein are
meat, nuts, beans, and eggs.

3


Some protein foods are crunchy,
like nuts.
Cashews
Almonds
Peanuts


Some are soft when you eat them
Fish
Eggs

Some might even be a little bit chewy.

Chicken

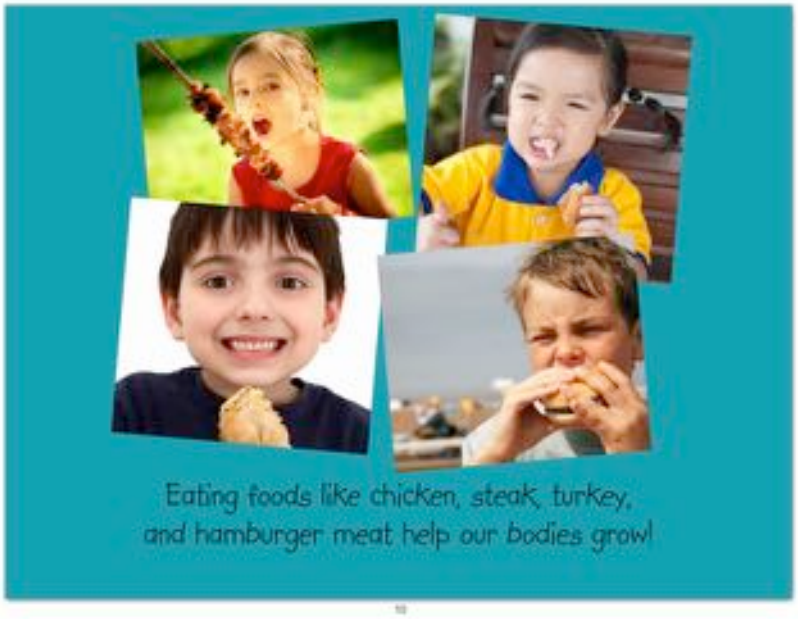
Beef

Some protein foods have hard shells
that have to be removed before
we can eat them.

Seafood, like crabs and
clams, have shells.


Different nuts,
like pistachios and walnuts,
need their shells removed
before we can eat them.


Meat that we eat comes from animals
like chicken and cows.


Eating foods like chicken, steak, turkey,
and hamburger meat help our bodies grow!


Some meats, like seafood, come from
rivers, lakes and the ocean.
Lobster
Shrimp
Salmon

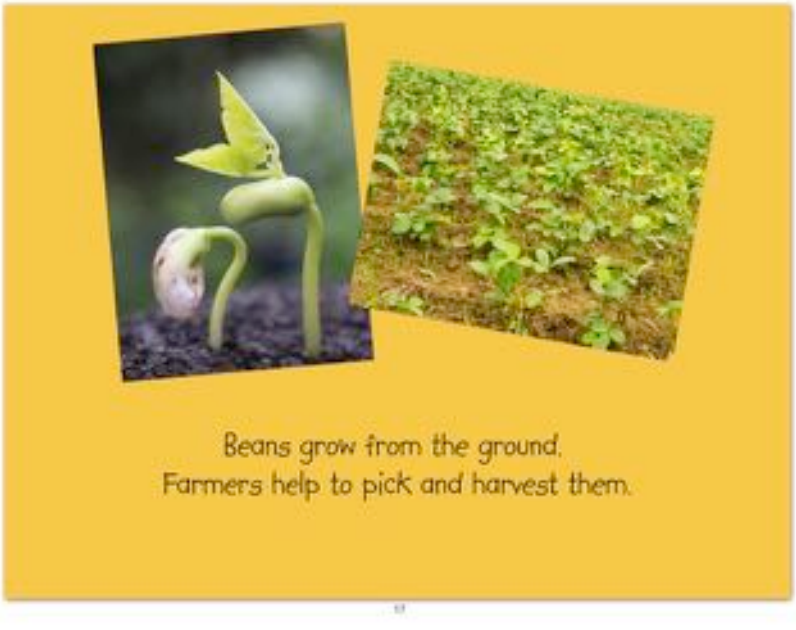

Fishermen use boats, nets, and fishing
poles to catch fish and other seafood.

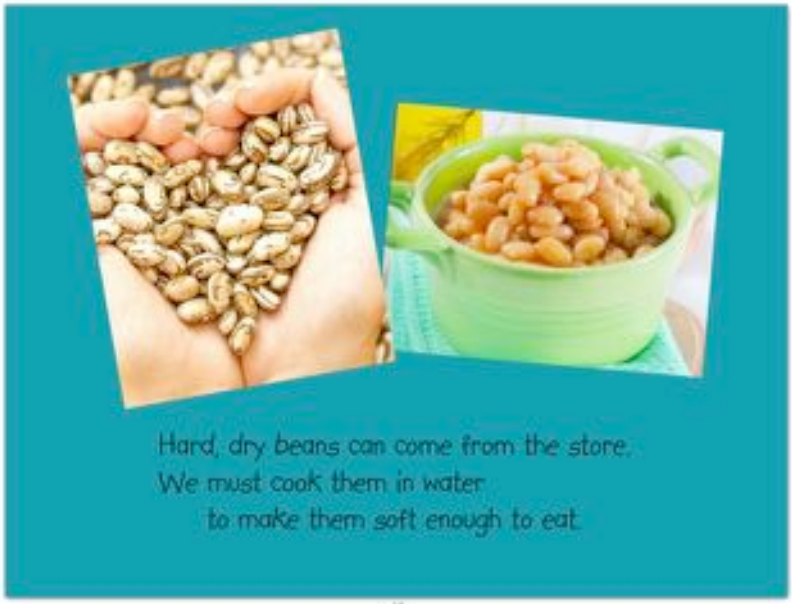

Chickens make eggs for us to eat.
Farmers collect the eggs and
take them to the store for us to buy.


We buy eggs from the store and take them
home to cook and eat.


Did you know
some protein foods, like peanuts,
grow under the ground?


Other nuts grow on trees.
Almonds
Pecans
Cashews
Walnuts


Beans grow from the ground.
Farmers help to pick and harvest them.



Protein foods can look very different before we cook them.


Raw
chicken
Cooked
chicken


Raw eggs
Fried eggs
Hard boiled eggs

Peanuts are often mashed up
together to make peanut butter.

Protein helps our bodies and
muscles grow to be big and strong!


Our bodies and muscles need to be strong so we can be active and play with our friends!

24


Fruits
Grains
Dairy
Vegetables
Protein
ChooseMyPlate.gov
We need to eat protein every day to help our bodies grow!

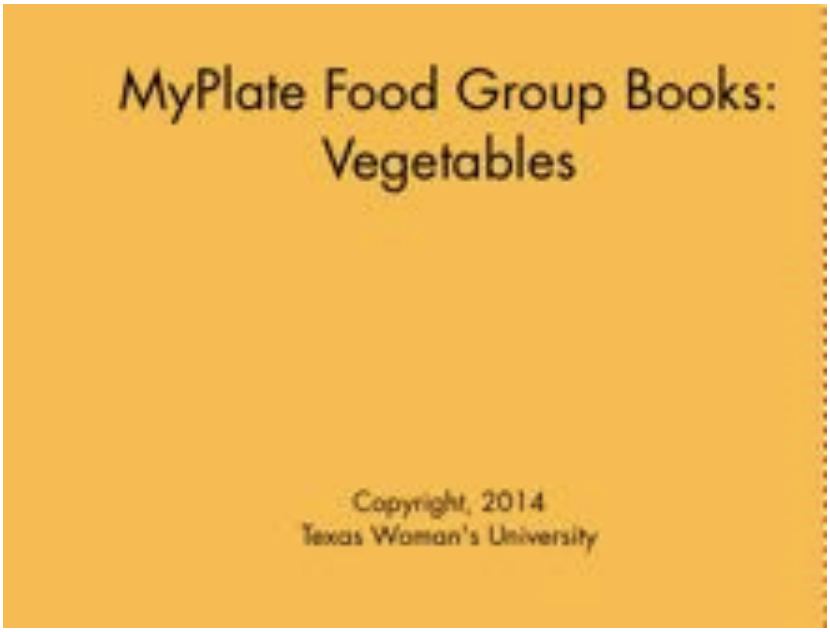
25

APPENDIX J

Final Vegetable Book


Vegetables

Cover


MyPlate Food Group Books:
Vegetables
Copyright, 2014
Texas Woman's University

Vegetables help make up a healthy plate.
We need to eat them every day to help our bodies grow!

2

Vegetables come in different shapes and sizes!

Asparagus

Carrots

Some are long and thin,

3

while others may be short and round.

Tomato

Brussels Sprouts

4

Some vegetables are BIG

Butternut Squash

Eggplant

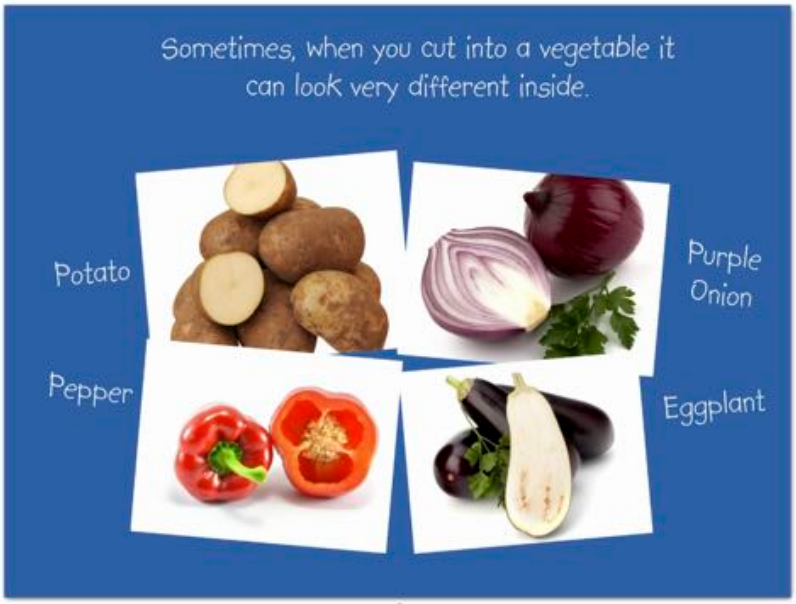
5


and others are little.
Black eyed peas
Green Peas

6


Did you know there are vegetables shaped like trees and hats?
Broccoli
Mushrooms

7


Sometimes, when you cut into a vegetable it
can look very different inside.
Potato
Purple
Onion
Pepper
Eggplant

8


Vegetables can be grown in small gardens in
our own backyard or school,
or in our community!

9

They also come from large farms.
Farmers work to grow a lot of vegetables
for us to eat and help our bodies grow!

10

Some vegetables grow straight from the ground.

Lettuce

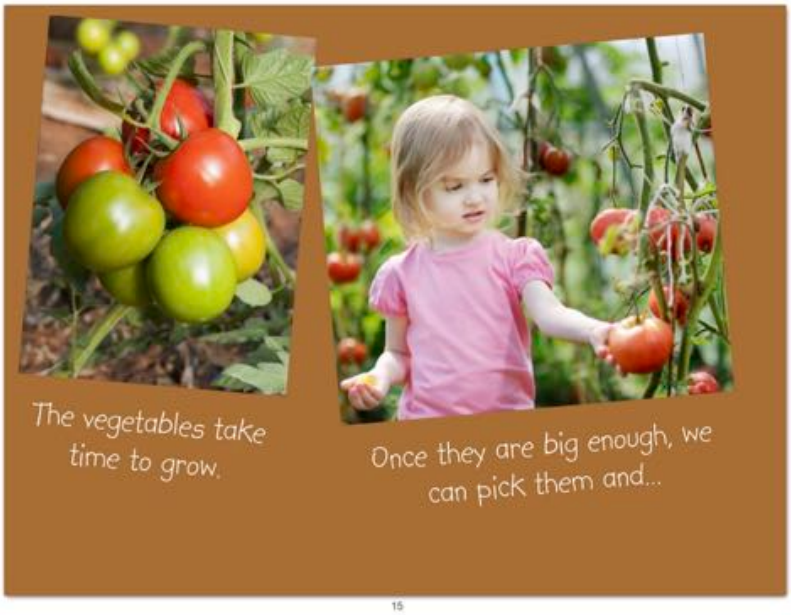
Asparagus

11


Others grow on vines and bushes.
Peas
Eggplant
Broccoli
12


Vegetables start off as tiny seeds.
The seeds need to be planted in the ground.
13


Soon, the seeds grow into little plants.
When the plants get big and strong, they can grow vegetables!
14


The vegetables take time to grow.
Once they are big enough, we can pick them and...
15

eat them!!

16

Once the farmer picks his vegetables, he can take them to the store or farmers market.

17


We can buy our vegetables at the store or
farmers market and take them home
to eat them!
18


Vegetables have vitamins and
minerals that help us grow
from babies to big kids.
19

They help our bodies grow big and strong

and have fiber to keep our tummies full and our hearts healthy.

20

Vegetables of different colors have different vitamins and minerals to help our bodies grow. We need to eat all of the different colors of vegetables every day!

21


Red Bell Pepper
Carrot
Corn
Broccoli
Beet
Black eyed peas
Tomato
Butternut Squash
Yellow Bell Pepper
Green Beans
Radish
Mushroom

22


Fruits
Grains
Dairy
Vegetables
Protein
ChooseMyPlate.gov
Remember to eat vegetables every day to help your body grow!

23

APPENDIX K

Prototype Testing Host Center Recruitment Email

Hello,

My name is Jessica Barnes and I am a doctoral student with TWU's Nutrition and Food Sciences department. We are starting a research project that will look at how newly developed MyPlate food group books will impact the behavior and food habits of preschool aged children. These books were designed to supplement current curriculums or even stand on their own as a nutrition teaching tool. They were developed with the cognitive needs of this age group in mind.

Here is just some general information about how the project will go:

- Various types of childcare centers will eligible to host the study. Three and four year old children will be asked to take part in the project. We will have to obtain consent from parents.

- For the basic intervention, teachers will read one food group book to students, once a day for two weeks. After that, they will keep the book in the classroom and be asked to use it however feels natural; meaning the teacher gets to pick when, how and how often the books are used. They will be asked to document how they did this.
- At three time points (before the intervention, after the two week readings, and after the 12 week natural environment), you will be asked to take pictures of the student meals and snacks before and after consumption. This will be done for two days at each time point.
- All necessary materials will be provided: cameras, consent forms, books, etc. We will do our best to make the entire process as simple as possible for all involved.
- At the end of the study, all centers will receive a set of all five food group books. Individual teachers involved will receive a basket of food models for their classroom.

We would love to have you and your center participate in this fun research study. If you are interested, please contact me at jessica.l.barnes@gmail.com for more information.

Thank you,
Jessica Barnes, MS, RDN, LD

APPENDIX L

Prototype Testing Informational Letter and Consent Form

October 2014

Dear Parents,

We are excited to be working with your child's class in the upcoming months as we test nutrition educational materials developed for preschoolers. Your child's class will be read a book providing information on one of the MyPlate food groups (fruit, vegetable, dairy, grain or protein) once a day for two weeks. Following this, teachers will be allowed to use the books in your child's class as they see fit for an twelve-week period. If you choose to allow your child to participate, you will be asked to do the following:

- Complete a Home Food Inventory at the beginning and end of the study
- At three different times, you will be asked to take pictures of your child's meals, before and after eating, for three days and email them to researchers.
- You will be asked to complete a brief survey about your child's eating behavior two times throughout the study.

In order to compensate you for your time, you and your family will receive a nutrition packet with helpful nutrition information and tips.

If you wish for your child to participate, please sign and return the consent form in the folder provided. If you do not wish for you child to participate, they will be engaged in other school activities during the readings of the books and data from their food consumption will not be collected.

If you have any questions about this research project, please contact:

Jessica Barnes, MS, RDN, LD
Graduate Research Assistant
Doctoral Candidate
Department of Nutrition and Food Sciences
Texas Woman's University
email: jlgarner1@twu.edu

Sincerely,

Jessica Barnes, MS, RDN, LD

There is a potential loss of confidentiality in all email, downloading, and internet transactions.

TEXAS WOMAN'S UNIVERSITY
CONSENT TO PARTICIPATE IN RESEARCH

Title: Testing of Educational Materials to Increase Visual Exposure of MyPlate Foods in Preschoolers: Child Consent Form

Investigator: Jessica Barnes, MS, RDN, LD.....jessica.L.barnes@gmail.com

Co-Investigator: Cynthia Warren, Ph.D.....cwarren2@twu.edu (940) 898-2647

Explanation and Purpose of the Research

The purpose of this study is to test the effectiveness of educational materials regarding MyPlate foods (USDA-FNS). Acceptance and consumption of foods from MyPlate will be measured, after repeated visual exposure to these educational materials, using photographic food diaries. Your child has been asked to be a part of this study because they attend a childcare center within Denton County.

Description of Procedures

Educational materials that were developed using input from preschoolers will be tested using the students in your child's class. Your child will be placed in one of six different groups: vegetable book, fruit book, grain book, dairy book, protein book, or no book. If in one of the book groups, your child will be read a designated food group book for a period of two weeks at their childcare center. If your child is placed in the "no book" group, no intervention will occur. After the initial two weeks, the childcare center teacher will be allowed to use the books as they see fit in their classrooms for twelve weeks. At three time points, you will be instructed to take photographs of your child's meals for three days using your cell phone. Photographs will be emailed to researchers. If you do not have a cell phone with picture and email capabilities, a disposable camera will be provided. You will also be asked to provide a Home Food Inventory at the start and end of the study. You will be asked to complete brief survey after the initial two weeks and follow-up twelve-week intervention. Overall, the project will take approximately 7 hours of your time and 12.5 hours of your child's time. This occurs over a 17-week period.

Potential Risks
All information will be collected confidentially. There is a potential risk of loss of confidentiality since your child's name will be on written documents, computer records and photographs of meals taken.

There is a potential risk of loss of confidentiality in all email, downloading, and Internet transactions. Confidentiality will be protected to the extent that is allowed by law.

There is a potential risk of loss of anonymity in doing this research. Parent and student names will only exist on their consent forms, which will be kept in a locked file cabinet. Every effort will be made to maintain the anonymity of all collected data by assigning code numbers to the students. There is potential risk of loss of anonymity in all email, downloading, and internet transactions. Anonymity will be protected to the extent allowable by law.

You are free to withdraw your child from the study at any time.

_____
Please Initial

Approved by the
Texas Woman's University
Institutional Review Board
Date: 9-5-14

Your child will be free to decline participation at any time and provided an alternative activity by their teacher.

The researchers will try to prevent any problem that could happen because of this research. You should let the researchers know at once if there is a problem and they will help you. However, TWU does not provide medical services or financial assistance for injuries that might happen because you are taking part in this research.

Participation and Benefits

Participation is voluntary. A decision not to participate will not affect the current or future relationship with your child's school or Texas Woman's University. Should you choose to participate, your family will be given a nutrition education packet which will include healthy eating and shopping tips for the family. Throughout the study, children will receive stickers for participating.

Questions Regarding the Study

You will be given a copy of this signed and dated consent to keep. If you have any questions about this study, you can contact the researcher listed at the top of this form or Texas Woman's University Office of Research and Sponsored Programs at 940-898-3378 or by e-mail at: irb@twu.edu.

By signing this document, you give consent for your child to participate in this study.

_____ _____
Your child's name (please print) Date

_____ _____
Parent/Guardian Signature Date

Approved by the
Texas Woman's University
Institutional Review Board
Date: 9-5-14

APPENDIX M

Natural Teaching Environment Documentation Form

November						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1
2	3 Begin Teacher Guided book exposure	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

Please use the calendar above to mark how and when you used the MyPlate food group book in your classroom. Use the lines below to explain why you chose this method.

December						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

Please use the calendar above to mark how and when you used the MyPlate food group book in your classroom. Use the lines below to explain why you chose this method.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

January						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23 End Teacher Guided book exposure	24
25	26	27	28	29	30	31

Please use the calendar above to mark how and when you used the MyPlate food group book in your classroom. Use the lines below to explain why you chose this method.

APPENDIX N

Family Information Questionnaire

Family Information Form: Please provide us with some additional information about yourself and your family. This form is completely optional, but will help researchers when reviewing data.

How many children live in your household?

1 ❒
2 ❒
3 ❒
4 ❒
5+ ❒

Average yearly household income:

<$20,000 ❒
$20,000-$29,999 ❒
$30,000-$39,999 ❒
$40,000-$49,999 ❒
$50,000-$59,999 ❒
$60,000-$69,999 ❒
$70,000-$79,999 ❒
$80,000-$89,999 ❒
$90,000-$99,999 ❒
>$100,000 ❒

Who is your children's primary care giver?

Father ❒
Mother ❒
Grandparent ❒
Other ❒

Who shops for food for your family?

Father ❒
Mother ❒
Grandparent ❒
Other ❒

Primary Caregiver Information

Age:

18-25 years ❒
26-35 years ❒
36-45 Years ❒
46-55 Years ❒
> 55 Years ❒

Gender

Male ❒
Female ❒

Ethnicity:

Hispanic/Latino ❒
Non-Hispanic/Latino ❒

Relationship to child

Mother ❒
Father ❒
Grandparent ❒

Other _____

Race:

American Indian/Alaskan Native ❒
Asian ❒
Black ❒
Native Hawaiian/Pacific Islander ❒
White ❒

Primary Caregiver Information Continued

Are you currently:

Employed for wages ❒
Self-employed ❒
Out of work and looking for work ❒
Out of work but not looking for work ❒
A homemaker ❒
A student ❒
Retired ❒
Unable to work ❒

Level of education:

Some High School ❒
High school graduate ❒
Some college ❒
College graduate ❒
Other _____

Additional Caregiver Information

Age:
18-25 years ❒
26-35 years ❒
36-45 Years ❒
46-55 Years ❒
> 55 Years ❒

Race:
American Indian/Alaskan Native ❒
Asian ❒
Black ❒
Native Hawaiian/Pacific Islander ❒
White ❒

Relationship to child

Mother ❒
Father ❒
Grandparent ❒
Other _____

Level of education:

Some High School ❒
High school graduate ❒
Some college ❒
College graduate ❒
Other _____

Gender
Male ❒
Female ❒

Ethnicity:
Hispanic/Latino ❒
Non-Hispanic/Latino ❒

Are you currently:

Employed for wages ❒
Self-employed ❒
Out of work and looking for work ❒
Out of work but not looking for work ❒
A homemaker ❒
A student ❒
Retired ❒
Unable to work ❒

APPENDIX O

Child Information Questionnaire

Child Information Form: Please provide us with some additional information about your child. This form is completely optional, but will help researchers when reviewing data.

Age:

3 years old ❒
4 years old ❒
5 years old ❒

Ethnicity:

Hispanic/Latino ❒
Non-Hispanic/Latino ❒

Gender

Male ❒
Female ❒

Race:

American Indian/Alaskan Native ❒
Asian ❒
Black ❒
Native Hawaiian/Pacific Islander ❒
White ❒
Other _____

Does your child have any favorite foods? If so, please let us know what it is!

_____

_____

_____

_____

APPENDIX P

Post-Intervention Child Behavior Questionnaire

Please think back on the past two weeks and answer the following questions.

Over the past two weeks, has your child been willing to try new foods?

❒ Yes ❒ No

Over the past two weeks, how often has your child asked to be served fruit?

❒ None ❒ 1-2 times ❒ 3-4 times ❒ 5-6 times ❒ > 7 times

Over the past two weeks, how often has your child asked to be served vegetables?

❒ None ❒ 1-2 times ❒ 3-4 times ❒ 5-6 times ❒ > 7 times

Over the past two weeks, how often has your child asked to be served dairy foods (milk, cheese, yogurt, etc.)?

❒ None ❒ 1-2 times ❒ 3-4 times ❒ 5-6 times ❒ > 7 times

Over the past two weeks, how often has your child asked to be served grain foods (bread, pasta, rice, etc.)?

❒ None ❒ 1-2 times ❒ 3-4 times ❒ 5-6 times ❒ > 7 times

Over the past two weeks, how often has your child asked to be served protein foods (meat, chicken, fish, eggs, beans, peanut butter, etc.)?

❒ None ❒ 1-2 times ❒ 3-4 times ❒ 5-6 times ❒ > 7 times

Over the past two weeks, how often has your child talked about food trying new foods?

❒ None ❒ 1-2 times ❒ 3-4 times ❒ 5-6 times ❒ > 7 times

Please think back on the past two weeks and answer the following questions.

Over the past two weeks, how often has your child talked about food where food comes from?

❒ None ❒ 1-2 times ❒ 3-4 times ❒ 5-6 times ❒ > 7 times

Over the past two weeks, how often has your child talked about food how food affects our body?

❒ None ❒ 1-2 times ❒ 3-4 times ❒ 5-6 times ❒ > 7 times

Any additional comments?

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

APPENDIX Q

Three-Day Diary Photograph Analysis Protocol

PROTOCOL: Three-Day Diary Photograph Analysis Protocol

Intervention Description:
Five food group books were developed to determine whether exposing 3 and 4-year olds to these foods through visual media would lead to changes in consumption. Preschoolers in the intervention group were read one of the five food group books (dairy, fruit, grain, protein, or vegetable) once a day for two weeks at their childcare center. The teachers were then instructed to use the books as they see fit in the classroom for 12 weeks. Teachers were allowed to choose when, how, and how often to use the books. Data was collected pre-intervention, after the 2-week readings and after the 12-week natural environment phase. At each collection time point, photographic food diaries were collected for three days by the teachers and parents of participating preschoolers. Data collectors were instructed to take a picture of the preschooler's meal before and after consumption using a designated placemat with the student ID.

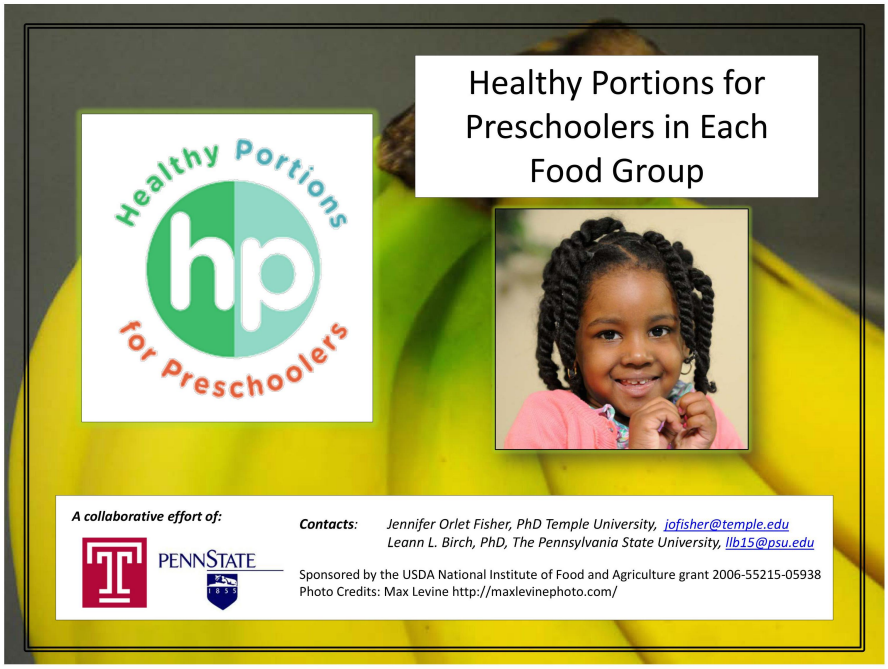
Data Analysis:
Photographs of preschooler meals were assessed by observing what percent of one serving was consumed by the child. This allows researchers to account for occasions where food groups were not served, children who were not provided a full serving, and those who were provided second helpings. Inter-rater reliability was established using three coders to minimizes subjectivity and bias. The following established preschool serving sizes were used in the analysis:

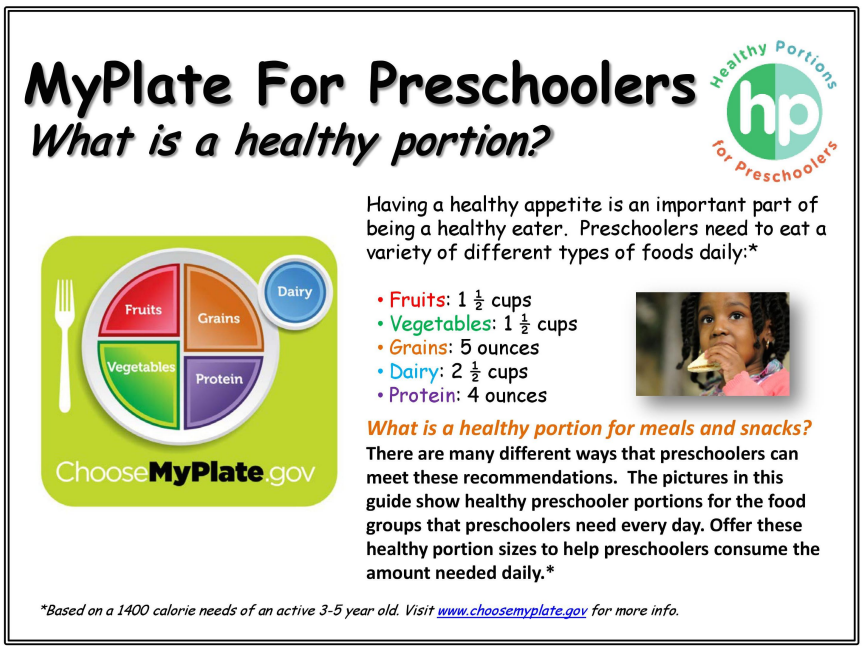
Preschooler Serving Sizes:

- Grains – 1 ounce (equivalent to 1 slice of bread, ½ cup cooked rice/grains, 1 cup dry cereal, ½ cup hot cereal ¾ cup crackers)
- Fruit/Vegetables – ½ cup fruit/vegetable or juice, ¼ cup dried fruit, ¼ cup legumes
- Dairy – ½ cup milk
- Protein – 1 ounce (equivalent to 1 oz meat, 1 Tbsp peanut butter, 1 egg, ¼ cup legumes, 1 oz cheese)

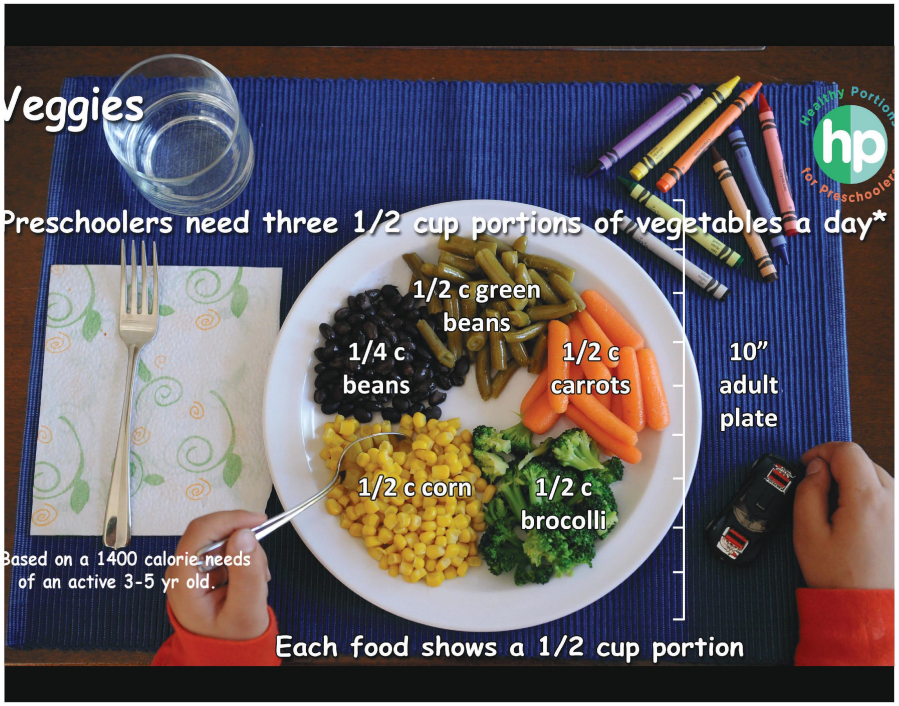
*Note: when assessing legumes, they are considered both a vegetable and protein. Coders considered how the childcare center used them in the meal. For example, if beans were served as a meat alternative/protein, then they were counted as a protein. If they were served along side the entrée as a vegetable, then they were considered a vegetable.

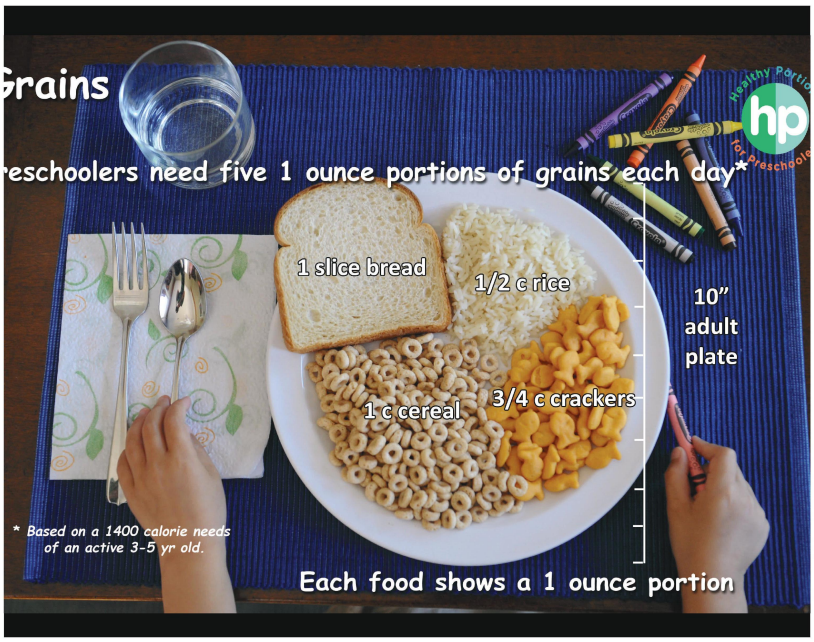
The following visual examples of portion sizes were used as a reference guide among all three coders.

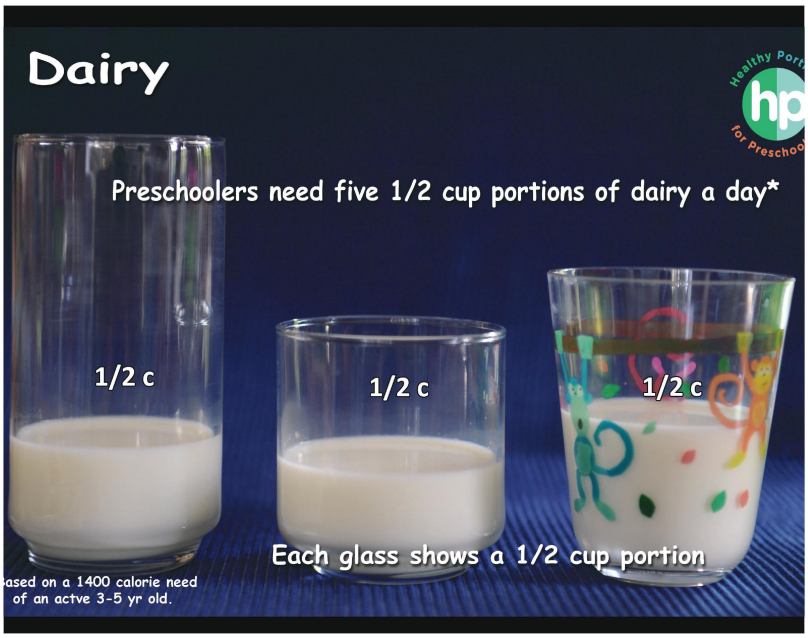

Healthy Portions for Preschoolers in Each Food Group
Healthy Portions for Preschoolers
hp
A collaborative effort of:
PENNSTATE
Contacts: Jennifer Orlet Fisher, PhD Temple University, jofisher@temple.edu
Leann L. Birch, PhD, The Pennsylvania State University, llb15@psu.edu
Sponsored by the USDA National Institute of Food and Agriculture grant 2006-55215-05938
Photo Credits: Max Levine http://maxlevinephoto.com/

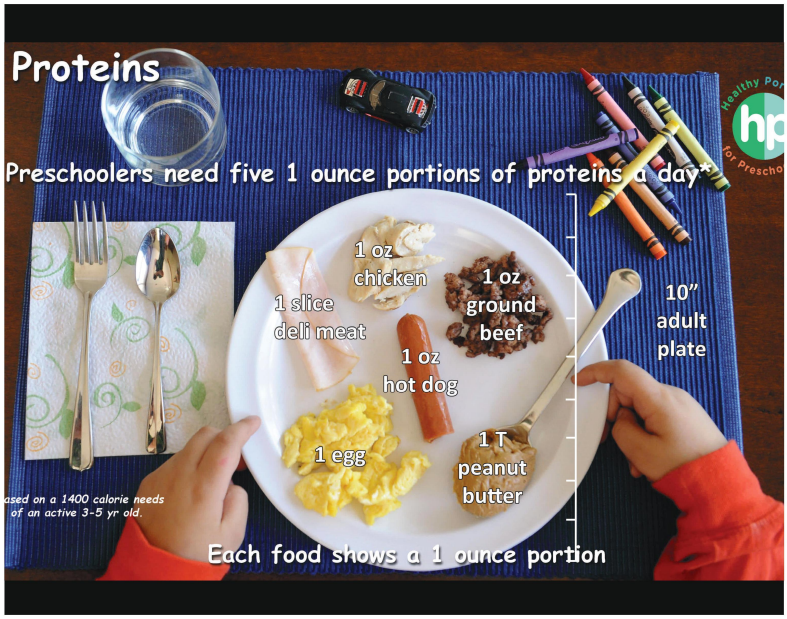

MyPlate For Preschoolers
What is a healthy portion?
Healthy Portions for Preschoolers
hp
Having a healthy appetite is an important part of being a healthy eater. Preschoolers need to eat a variety of different types of foods daily:*
• Fruits: 1 ½ cups
• Vegetables: 1 ½ cups
• Grains: 5 ounces
• Dairy: 2 ½ cups
• Protein: 4 ounces
Fruits
Grains
Dairy
Vegetables
Protein
ChooseMyPlate.gov
What is a healthy portion for meals and snacks?
There are many different ways that preschoolers can meet these recommendations. The pictures in this guide show healthy preschooler portions for the food groups that preschoolers need every day. Offer these healthy portion sizes to help preschoolers consume the amount needed daily.*
*Based on a 1400 calorie needs of an active 3-5 year old. Visit www.choosemyplate.gov for more info.

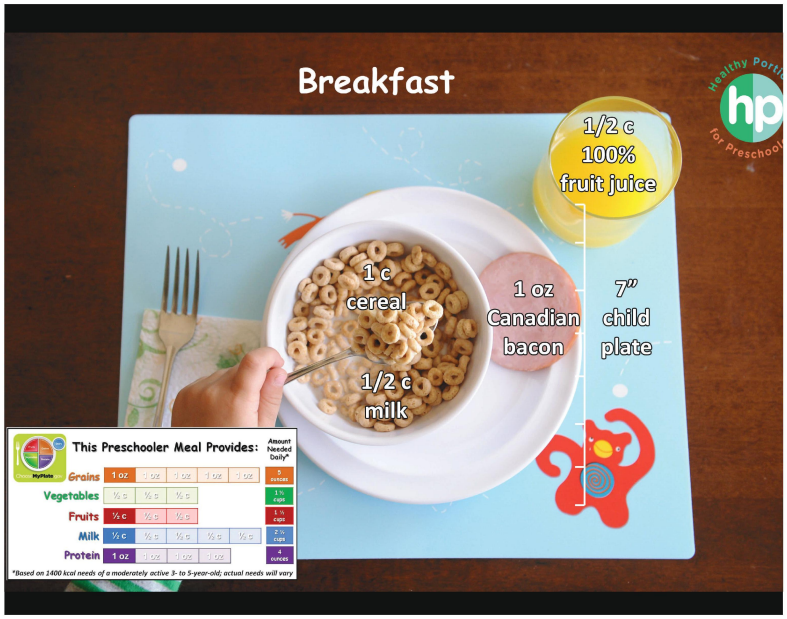

Fruits
1/2 c
100%
juice
Preschoolers need three 1/2 cup portions of fruit each day*
1/2 c
apples
1/2 c
mixed fruit
1/4 c
raisins
1/2 c pears
10”
adult
plate
* Based on a 1400 calorie needs
of an active 3-5 yr old.
Each food shows a 1/2 cup portion

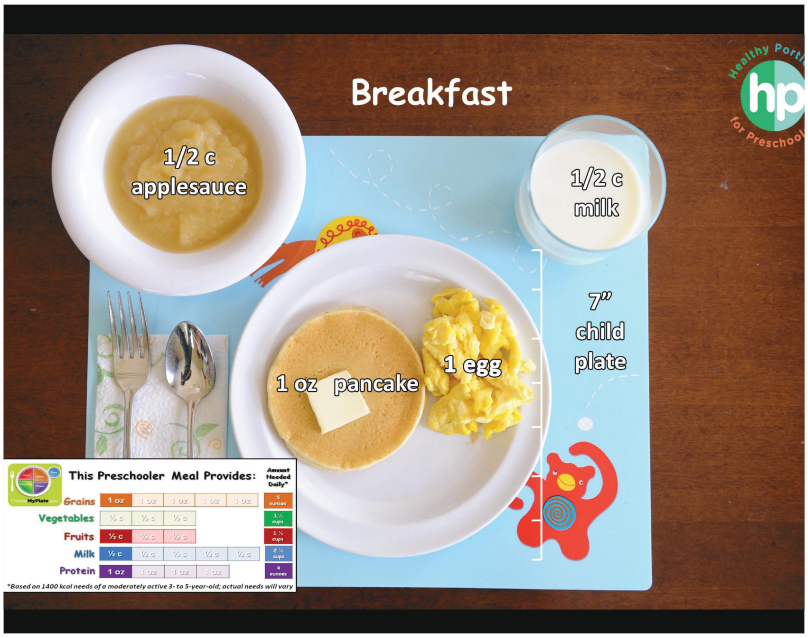

Veggies
Preschoolers need three 1/2 cup portions of vegetables a day*
1/2 c green
beans
1/4 c
beans
1/2 c
carrots
10”
adult
plate
1/2 c corn
1/2 c
brocolli
Based on a 1400 calorie needs
of an active 3-5 yr old.
Each food shows a 1/2 cup portion

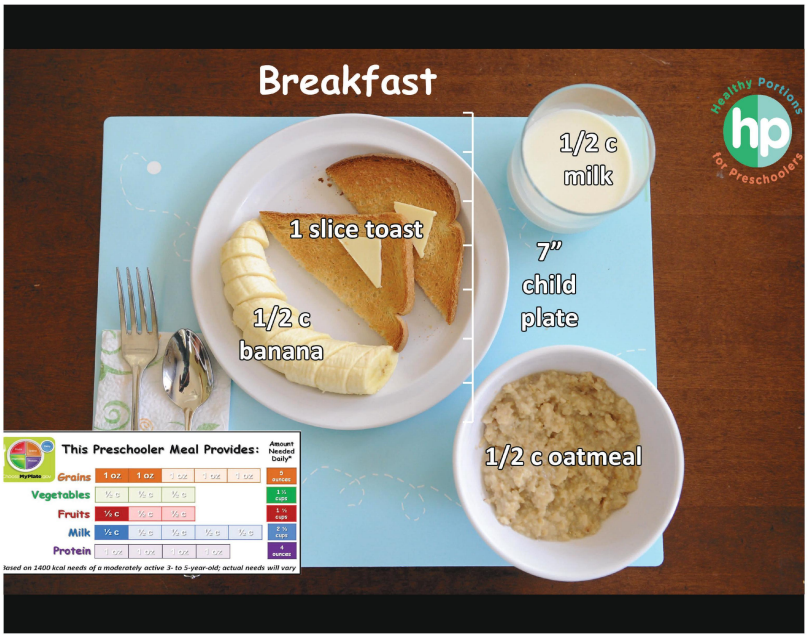

Grains
Preschoolers need five 1 ounce portions of grains each day*
1 slice bread
1/2 c rice
10" adult plate
1 c cereal
3/4 c crackers
* Based on a 1400 calorie needs of an active 3-5 yr old.
Each food shows a 1 ounce portion

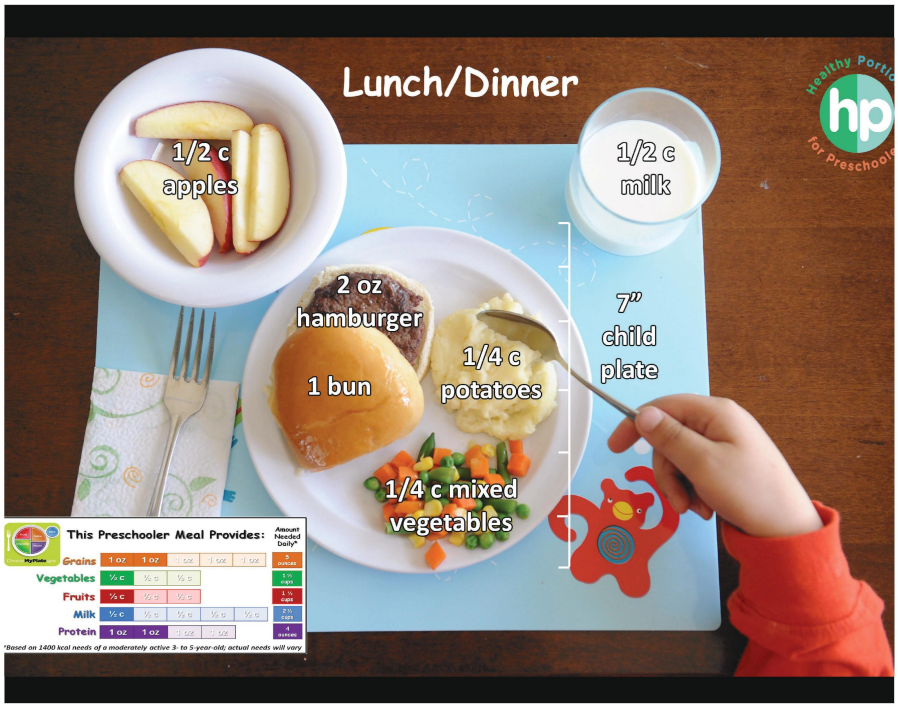

Dairy
Preschoolers need five 1/2 cup portions of dairy a day*
1/2 c
1/2 c
1/2 c
Each glass shows a 1/2 cup portion
based on a 1400 calorie need of an actve 3-5 yr old.

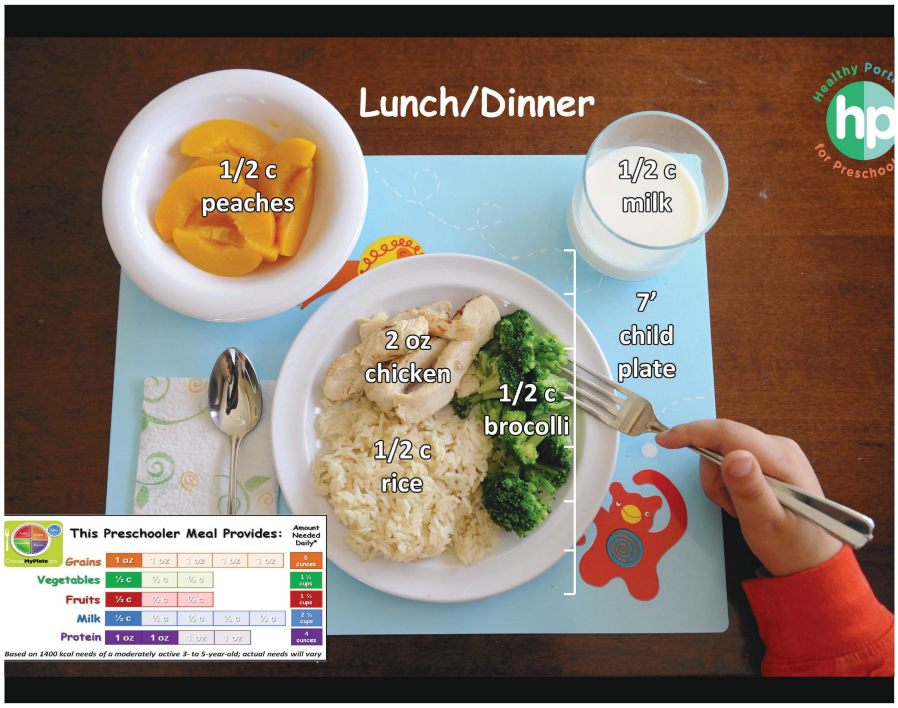

Proteins
Preschoolers need five 1 ounce portions of proteins a day*
1 oz chicken
1 oz ground beef
1 slice deli meat
1 oz hot dog
1 egg
1 T peanut butter
10" adult plate
Each food shows a 1 ounce portion
based on a 1400 calorie needs of an active 3-5 yr old.

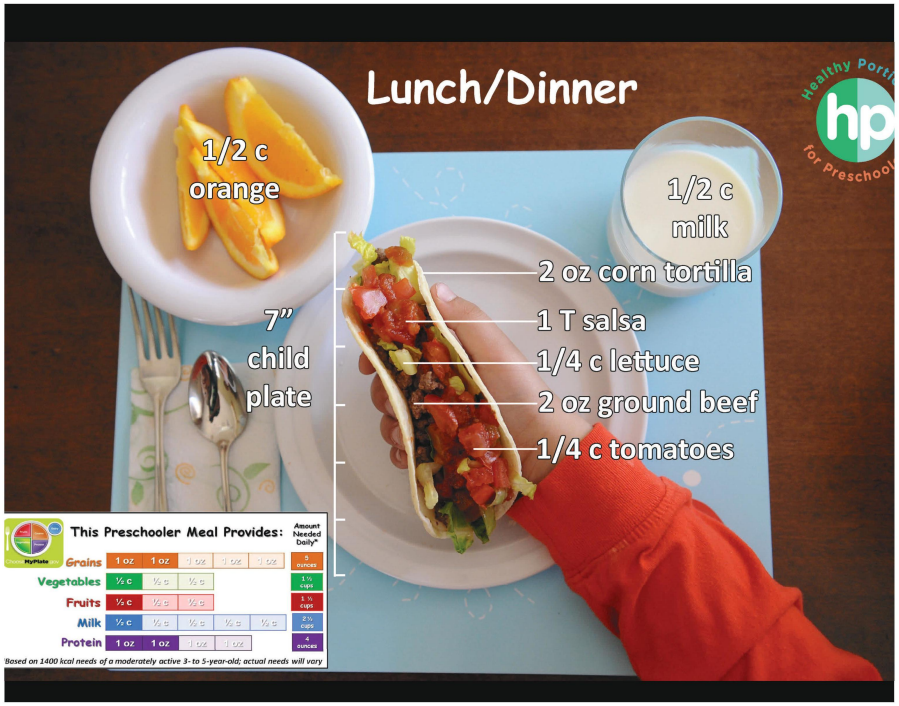

Breakfast
1/2 c 100% fruit juice
1 c cereal
1/2 c milk
1 oz Canadian bacon
7" child plate
This Preschooler Meal Provides:
Amount Needed Daily*
Grains 1 oz
Vegetables
Fruits ½ c
Milk ½ c
Protein 1 oz
*Based on 1400 kcal needs of a moderately active 3- to 5-year-old; actual needs will vary

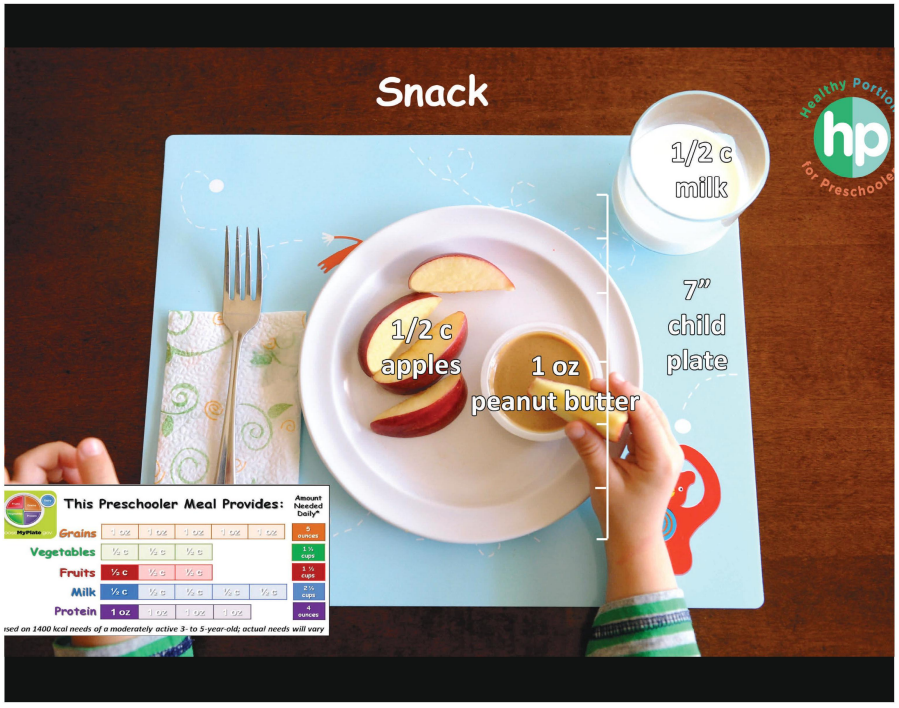

Breakfast
1/2 c applesauce
1/2 c milk
7" child plate
1 oz pancake
1 egg
Healthy Portions for Preschoolers
hp
This Preschooler Meal Provides:
Amount Needed Daily*
Grains 1 oz 1 oz 1 oz 1 oz 1 oz 5 ounces
Vegetables ½ c ½ c ½ c 1½ cups
Fruits ½ c ½ c ½ c 1½ cups
Milk ½ c ½ c ½ c ½ c ½ c 2½ cups
Protein 1 oz 1 oz 1 oz 1 oz 4 ounces
*Based on 1400 kcal needs of a moderately active 3- to 5-year-old; actual needs will vary


Breakfast
1/2 c milk
1 slice toast
7" child plate
1/2 c banana
1/2 c oatmeal
Healthy Portions for Preschoolers
hp
This Preschooler Meal Provides:
Amount Needed Daily*
Grains 1 oz 1 oz 1 oz 1 oz 1 oz 5 ounces
Vegetables ½ c ½ c ½ c 1½ cups
Fruits ½ c ½ c ½ c 1½ cups
Milk ½ c ½ c ½ c ½ c ½ c 2½ cups
Protein 1 oz 1 oz 1 oz 1 oz 4 ounces
ased on 1400 kcal needs of a moderately active 3- to 5-year-old; actual needs will vary


Lunch/Dinner
1/2 c apples
1/2 c milk
2 oz hamburger
1 bun
1/4 c potatoes
1/4 c mixed vegetables
7" child plate
This Preschooler Meal Provides:
Amount Needed Daily*
Grains 1 oz 1 oz 5 ounces
Vegetables ½ c 1½ cups
Fruits ½ c 1½ cups
Milk ½ c 2½ cups
Protein 1 oz 1 oz 4 ounces
*Based on 1400 kcal needs of a moderately active 3- to 5-year-old; actual needs will vary


Lunch/Dinner
1/2 c peaches
1/2 c milk
2 oz chicken
1/2 c brocolli
1/2 c rice
7' child plate
This Preschooler Meal Provides:
Amount Needed Daily*
Grains 1 oz 5 ounces
Vegetables ½ c 1½ cups
Fruits ½ c 1½ cups
Milk ½ c 2½ cups
Protein 1 oz 1 oz 4 ounces
Based on 1400 kcal needs of a moderately active 3- to 5-year-old; actual needs will vary


Lunch/Dinner
1/2 c orange
1/2 c milk
2 oz corn tortilla
1 T salsa
1/4 c lettuce
2 oz ground beef
1/4 c tomatoes
7" child plate
This Preschooler Meal Provides:
Amount Needed Daily*
Grains 1 oz 1 oz 5 ounces
Vegetables ½ c ½ c ½ c 1½ cups
Fruits ½ c ½ c ½ c 1½ cups
Milk ½ c ½ c ½ c ½ c ½ c 2½ cups
Protein 1 oz 1 oz 4 ounces
*Based on 1400 kcal needs of a moderately active 3- to 5-year-old; actual needs will vary


Snack
1/2 c milk
1/2 c apples
1 oz peanut butter
7" child plate
This Preschooler Meal Provides:
Amount Needed Daily*
Grains 5 ounces
Vegetables ½ c ½ c ½ c 1½ cups
Fruits ½ c ½ c ½ c 1½ cups
Milk ½ c ½ c ½ c ½ c ½ c 2½ cups
Protein 1 oz 4 ounces
sed on 1400 kcal needs of a moderately active 3- to 5-year-old; actual needs will vary


Snack
1/2 c milk
1/2 c carrots
1 T dip
7" child plate
Healthy Portions for Preschoolers
hp
This Preschooler Snack Provides:
Amount Needed Daily*
Grains
Vegetables
Fruits
Milk
Protein
*Based on 1400 kcal needs of a moderately active 3- to 5-year-old; actual needs will vary

APPENDIX R

Inter-Rater Reliability Protocol

PROTOCOL: Establishing Inter-Rater Reliability

Three coders will be utilized to establish inter-rater reliability (IRR). The primary investigator will code all subject data, while the other two coders will analyze a randomly selected subset of data from each types of intervention groups in a fully crossed design. The IRR score will be generalized to the full sample of participating preschoolers. IRR will be analyzed using mixed-effect, two-way model intra-class correlation (ICC) (Hallgren, 2012). ICC values for ratings of agreement will use the following scale (Cicchetti, 1994):

- Poor IRR: ICC <0.4
- Fair IRR: ICC between 0.4-0.59
- Good IRR: ICC between 0.6-0.75
- Excellent IRR: ICC between 0.75-1.0

The following table details which subjects will be coded by a single or multiple coders:

SUBJECT	CODER A	CODER B	CODER C	SUBJECT	CODER A	CODER B	CODER C
CGC-01001	X	X	X	FRC-03012	X	X	X
CGC-01002	X	X	X	FRC-03013	X	X	X
CGC-01003	X	X	X	FRC-03014	X	X	X
CGC-01004	X	X	X	FRC-03015	X	X	X
CGC-01005	X	X	X	FRC-03016	X	X	X
CGC-01006	X	X	X	GRC-01001	X		
CGC-01007	X	X	X	GRC-01002	X		
CGC-01008	X	X	X	GRC-01003	X		
CGC-01009	X	X	X	GRC-01004	X		
CGC-01010	X	X	X	GRC-01005	X		
CGC-01011	X	X	X	GRC-01006	X		
CGC-01012	X	X	X	GRC-01007	X		
CGC-01013	X	X	X	GRC-01008	X		
CGC-01014	X	X	X	GRC-01009	X		
CGC-01015	X	X	X	GRC-01010	X		
CGC-01016	X	X	X	GRC-01011	X		
CGC-01017	X	X	X	GRC-01012	X		
CGC-01018	X	X	X	GRC-01013	X		
CGC-01019	X	X	X	GRC-01014	X		
CGC-01020	X	X	X	GRC-01015	X		
CGC-01021	X	X	X	GRC-01016	X		
CGC-01022	X	X	X	GRH-01001	X		
CGC-01023	X	X	X	GRH-01002	X		
CGC-01024	X	X	X	GRH-01003	X		
CGC-01025	X	X	X	GRC-02001	X	X	X
CGC-01026	X	X	X	GRC-02002	X	X	X
CGC-01027	X	X	X	GRC-02003	X	X	X
CGC-02001	X			GRC-02004	X	X	X
CGC-02002	X			GRC-02005	X	X	X
CGC-02003	X			GRC-02006	X	X	X
CGC-02004	X			GRC-02007	X	X	X
CGC-02005	X			GRC-02008	X	X	X
CGC-02006	X			GRC-02009	X	X	X
CGC-02007	X			GRC-02010	X	X	X
CGC-02008	X			GRC-02011	X	X	X

CGC-02009	X			PRH-01001	X		
CGC-02010	X			PRH-01002	X		
DAC-01001	X	X	X	PRH-01003	X		
DAC-01002	X	X	X	PRH-01004	X		
DAC-01003	X	X	X	PRH-01005	X		
DAC-01004	X	X	X	PRC-01001	X		
DAC-01005	X	X	X	PRC-01002	X		
DAC-01006	X	X	X	PRC-01003	X		
DAC-01007	X	X	X	PRC-01004	X		
DAC-01008	X	X	X	PRC-01005	X		
DAC-01009	X	X	X	PRC-01006	X		
DAC-01010	X	X	X	PRC-01007	X		
DAC-02001	X			PRC-01008	X		
DAC-02002	X			PRC-01009	X		
DAC-02003	X			PRC-01010	X		
DAC-02004	X			PRC-01011	X		
DAC-02005	X			PRC-01012	X		
DAC-02006	X			PRC-01013	X		
DAC-02007	X			PRC-02001	X	X	X
DAC-02008	X			PRC-02002	X	X	X
DAC-02009	X			PRC-02003	X	X	X
DAC-02010	X			PRC-02004	X	X	X
DAC-02011	X			PRC-02005	X	X	X
DAC-02012	X			PRC-02006	X	X	X
DAC-02013	X			PRC-02007	X	X	X
DAC-02014	X			PRC-02008	X	X	X
DAC-02015	X			PRC-02009	X	X	X
DAC-02016	X			PRC-03001	X		
DAC-02017	X			PRC-03002	X		
DAC-02018	X			PRC-03003	X		
DAC-02019	X			PRC-03004	X		
DAC-02020	X			PRC-03005	X		
DAC-02021	X			PRC-03006	X		
FRC-01001	X			PRC-03007	X		
FRC-01002	X			PRC-03008	X		
FRC-01003	X			PRC-03009	X		
FRC-01004	X			PRC-03010	X		
FRC-01005	X			PRC-03011	X		
FRC-01006	X			VEC-01001	X		
FRC-01007	X			VEC-01002	X		
FRC-01008	X			VEC-01003	X		
FRC-01009	X			VEC-01004	X		
FRC-02001	X			VEC-01005	X		
FRC-02002	X			VEC-01006	X		
FRC-02003	X			VEC-01007	X		
FRC-02004	X			VEC-01008	X		
FRC-02005	X			VEC-01009	X		
FRC-02006	X			VEC-01010	X		
FRC-02007	X			VEC-01011	X		
FRC-02008	X			VEC-01012	X		
FRC-02009	X			VEC-01013	X		
FRC-02010	X			VEC-01014	X		
FRC-02011	X			VEC-01015	X		
FRC-02012	X			VEC-01016	X		
FRC-02013	X			VEC-01017	X		
FRC-02014	X			VEC-01018	X		
FRC-02015	X			VEH-01001	X		
FRC-02016	X			VEC-02001	X	X	X
FRC-03001	X	X	X	VEC-02002	X	X	X
FRC-03002	X	X	X	VEC-02003	X	X	X
FRC-03003	X	X	X	VEC-02004	X	X	X

FRC-03004	X	X	X	VEC-02005	X	X	X
FRC-03005	X	X	X	VEC-02006	X	X	X
FRC-03006	X	X	X	VEC-02007	X	X	X
FRC-03007	X	X	X	VEC-02008	X	X	X
FRC-03008	X	X	X	VEC-02009	X	X	X
FRC-03009	X	X	X	VEC-02010	X	X	X
FRC-03010	X	X	X	VEC-02011	X	X	X
FRC-03011	X	X	X				

References:

Cicchetti, DV. (1994). Guidelines, criteria, and rules of thumb for evaluating normed and standardized assessment instruments in psychology. *Psychological Assessment.* 6(4); 284-290.

Hallgren, KA. (2012). Computing Inter-Rater Reliability for Observational Data: An Overview and Tutorial. *Tutor Quant Methods Psychol.* 8(1); 23-34.