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Youth School Enrichment Nutrition Programming in Nebraska: A Descriptive Study

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CHAPTER I

INTRODUCTION

In 2008, 34% of the children in Nebraska were considered to live in low-income families, which are defined as an income below 200% of the federal poverty level (1). This is compared to 41% of children at the national level (1). Recent studies have found that persistent poverty appears to be damaging for health and those children who are persistently poor have worse health outcomes than those who experience poverty only occasionally or not at all (2). Extensive research has demonstrated that poverty adversely affects children's growth, cognitive development, academic achievement, and physical and emotional health (3).

Good nutrition is essential to health and well being as well as to healthy growth development (4). The current dietary behaviors and practices observed in children and adolescents may have detrimental consequences on their health (5). Without proper nutrition and physical activity, the tendency to gain weight increases; therefore, the chance of becoming overweight or obese climbs higher as long as poor diet and sedentary behaviors continue (5). Moreover, obesity is strongly associated with recent changes in lifestyle and dietary habits, such as the low cost of and easy access to foods containing high amounts of fat and sugar (2). Generally, a child is not considered obese until his/her weight is at least 10% higher than what is recommended for height and body type (6). Obesity most commonly begins in childhood between the ages of five and six, and during adolescence (6). Studies have shown that children who are obese between the ages of 10 and 13 have an 80% chance of becoming an obese adult (6). Among children six to 11

years of age, the prevalence of obesity more than doubled over the past 20 years, increasing from six and a half percent to 17.0% (7).

Youth that are obese are more prone to have risk factors for cardiovascular disease (CVD), such as high blood pressure or high LDL cholesterol (7). In addition to the physical problems, obese children are at greater risk for sleep apnea, bone and joint problems, and social and psychological problems such as discrimination, depression, eating disorders, and poor self-esteem (7). Obese youth are also more at risk for associated adult health problems, including type II diabetes, heart disease, stroke, several types of cancer, and osteoarthritis (7).

Rates of obesity and overweight may differ depending on a child's race and ethnicity. Rates are higher among Mexican American boys, non-Hispanic black girls, and American Indian youth (8). In Nebraska, 36% of African American, 45% of Hispanic, and 48% of Native American youth are overweight or at risk for becoming overweight (9). Additionally, non-Hispanic white adolescents from lower-income families are more likely to be overweight than their counterparts from higher-income families (8). Sixty-eight percent of black children, 63% of Hispanic children, and 26% of white children live in low-income families in Nebraska (1).

Additionally, physical inactivity is also associated with an increase in obesity and chronic diseases among youth (10). Research has shown there is a decline in physical activity among children overall, with less than one-third meeting recommended physical activity guidelines by the time they are 15 years old (10). In Nebraska, two out of three students did not engage in enough physical activity as recommended by Dietary

Guidelines (9). Healthy lifestyle habits, including healthy eating and physical activity, can lower the risk of becoming obese and developing related diseases (7).

In Nebraska, it has been shown that nine out of ten students drank soda during the week, 50% of youth drank regular soda per day, one out of five youth consumed on average three or more cups of dairy per day, and less than 15% met the recommendation of having two cups of fruit and two and one-half cups of vegetables per day (9). Since most youth are not meeting the recommended daily dietary allowances, teaching them the benefits of eating healthy foods encourages them to develop and maintain healthy eating habits. Research shows that school-based programs can increase physical activity and improve nutrition among students (11).

Eating behaviors and physical activity levels are influenced by many environmental factors such as, families, community organizations, health care providers, faith-based institutions, businesses, government agencies, the media, and schools (11). All of these factors need to be involved to reverse the obesity epidemic. Schools cannot solve the epidemic alone, but they play a very important role because over 95% of youth are enrolled in schools (11). Promotion of healthy eating and physical activity have been an integral part of American education for some time and research has shown that well-designed and implemented school programs can promote healthy eating, physical activity, and reductions in sedentary time (11). Current research is showing the connections between good nutrition, physical activity, physical education and nutrition programs, and academic performance (11). Schools can make a difference because they help students adopt and maintain healthy eating and physical activity behaviors.

Research has also shown that nutrition interventions, especially those based on behavior, have been effective in changing dietary behavior among youth. Additionally, nutrition interventions have been shown to be cost effective and can influence development of chronic diseases later in life. Interventions conducted through schools particularly have the potential to affect youth. Successful nutrition education programs require a systematic approach that combines knowledge of determinants of behavior with effective strategies and an evaluation plan (12).

Research has also shown that there is some merit to understanding rural-urban differences in physical activity profiles, which may help deliver more targeted interventions. It has been found that the prevalence of overweight was higher among rural children than children from urban areas and small cities (13). Overall, urban children were the least active and children from small cities reported the highest level of physical activity (13). In Nebraska, 43% of children in rural areas, 34% of children in urban areas, and 20% of children in suburban areas live in low-income families as of 2008 (1). Therefore, when developing interventions for a low-income population taking rural-urban differences into account would be beneficial.

The Supplemental Nutrition Assistance Program (SNAP), previously known as the federal Food Stamp Program, focuses on fostering healthy lifestyles through eating right and physical activity (14). SNAP-Ed is a federal/state partnership that supports nutrition education (14). The program is behavioral-focused and its goal is to provide education and organize social marketing campaigns that increase the likelihood that individuals eligible for SNAP will make healthy food choices within a limited budget and choose physically active lifestyles (14).

The Nebraska SNAP-Ed School Enrichment program is part of Nebraska's 4-H program that provides nutrition and physical activity lessons in schools to low-income children. Either elementary school teachers or NEP staff delivers these hands-on educational lessons to students. Additionally, the lessons are intended to enhance the school curriculum by meeting the health curriculum objectives of the schools' nutrition units. The School Enrichment program supplies the kits providing nutrition to qualifying schools in Nebraska (15).

Objectives

The purpose of this research is to examine the youth data from the Nebraska SNAP-Ed program and determine the impact it has on youth knowledge and behaviors regarding nutrition. The objectives of this research are: 1) to obtain current nutrition knowledge from students in grades K-6 participating in the Nebraska SNAP-Ed program using a pre-test format, 2) to determine if the nutritional information provided by the SNAP-Ed program impacts the nutrition knowledge and behaviors of K-6 students through simple pre and post questionnaires, and 3) to determine if there is a difference between the impact of the school enrichment kit program and the non-kit school enrichment program.

CHAPTER II

REVIEW OF LITERATURE

Nutrition Education Program

The Nutrition Education Program (NEP) helps limited resource families improve the quality of their diet by learning to prepare nutritious, safe foods while extending their food dollars. The participants of NEP acquire the knowledge, skills, attitudes, and behavior changes that are essential to improve health. NEP offers classes to adults, seniors, and youth. Youth NEP classes are given at various sites throughout communities, such as preschools, childcare centers, afterschool programs, and summer youth camps. Examples of lessons offered in the areas of food and nutrition and food safety include choosing healthier foods, keeping food safe to eat, and preparation of healthy snacks and meals. NEP has two key components: the Expanded Food and Nutrition Education Program (EFNEP) and the Food Stamp Nutrition Education Program (FSNEP), now known as the Supplemental Nutrition Assistance Program - Education (SNAP-Ed). Both of these programs receive federal funding from the United States Department of Agriculture (USDA) (16).

The University of Nebraska-Lincoln Extension manages the NEP program and its staff. Local Extension Offices deliver the program to residents in over 39 counties throughout the state of Nebraska. These counties are as follows: Adams, Buffalo, Boone, Butler, Cass, Colfax, Custer, Dakota, Dawson, Dodge, Douglas, Franklin, Frontier, Furnas, Gage, Gosper, Hall, Harlan, Jefferson, Johnson, Kearney, Keith, Lancaster, Lincoln, Madison, McPherson, Nance, Nemaha, Otoe, Pawnee, Phelps, Platte, Red

Willow, Richardson, Saline, Sarpy, Saunders, Thurston, and Washington. Five of these counties also have access to EFNEP, which include Douglas/Sarpy, Lancaster, and Adams/Hall (16).

Expanded Food and Nutrition Education Program (EFNEP)

The Expanded Food and Nutrition Education Program (EFNEP) is a primary prevention, health promotion intervention under the guidance of the USDA, which targets low-income families and youth in 50 states and six US territories. The key objective is to assist youth and adults in attaining the knowledge, skills, and behaviors necessary for nutritionally sound diets, contribute to their personal development and the improvement of the overall family diet and nutritional well-being. With a practical learning approach, the youth component of EFNEP is delivered to children three to 19 years of age as a series of lessons over a period of days, weeks, or months at sites that include schools, after-school care, youth clubs (such as 4-H and EFNEP club), day camps, residential camps, community centers, and home and community gardens. This program provides information on nutrition, food preparation, food safety, and sometimes, physical activity and health (17).

Supplemental Nutrition Assistance Program (SNAP)

As of October 1, 2008, Supplemental Nutrition Assistance Program (SNAP) is the new name for the federal Food Stamp Program and reflects the changes Food and Nutrition Services (FNS) made to meet the needs of eligible clients, including a focus on nutrition and an increase in benefit amounts. SNAP mimics a modern nutrition assistance program that delivers benefits electronically, reducing the stigma of participation and achieving payment accuracy that assures the highest level of program integrity. The

pillar of SNAP is nutrition, with a focus on encouraging healthy lifestyles through eating right and physical activity. SNAP also focuses on nutrition by putting healthy food within reach for low-income households by helping them buy the food they need for good health and helping them make the transition to self-sufficiency (14). As of January 3, 2010, the average monthly participation in Nebraska is 165,507 participants (18).

Supplemental Nutrition Assistance Program - Education (SNAP-Ed)

The Supplemental Nutrition Assistance Program – Education (SNAP-Ed) is a federal/state partnership that supports nutrition education for individuals eligible for SNAP. The goal is to provide educational programs and organize social marketing campaigns that increases the likelihood that individuals eligible for SNAP will make healthy food choices within a limited budget and choose physically active lifestyles that are consistent with the Dietary Guideline for Americans and Food Guidance System. One of the main aspirations of SNAP-Ed is health promotion to help those eligible for SNAP to establish healthy eating habits and physically active lifestyles. The second is primary prevention of diseases to help those eligible for SNAP that have risk factors for diet-related chronic diseases by preventing or postponing the onset of disease through creating more physically active lifestyles and healthier eating habits (19).

SNAP-Ed is delivered through group and individual interactive learning opportunities and the distribution of print and video materials. SNAP-Ed is learner-centered and behavioral-focused. The growth of SNAP-Ed has occurred mainly through the Land-Grant University System, primarily through affiliated state Cooperative Extension Systems (CES), and to a lesser degree through nutrition departments. By 2004,

land-grant colleges and universities were conducting SNAP-Ed in all 50 states either independently or in cooperation with other contractors, and accounted for the majority of state and local financial support of SNAP-Ed (19).

School Enrichment Program

School Enrichment programs are part of Nebraska's 4H program that provides educational lessons in schools. The NEP School Enrichment program is offered to low-income children and the lessons taught are hands-on educational experiences that are intended to enhance the school curriculum. Extension staff develops the educational programs and trains the teachers how to use them in the classroom (15).

During the 2008-2009 school year, more than 10,000 Lancaster County youth in 261 classrooms participated in NEP, which offers School Enrichment programs to qualifying schools. For Lincoln Public Schools to qualify for free nutrition kits, they must have 50% or greater free or reduced meals. The time spent on teaching nutrition has tripled to about 11 hours per school year (15).

School Enrichments kits are funded through the SNAP-Ed federal grant and are administered through University of Nebraska-Lincoln Extension in Lancaster, Douglas/Sarpy, and Adams/Hall Counties and the Nebraska Department of Health and Human Services. These kits are free of cost to qualifying schools. Additionally, they meet health curriculum objectives for the nutrition unit, are available for 3-week checkout, and contain five one to two hour block lesson plans plus additional activities. School Enrichment kits are delivered directly to classrooms by NEP staff along with an initial hand washing presentation to the classroom. In addition, a food preparation activity is presented at completion of the program (15).

Youth Issues in Regard to Nutrition

Research by Enns and colleagues studied trends in intake among children 6 to 11 years of age by examining three nationwide surveys. They found increases in consumption of soft drinks, total grain products, grain mixtures (such as pasta with sauce, pizza, and rice dishes), fried potatoes, cheese, non-citrus juices, low fat milk, skim milk, candy, and fruit drinks. Additionally, decreases were found in consumption of whole milk and total fluid milk, yeast breads, green beans, corn, green peas, lima beans, beef, pork, and eggs. This study also found that lower percentages of calories from fat were partly due to increased carbohydrate intakes and that for any given MyPyramid group, less than one-half of the children consumed the recommended number of servings, and their intakes of discretionary fat and added sugars were much higher than recommended. As a result of these trends, children were shown to have decreases in vitamin B₁₂ and increases in thiamin and iron (20).

Enns and colleagues recommend that guidance should continue to encourage children to increase intake of whole grains, fruits, dark-green and deep-yellow vegetables, legumes, nonfat or low fat dairy products, and lean meats; decrease intake of fats and added sugars; and increase physical activity. They also suggest that nutrition education can effectively change dietary behavior among elementary school-aged children and resources must be committed on every level (national, state, local, community, school, and family) to help children eat more healthfully and become more physically active (20).

Nutrition Education in Schools and Youth

A fundamental element to encouraging lifelong healthy eating and exercise behaviors is nutrition education, and should start during the early stages of life. The settings approach, which acknowledges there is an opportunity to influence health through policy measures and education within certain settings, such as schools, workplaces, and hospitals, has become popular in health promotion. School-based nutrition education should address the interests and needs of the students, the teachers, and the school; be relevant to program goals; take into account what children already know; be culturally appropriate; be delivered in a way children can understand; and teach the skills and knowledge required to improve or strengthen healthy eating habits (21).

In order to be successful, nutrition education should be incorporated into the school curriculum and involve the teachers, families, and other professionals in the community. Studies have found that these multi-component school-based programs, have reported a significant increase in observed lunchroom intake of vegetables and fruit, positive changes in fat content of school lunches, and overall children's diets as well as increased physical activity. Some studies have observed, among fourth and fifth graders, an overall increase in reported fruit consumption, but not for vegetable consumption. Reynolds and colleagues reported increased consumption of daily servings of fruit and vegetables in fourth graders and their parents. Additionally, studies have reported differences between gender and poorer results in low-income and ethnic subgroups (21).

Another study by Fernandes and colleagues was designed to assess the effects of a nutritional education program on the prevalence of overweight and obesity and on the foods eaten by second grade students. The nutrition education program consisted of

eight, 50 minute meetings and covered nutrition topics related to healthy diets, how to make healthy snacks, and physical activity; the aim was to form healthy dietary habits as a means of preventing obesity. They found that the percentage of overweight and obese students increased from 21.8% to 23.6% in the intervention group and from 33.7% to 35.0% in the non-intervention group showing no significant difference. However, the intervention group significantly reduced its intake of artificial juice and in the non-intervention group there was a significant increase in intake of prohibited food, such as mass-produced snacks and soda. Furthermore, the intake of breakfast cereal decreased. They concluded that even though the program was short, there were improvements in the quality of the food the school-aged children were eating after attending the nutrition education program (22).

Nutrition Education Programs and Theory in Youth

Education is an effective beginning to facilitate dietary behavior change. There are a variety of theories identified that uses a behavioral focus to create change. One of the models is the Social Cognitive Theory, which emphasizes a strong behavioral component as well as environmental and individual aspects and reinforces self-efficacy and decision-making skills. Additionally, a number of studies use the Stages of Change to identify characteristics of a study group and design intervention strategies to match. Some studies have used a combination of theories, particularly adding the PRECEDE planning model, which considers predisposing, reinforcing and enabling factors in the educational planning (21).

Research by Powers and colleagues investigated the effects of a Social Cognitive Theory-based nutrition education program on dietary behavior and nutrition knowledge

among 1,100 second and third-grade students, equally distributed among gender, in Alabama. At least 51% of students received free or reduced price meal plans. A pre- and post-assessment control group design evaluated dietary behavior and nutrition knowledge. The treatment group's intervention consisted of six weekly nutrition education classes based on tenets of Social Cognitive Theory and were conducted by nutrition educators employed by the State Cooperative Extension Nutrition Education Program (23).

Children in the treatment group exhibited significantly greater improvement in overall dietary behaviors, such as consumption of dairy products, fruits, and vegetables, than children in the control group, whose overall dietary behavior declined. In this study, by participating in as few as six hours of nutrition education there was a significant increase in overall nutrition knowledge; thus, indicating that nutrition education programs teaching positive dietary messages can potentially improve dietary behavior and increase nutrition knowledge in children (23).

These findings by Powers and colleagues are similar to what other studies demonstrate, such as a study done by Lytle, who found that a school-based intervention could positively influence children's dietary intakes. These results show there was a significant difference in the changes of total energy as well as proportion of energy from fat, saturated fat, protein, and monounsaturated fat in the intervention group; students in this group decreased their total fat intake from 32.7% to 30.3% of energy and saturated fat from 12.8% to 11.4% of energy. Results also show that the intervention was effective in Caucasian, African-American, and Hispanic students, in boys and girls, and across four regions of the United States (24).

EFNEP and Youth

A study done by Townsend and colleagues is the first report of an evaluation of a statewide EFNEP program for 9 to 11 year old youth. Their primary purpose was to examine program effectiveness of California's Youth EFNEP as it is normally delivered in the community and their second purpose was to estimate the validity of the widely used USDA impact indicator method for program evaluation, which is a task that has not been undertaken by any previously published study. All leaders and youth in the 9 to 11 year old age category who were enrolled in EFNEP in California for FY 1998-1999 participated in the study. Three hundred youth groups were targeted for recruitment; 200 were randomized to the treatment group and 100 to the control group. Pre and post surveys were completed for the 5,508 children. The intervention focused on increasing awareness of fruits and vegetables in healthful diets and of food safety practices for those children who may prepare some of their own meals and/or snacks. The results show that there was a favorable gain for each of the four USDA impact indicators: 34% of children had improved scores for Eat a Variety of Foods, 53% for Nutrition Knowledge, 31% for Food Selection, and 68% for Food Preparation Skills and Safety Practices. Three of the four indicators were shown to be significant. The indicator that was not significant was 'Eat a Variety of Foods.' It was also shown that gender and race/ethnicity had a significant impact on outcome. Overall, they found positive changes in knowledge and short-term behaviors, which are similar to studies of general nutrition education programs (25).

Another study by Rabe and colleagues was conducted to assess the effectiveness of Youth EFNEP on nutrition knowledge and self-reported behavior of third and fourth

grade students in Ohio. Nutrition educators presented four lessons to students over a two to four week period and included information on the Food Guide Pyramid, food groups and nutrients, planning and choosing nutritious meals and snacks, nutrition labels and food safety. Through pre- and post-surveys, they found that the students in the intervention group increased their nutrition knowledge, but there was no change in their self-reported nutrition behaviors (26).

Coordinated School Health Programs

Current studies of children, adolescents, and young adults have demonstrated the close link of blood cholesterol level, blood pressure level, smoking, and obesity with the extent and severity of atherosclerosis among people well below the age of 20 years. The Coordinated School Health Program Model (CSHP) aids schools and communities in preventing and reducing chronic diseases. A CSHP consists of eight interactive components, which can help schools create programs that help students establish healthy habits (27).

Coordinated Approach to Child Health (CATCH)

CATCH is an example of a coordinated school health program because it builds an alliance of children, parents, teachers, and school staff to teach skills and behaviors associated with maintaining healthy lifestyles. Additionally, it coordinates four component areas, including classroom curricula, food service modifications, physical education changes, and family enforcement, targeting both children's behaviors and the schools environment. The coordination of health activities and messages between the components is vital to positively impact children's knowledge, skills, and behavior (28).

CATCH directly addresses four of the eight CDC Coordinated School Health (CSH) Model components, and indirectly supports facets of a more comprehensive program (29).

Researchers designed and tested CATCH, which is now implemented in over 7,500 schools and after-school programs across the United States and Canada, started as a clinical trial and is currently an effective public health intervention program (27,29). CATCH is a program designed to encourage physical activity, healthy food choices, and prevent tobacco use in elementary school-aged children (28). Its holistic approach to child health promotion targets various aspects of the school environment and involves classroom teachers, school food service staff, physical education teachers, students' families, and the broader school community in a range of health promoting activities for all children in grades K-5 (28). CATCH has lead schools, families, and children in healthy living for nearly 20 years (28).

CATCH started as a randomized controlled clinical trial from 1991-1994 and was one of the largest and most significant school-based health promotion studies funded in the United States. At the conclusion of the main trial, it succeeded in producing lasting changes in dietary and physical activity behaviors. Students involved in the intervention ate less fat and participated in more physical activity outside of school; school cafeterias provided lower fat meals; and students became more physically active during physical education classes. Follow-up, three years after the intervention, showed that changes in diet and physical activity were maintained (28).

The CATCH program received state, national, and international recognition. In Texas, more than 2,000 schools, almost 50% of all elementary schools in the state, have implemented the program (28). A recent replication of the CATCH study was conducted in El Paso, Texas to assess the impact on children's health of translating evidence-based nutritional intervention trial to low-income elementary schools with primarily Hispanic students (30). This study reported significant effects on preventing the onset of overweight and obesity among children (30). After three years of the implementation of the program, there were 11% fewer girls and 9% fewer boys in the intervention group that were classified as greater than the 85th percentile for height and weight (28). The key components to the successfulness of this program are attributed to the evidence-based approach of the study design, tailoring the protocol to meet local resources, communitywide funding and infrastructure support, and quality control program feedback to participating agencies and schools (30).

The School Physical Activity and Nutrition (SPAN) population-based surveillance study is another source of CATCH impacts on childhood obesity. SPAN, the first study in the United States to use a large population-based sample, shows statewide leveling off in the prevalence of overweight in children. This leveling was seen in every Texas region and at all grade levels. Additionally, significant population-level decreases in the prevalence of childhood overweight were found. These decreases occurred in high-risk populations, predominantly Hispanic (28).

A study of the CATCH intervention program show that it is cost-effective and beneficial. CATCH compares favorably to alternative school-based health promotions, targeting childhood obesity, such as Planet Health. It has been shown that with the

growth of the Hispanic population in the United States, school-based overweight programs, such as CATCH, that are cost-effective for this population will be increasingly important (31).

A follow-up study done by Nader and colleagues was designed to assess differences through eighth grade in diet, physical activity, and related health indicators of students who participated in the CATCH school and family intervention from third through fifth grade. This three-year follow-up without further intervention suggests that the behavioral changes initiated during the elementary school years persisted to early adolescence for self-reported dietary and physical activity behaviors (32).

Planet Health

Planet Health was created to reduce obesity by increasing energy expenditure while promoting key dietary behaviors consistent with dietary guidelines. The intervention focused on four changes in behavior, which include reducing television viewing to less than two hours per day, increasing moderate and vigorous physical activity, decreasing consumption of high-fat foods, and increasing consumption of fresh fruits and vegetables. This study utilized concepts from behavioral-choice and social cognitive theories and used an interdisciplinary curriculum approach, with intervention material combined into major subject areas and physical education, using subject and grade appropriate skills and competencies. This approach was designed to improve efficiency by using classroom teachers with little health education training to implement the materials, and to enhance effectiveness by involving multiple classes that used different approaches to learning. This study showed that the prevalence of obesity among girls in the intervention schools were reduced compared to controls, controlling for

baseline obesity; however, no differences were found among boys. There was greater remission of obesity among intervention girls versus control girls. The intervention reduced television hours among both girls and boys and increased fruit and vegetable consumption. Also, among girls there was less of an increase in estimated energy intake per day over two years among intervention participants compared to controls. In conclusion, among female students, Plant Health decreased the incidence of obesity, indicating a promising school-based approach to reducing obesity among youth (33).

Nutrition Intervention Effects on Nutrition Knowledge and Behaviors in Youth

Fahlman and colleagues conducted a pilot study to determine the impact of the Michigan Model Nutrition Curriculum on nutrition knowledge, efficacy expectations, and eating behaviors in middle school students. This study was comprised of a control group and an intervention group. Health teachers were trained to use the curriculum and implemented the intervention and a questionnaire was used to determine pre-post differences that consisted of three subscales assessing eating habits, nutrition knowledge, and efficacy expectations toward healthy eating. The curriculum lesson plans focused on using the food pyramid to choose healthy snacks, increasing consumption of fruits and vegetables, and making healthy selections when dining at fast-food restaurants. Their results show that the intervention group increased their nutrition knowledge post-intervention and they were significantly more likely to eat fruits and vegetables and less likely to eat junk food than the control group. Students in the intervention group also felt more confident that they could eat healthy. In conclusion, this study shows that this program, delivered by trained professionals, resulted in significant positive changes in both nutrition knowledge and behaviors in middle school children (34).

CHAPTER III

MEHTODOLOGY

The intent of this research is to identify current nutrition knowledge of kindergarten through sixth grade students participating in the SNAP-Ed program, to examine if the SNAP-Ed program is effective in impacting the knowledge and behaviors of these youth, and to determine if the school enrichment kit program and the non-kit school enrichment program outcomes are significantly different. The data for this project were collected by a pre- and post-questionnaire method. Institutional Review Board (IRB) approval was granted under the NEP program using the aggregate youth data (Appendix A).

Subjects

The subjects for this research study are the students that participated in the SNAP-Ed program (n=62,324) in Nebraska. These students range from kindergarteners through sixth graders and come from the following types of educational programs: rural; urban; school enrichment; non-school enrichment, such as the YMCA, Salvation Army, 4-H, and parks and recreation; and before and after school programs. The subjects were divided into two groups for analysis, which include: the school enrichment program via curriculum kits, SEK group, (n= 13,854) and the non-kit school enrichment program, NKSE group, (n= 48,470). Therefore, the person completing the nutrition education in the classroom is the main difference between these two subject groups.

Program Delivery

The SNAP-Ed youth program is delivered in two methods. One method uses the school enrichment kits, which is used primarily in Lancaster, Douglas/Sarpy and Adams/Hall counties. The second method is the non-kit school enrichment method and is delivered in Buffalo, Lincoln, Dawson/Custer, Red Willow/Frontiers/Furnas, Franklin, Dakota/Thurston, Southeast-6, Madison, and Colfax counties. The elementary school teacher in each classroom, who is required only to have an Introduction to Nutrition-type course throughout their education, teaches the nutrition lessons to students in the school enrichment kit program. The school enrichment kits contain well-organized learning activities and easy-to-follow manuals supplying these teachers with everything they need to effectively teach nutrition to their students. The NEP Assistant delivers the kit to the classroom on a prescheduled date and teaches the students the first lesson, which often focuses on food safety, specifically hand washing. The kit is then left in the classroom for three weeks for the teacher to utilize. At the end of the three weeks, the NEP Assistant returns to the classroom to teach the final class, which is usually on healthy snacking and includes preparing a nutritious snack with the classroom. There is a kit for each grade level, which includes kindergarten through sixth grade.

For the non-kit school enrichment program, the NEP staff does all of the nutrition education. All NEP staff has a strong background in nutrition; they are either Registered Dietitians, former nutritionists for the Women, Infants, and Children (WIC) program, worked for Head Start, or hold a degree in Family and Consumer Science Education. For the lessons, the length of time they spend with the students varies, however; the average is at least three contacts for an average of 30 minutes per contact. Topics taught to youth

include USDA's MyPyramid, individual food groups, hand washing, and healthy snacks. The learning activities used to teach healthy eating and food budgeting is tailored to meet the needs of the specific age group. The NEP staff use the Show-Me nutrition curriculum, which was developed by the University of Missouri SNAP-Ed and EFNEP programs. They also use some supplemental materials from Professor Popcorn that was developed by Purdue University EFNEP program.

Data Collection Tool

The NEP youth program has six target outcomes, which include: 70% of the youth will indicate they almost always wash their hands before touching or eating food, 70% of the youth will indicate knowledge on how to choose healthful snacks and/or beverages, 70% of the youth will indicate an increase in knowledge in regards to MyPyramid recommendations and the Dietary Guidelines, 70% of the youth will indicate they engage in regular physical activity almost every day (biking, hiking, sports), 70% of the youth will increase the frequency of eating breakfast, and 70% of the youth will indicate knowledge on how to follow a recipe correctly and safely. Nutrition education lessons taught to youth are based on these outcomes and the questions in the database relate to them as well (Table 1).

Table 1. Youth Indicators and Sample Questions for Grades 3-6

Category/Outcome	Example Questions
Proper hand washing	I wash my hands before I touch or eat food. a. Almost always b. Sometimes c. Not very often
Healthy snack and beverage choices	Which is the healthiest snack choice? a. Soda pop and chips b. Milkshake and fries c. Fruit juice and pretzels
My Pyramid recommendations/ Dietary Guidelines	How many cups should we have from the milk group? a. 1 cup b. 3 cups c. 4 cups d. 5 cups
Physical activity	Why is running and playing so important? a. It keeps you healthy b. It gives you energy c. It makes you happy d. All of the above
Frequency of eating breakfast	Eating breakfast every day: a. Takes up too much time b. Helps me to learn better in class c. Costs a lot of money d. Is not needed
Safe and appropriate food preparation techniques	Which of these would you use to measure milk? a. Drinking cup b. Liquid measuring cup c. Dry measuring cup

In Nebraska, youth evaluation occurs primarily in the group setting. NEP staff members collect basic demographic information about each classroom and pre- and post-evaluation data, and then report it using an online reporting system. Staff members are asked to select one or more questions from the database of questionnaire tools that relates to the topic they are teaching to the group. They are to ask the class the selected questions both at the beginning of the youth group session and at its completion. The database of questions (Appendix B) was designed based upon the age of the students they were trying to impact. The questions are split into two age categories: K-2 and 3-6.

The questions used in the NEP program are from the EFNEP Youth Evaluation Database which is housed at the University of Wisconsin SNAP-Ed/EFNEP website. A team of Reviewers assessed each tool and question that is submitted. The Reviewers look at the tools and review the information on how they were developed, tested, and used. Reliability and validity are required to be established for each question before it is posted on the youth evaluation website. UNL NEP staff review each question and determine which ones are most appropriate to evaluate the program's outcomes. Once a report is submitted, that data are compiled in an online database and can be analyzed statistically at the completion of the fiscal year at the state NEP office.

Data Analysis

Data from the pre- and post-questionnaires were collected from October 1, 2007 through September 30, 2009. The time points, pre- and post-test, and type of program involved, school enrichment kits or non-kit school enrichment, identify the data. Data from the NEP Youth Blackboard website were downloaded in October 2008 and October 2009 and then was entered into an Excel database. The data that applied to the questions NEP staff asked students were pulled from the main database and re-entered into a separate Excel file. Then, data from the two fiscal years were merged together and the percent correct of responses for each item was calculated.

Statistical Analysis

The Excel file of merged data and percent correct for each item was used for statistical analysis, which was completed in consultation with the Nebraska Evaluation and Research (NEAR) Center at the University of Nebraska-Lincoln. Chi-Square Tests of Independence are used with descriptive statistics and for the purpose of this research

they were used to analyze each correct response for each item on the questionnaire. The Chi-Square Tests of Independence were used to measure the relationship between two nominal variables, which are time (pre- and post-test) and type of program (SEK and NKSE). The variables were measured to find dependence or independence of one another. The null hypothesis states that there is no association between time and type of program. On the other hand, the alternative hypothesis states that there is an association between the two variables. Two-way contingency tables were created to show the relationship between the two variables. The variables were classified into mutually exclusive categories and the cell entries are frequencies.

For the entire set of data, the degrees of freedom for these Chi-Square Tests of Independence are one. With a test where the degree of freedom is one, the effect size can be estimated. Therefore, χ^2 of 0.10 to 0.30 are considered a small effect; χ^2 of 0.31 to 0.50 are considered medium effects; and χ^2 of 0.51 and up are considered a large effect. For the purpose of this research, only the information relating to the correct response options are reported and the level of significance is $p \leq .05$.

CHAPTER IV

RESULTS

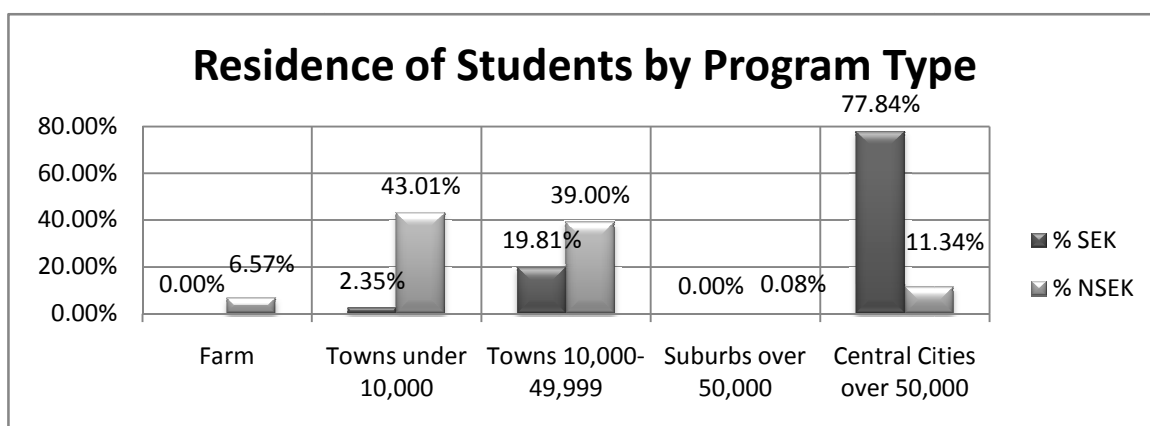
The demographics of the students in both groups are identified by gender, race/ethnicity, residence, and grade level. Of the school enrichment group via kits (n=13,854), 49.9% are female and 50.1% are male. The majority of the students are White/non-Hispanic (n=7,549, 54.43%). Other race/ethnicities of this group include: 17.25% White/Hispanic, 11.62% African American/non-Hispanic, 6.06% mixed race/non-Hispanic, 3.53% Asian/non-Hispanic, 2.6% mixed race/Hispanic, and 1.79% Native American/non-Hispanic. There are less than 1% of the following race/ethnicities: Native American/Hispanic, Asian/Hispanic, African American/Hispanic, Native Hawaiian/Hispanic, Native Hawaiian/non-Hispanic, not given/Hispanic, and not given/non-Hispanic (Table 2).

TABLE 2

Table 2. Demographic Characteristics of School Enrichment and Non-Kit School Enrichment Participants					
	SEK (n)	SEK (%)	NKSE (n)	NKSE (%)	Total (n)
Gender					
Female	6912	49.89%	24066	49.65%	30978
Male	6942	50.11%	24404	50.35%	31346
Race/Ethnicity					
Native American/Alaskan Native – Hispanic	74	0.53%	553	1.16%	627
Native American/Alaskan Native – Non-Hispanic	248	1.79%	1094	2.30%	1342
Asian – Hispanic	34	0.25%	13	0.03%	47
Asian - Non-Hispanic	490	3.53%	349	0.73%	839
Black/African American – Hispanic	72	0.52%	61	0.13%	133
Black/African American - Non-Hispanic	1612	11.62%	2187	4.59%	3799
Native Hawaiian/Other – Hispanic	17	0.12%	29	0.06%	46
Native Hawaiian/Other - Non-Hispanic	113	0.81%	36	0.08%	149
White – Hispanic	2393	17.25%	11241	23.59%	13634
White - Non-Hispanic	7549	54.43%	27736	58.20%	35285
Mixed Race – Hispanic	360	2.60%	2140	4.49%	2500
Mixed Race - Non-Hispanic	840	6.06%	542	1.14%	1382
Not Given – Hispanic	61	0.44%	1361	2.86%	1422
Not Given - Non-Hispanic	6	0.04%	312	0.65%	318
Residence					
Farm	0	0.00%	3173	6.57%	3173
Towns under 10,000	326	2.35%	20766	43.01%	21092
Towns 10,000-49,999	2746	19.81%	18829	39.00%	21575
Suburbs over 50,000	0	0.00%	38	0.08%	38
Central Cities over 50,000	10788	77.84%	5474	11.34%	16262
Grade Level					
Kindergarten	3667	26.13%	3227	6.28%	6894
1st Grade	2633	18.76%	4927	9.59%	7560
2nd Grade	1838	13.10%	5738	11.17%	7576
3rd Grade	1080	7.70%	4961	9.66%	6041
4th Grade	1897	13.52%	5638	10.98%	7535
5th Grade	2800	19.95%	4199	8.18%	6999
6th Grade	68	0.48%	2060	4.01%	2128
SEK = School Enrichment program via curriculum kits					
NKSE = Non-kit School Enrichment program					

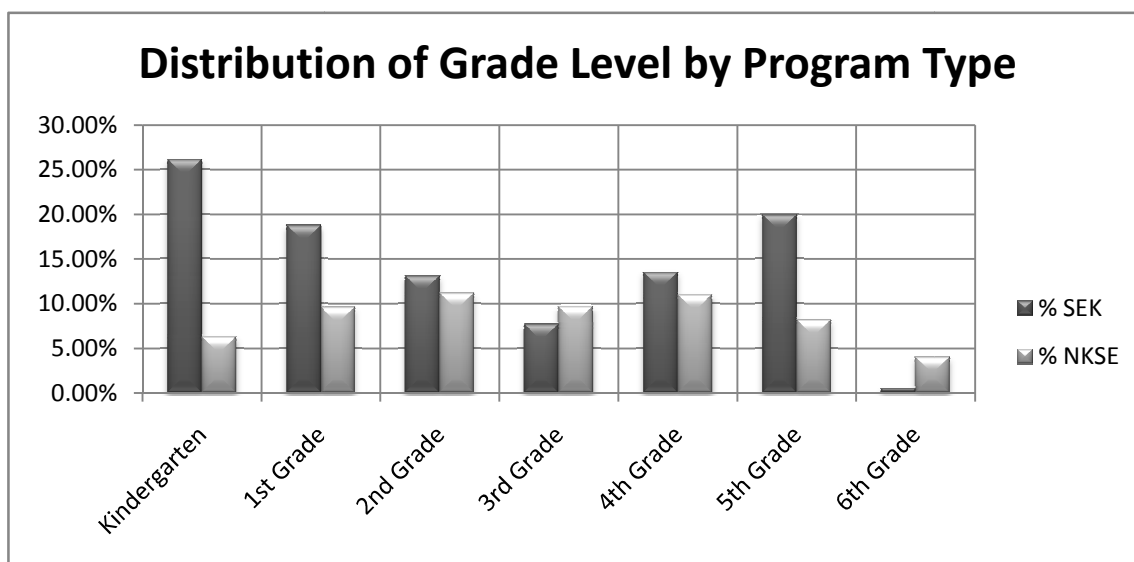
Additionally, in the school enrichment group via kits, most of the students live in central cities with a population of over 50,000 (n=10,788, 77.84%.) The rest of the students live in towns with a population of 10,000-49,999 (n=2,746, 19.81%) and in towns with fewer than 10,000 people (n=326, 2.35%) (Figure 1).

FIGURE 1



Lastly, the grade level of the students also differ, with 26.13% kindergarteners, 18.76% first graders, 13.1% second graders, 7.7% third graders, 13.52% fourth graders, 19.95%, fifth graders, and 0.48% sixth graders (Figure 2). The other 0.36% includes seventh through twelfth graders and special education students; however, only data from the kindergarteners through sixth graders will be used for analysis.

FIGURE 2



Of the non-kit school enrichment group (n=48,470), 49.65% of the students are female and 50.35% are male. Similar to the school enrichment group with kits, the majority of this group consists of White/non-Hispanic students (n=27,736, 58.2%). Furthermore, 23.59% are White/Hispanic, 4.59% are African American/non-Hispanic, 4.49% are mixed race/Hispanic, 2.86% are not given/Hispanic, 2.3% are Native American/non-Hispanic, 1.16% are Native American/Hispanic, and 1.14% are mixed race/non-Hispanic. In addition, the non-kit school enrichment group consists of less than 1% of the following race/ethnicities: Asian/Hispanic, Asian/non-Hispanic, African American/Hispanic, Native Hawaiian/Hispanic, Native Hawaiian/non-Hispanic, and not given/non-Hispanic (Table 2).

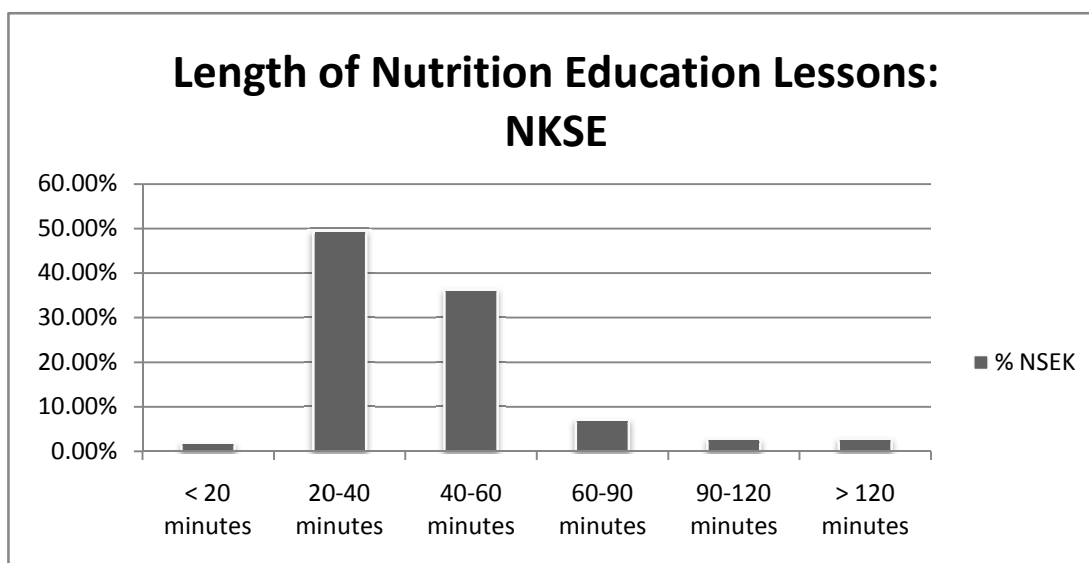
With respect to residence for the non-kit school enrichment group, majority of the students live in towns with a population under 10,000 (n=20,766, 43.01%). Other places of residence include: towns with a population of 10,000-49,999 (n=18,829, 39%), central

cities with a population over 50,000 (n=5,474, 11.34%), farm communities (n=3,173, 6.57%), and suburbs with a population over 50,000 (n=38, 0.08%) (Figure 1).

Lastly, the distribution of students by grade level is as follows: 6.28% kindergarteners, 9.59% first graders, 11.17% second graders, 9.66% third graders, 10.98% fourth graders, 8.18% fifth graders, and 4.01% sixth graders (Figure 2). The remaining 40.13% includes preschoolers (2-4 years old), seventh through twelfth graders, and special education students; however, only data from the kindergarteners through sixth graders will be used for analysis.

The length of education for the school enrichment program with kits and non-kit school enrichment programs also fluctuated. The majority of the lessons in the school enrichment program via kits were greater than 120 minutes total per classroom (n=586, 92.72%). On the other hand, most of the lessons for the non-kit school enrichment program were between 20-40 minutes and 40-60 minutes per contact (n=998, 49.48% and n=732, 36.29%, respectively) for an average of three to four contacts (Figure 3).

FIGURE 3



Questionnaire Items for Grades K-2

Item 1 – Circle the reason we wash our hands.

There are two possible correct responses for item one, which are ‘to get rid of germs’ and ‘to keep from getting sick.’ Sixty-nine percent of the SEK group and 83% of the NKSE group selected ‘to get rid of germs’ at pre-test, $\chi^2(1, N = 1377) = 50.21, p = 0.00$ (Table 3). Whereas, 70% and 98% of the SEK and NKSE groups, respectively, selected this response option at post-test $\chi^2(1, N = 1440) = 265.88, p = 0.00$ (Table 4). This shows that a significantly larger percentage of the NKSE group selected ‘to get rid of germs’ at both the pre- and post-test time points, compared to the SEK group. Additionally, a significantly larger percentage of the NKSE group selected ‘to get rid of germs’ at post-test compared to pre-test; there was no significant difference between pre- and post-test time points for the SEK group. Table 5 summarizes only the significant differences in proportion of the SEK group selecting each response option from pre- to post-test; therefore, item one is not listed on the table. Eighty-three percent of the NKSE group chose this response at pre-test and 89% chose it at post-test $\chi^2(1, N = 1880) = 12.86, p = 0.00$ (Table 6).

Then, the second option, ‘to keep from getting sick,’ was not listed as a choice for the SEK students; therefore there were no data to compare. However, data were complete for the NKSE group and shows that the difference in the percentage of students in the group who selected this response at pre- and post-test time points is not significant (Table 6).

TABLE 3

Table 3. Proportion of SEK vs. NKSE Selecting Each Response Option at Pre-Test					
Questions and Response Options	% Correct		X²	Df	p
	SEK	NKSE			
1A - To get rid of germs	69.04	83.42	50.21	1	0.00
2A - Almost always	44.53	52.50	38.69	1	0.00
3A – Apple	73.72	78.19	7.57	1	0.01
3C – Banana	71.36	75.65	6.54	1	0.01
3F – Grapes	69.76	74.01	6.16	1	0.01
6C - Fruit juice and pretzels	68.11	71.85	7.99	1	0.00
9C – Banana	55.23	70.65	56.69	1	0.00
9D – Orange	61.17	71.81	28.27	1	0.00
9F – Apple	58.47	72.89	51.31	1	0.00
10A - Bell pepper	76.79	56.37	17.06	1	0.00
10E – Lettuce	90.18	65.79	27.39	1	0.00
10F – Cucumber	86.61	65.33	20.57	1	0.00
11B - Ice cream	50.70	59.48	15.53	1	0.00
11C – Cheese	40.18	56.27	51.70	1	0.00
11F – Yogurt	53.21	65.30	30.19	1	0.00
16A – Always	14.21	11.57	5.36	1	0.02
24A - Almost always	43.02	50.41	7.07	1	0.01
26B - Helps me to learn better in class	62.92	55.32	12.50	1	0.00
27E – Always	46.94	4.95	139.80	1	0.00
SEK = School Enrichment program via curriculum kits					
NKSE = Non-kit School Enrichment program					
Significance $p \leq .05$					

TABLE 4

Table 4. Proportion of SEK vs. NKSE Selecting Each Response Option at Post-Test					
Questions and Response Options	% Correct		X²	df	P
	SEK	NKSE			
1A - To get rid of germs	69.78	97.68	265.88	1	0.00
2A - Almost always	50.21	65.21	139.89	1	0.00
3A – Apple	75.48	79.77	7.35	1	0.01
3F – Grapes	74.11	77.78	5.11	1	0.02
5B - Glass of juice	44.02	63.09	142.03	1	0.00
6C - Fruit juice and pretzels	69.70	78.98	54.32	1	0.00
9C – Banana	63.78	79.17	64.62	1	0.00
9D – Orange	65.23	81.96	80.12	1	0.00
9F – Apple	64.68	81.87	83.86	1	0.00
10A - Bell pepper	87.50	67.51	18.81	1	0.00
10E – Lettuce	96.43	70.72	33.79	1	0.00
11B - Ice cream	59.52	69.61	22.19	1	0.00
11C – Cheese	58.92	72.42	40.31	1	0.00
11F – Yogurt	61.12	76.03	51.42	1	0.00
14B - 3 cups	56.25	83.93	150.50	1	0.00
16A – Always	16.69	13.46	7.04	1	0.01
23B - Riding a bike	63.13	48.77	14.26	1	0.00
24A - Almost always	50.00	61.71	19.31	1	0.00
25D - All of the above	32.96	38.96	7.78	1	0.01
27E – Always	51.02	14.84	93.54	1	0.00
SEK = School Enrichment program via curriculum kits					
NKSE = Non-kit School Enrichment Program					
Significance $p \leq .05$					

TABLE 5

Table 5. Proportion of SEK Selecting Each Response Option: Pre-Test vs. Post-Test					
Questions and Response Options	% Correct		X²	df	P
	Pre-Test	Post-Test			
2A - Almost always	44.53	50.21	19.71	1	0.00
3C – Banana	71.36	74.71	3.74	1	0.05
3F – Grapes	69.76	74.11	6.13	1	0.01
5B - Glass of juice	50.57	44.02	16.55	1	0.00
9C – Banana	55.23	63.78	16.78	1	0.00
9D – Orange	61.17	65.23	3.92	1	0.05
9F – Apple	58.47	64.68	9.06	1	0.00
10A -Bell pepper	76.79	87.5	4.38	1	0.04
11B - Ice cream	50.7	59.52	15.68	1	0.00
11C – Cheese	40.18	58.92	70.08	1	0.00
11F – Yogurt	53.21	61.12	12.77	1	0.00
14B - 3 cups	45.93	56.25	14.66	1	0.00
16A – Always	14.21	16.69	4.74	1	0.03
23B - Riding a bike	44.97	63.13	23.76	1	0.00
24A - Almost always	43.02	50	6.73	1	0.01
26B - Helps me to learn better in class	62.92	70.04	10.23	1	0.00

SEK = School Enrichment program via curriculum kits
Significance $p \leq .05$

TABLE 6

Table 6. Proportion of NKSE Selecting Each Response Option: Pre-Test vs. Post-Test					
Questions and Response Options	% Correct		X²	df	p
	Pre-Test	Post-Test			
1A - To get rid of germs	83.42	88.74	12.86	1	0.00
2A - Almost always	52.50	65.21	101.26	1	0.00
3F – Grapes	74.01	77.78	5.67	1	0.02
4A – Fruit	80.08	97.99	122.97	1	0.00
5B - Glass of juice	51.37	63.09	55.02	1	0.00
6C - Fruit juice and pretzels	71.85	78.98	34.59	1	0.00
8A - Oat Bran	71.21	83.71	23.63	1	0.00
8D – Bread	86.74	92.61	9.83	1	0.00
8F – Taco shell	56.44	83.52	92.18	1	0.00
9C – Banana	70.65	79.17	21.55	1	0.00
9D – Orange	71.81	81.96	32.25	1	0.00
9F – Apple	72.89	81.87	24.64	1	0.00
10A - Bell pepper	56.37	67.51	22.91	1	0.00
10E – Lettuce	65.79	70.72	4.90	1	0.03
10F – Cucumber	65.33	94.95	240.06	1	0.00
11B - Ice cream	59.48	69.61	22.35	1	0.00
11C – Cheese	56.27	72.42	56.66	1	0.00
11F – Yogurt	65.30	76.03	27.70	1	0.00
12B - Hot dogs	90.65	99.53	36.15	1	0.00
12E – Turkey	92.52	99.77	30.29	1	0.00
13B - Raw carrots at lunch, and sweet potatoes and green beans for dinner	54.44	79.39	46.06	1	0.00
14B - 3 cups	41.53	83.93	356.32	1	0.00
17B - 3 cups	44.46	70.03	94.02	1	0.00
18B - 2 to 3 cups	64.73	86.88	62.20	1	0.00
19B - 1 1/2 to 2 cups	64.73	86.88	62.20	1	0.00
20B - 5 ounces	26.74	18.18	7.86	1	0.01
20C - 6 ounces	32.09	69.79	106.35	1	0.00
21B - 5 ounces	46.01	77.91	35.19	1	0.00
22B - 3 ounces	34.81	73.25	114.53	1	0.00
23B - Riding a bike	38.27	48.77	7.26	1	0.01
24A - Almost always	50.14	61.71	19.01	1	0.00
25D - All of the above	33.83	38.96	6.42	1	0.01
26B - Helps me to learn better in class	55.32	67.77	41.56	1	0.00
27E – Always	4.95	14.84	15.54	1	0.00
29A – Yes	76.25	100.00	21.56	1	0.00
30B - Measuring spoons	60.61	86.36	11.24	1	0.00

30D - Dry measuring cups	63.64	84.85	7.76	1	0.01
31B - Liquid measuring cups	79.09	98.18	19.90	1	0.00
32B - Measuring spoon	91.30	97.39	4.00	1	0.05
NKSE = Non-kit School Enrichment program					
Significance $p \leq .05$					

Item 3 – Circle the snacks that are best for your body.

Four response options are considered correct for this item. They are: apple, banana, carrot, and grapes. At pre-test, 74% of SEK students and 78% of NKSE students ($\chi^2 (1, N = 2108) = 7.57, p = 0.01$) answered ‘apple’ and at post-test 75% of SEK students and 80% of NKSE students ($\chi^2 (1, N = 2154) = 7.35, p = 0.01$) answered ‘apple’ (Table 3, 4) For this response option, a significantly larger percentage of the NKSE group selected ‘apple’ at both pre- and post-test compared to the SEK group. The difference in the percentage of students who chose this response option between pre-and post-test was not significant for either group.

Additionally, 71% of SEK students and 76% of NKSE students selected ‘banana’ at pre-test $\chi^2 (1, N = 2040) = 6.54, p = 0.01$ (Table 3). Thus, significantly more individuals in the NKSE group selected ‘banana’ at pre-test compared to the SEK group; however the difference between the two groups was not significant at the post-test time point. Additionally, of the SEK group 71% of the students selected ‘banana’ at pre-test compared to 75% at post-test $\chi^2 (1, N = 1918) = 3.74, p = 0.05$ (Table 5). This shows that a significantly larger percentage of students in the SEK group selected this response option at post-test compared to pre-test; this difference is not significant for the NKSE group.

For the response option ‘carrot,’ no significance was found between the two groups at pre- and post-test as well as post-test compared to pre-test for either the SEK or NKSE group.

Seventy percent of SEK and 74% of NKSE students selected ‘grapes’ at pre-test $\chi^2 (1, N = 1995) = 6.16, p = 0.01$ (Table 3). At post-test, 74% of SEK and 78% of NKSE

students selected this response option $\chi^2 (1, N = 2107) = 5.11, p = 0.02$ (Table 4). So, a significantly larger percentage of the NKSE group chose ‘grapes’ compared to the SEK group at both pre- and post-test time points. Additionally, when comparing the two groups, a significantly larger percentage of students in both groups selected ‘grapes’ at post-test compared to pre-test. For the SEK group, 70% at pre-test compared to 74% at post-test selected ‘grapes’ $\chi^2 (1, N = 1889) = 6.13, p = 0.01$ (Table 5). Then for the NKSE group, 74% at pre-test compared to 78% at post-test selected this response option $\chi^2 (1, N = 2213) = 5.67, p = 0.02$ (Table 6).

Item 8 – Circle the foods from the grain group.

For this item, the correct response options are oat bran, bread, and taco shell. In the NKSE group, 71% of the students selected ‘oat bran’ at pre-test compared to 84% at post-test; therefore showing that a significantly larger percentage of NKSE students chose ‘oat bran’ at post-test compared to pre-test $\chi^2 (1, N = 818) = 23.63, p = 0.00$ (Table 6). Also, 87% of the NKSE group chose ‘bread’ at pre-test compared to 93% at post-test ($\chi^2 (1, N = 947) = 9.83, p = 0.00$) and 56% of the NKSE students chose ‘taco shell’ at pre-test compared to 84% at post-test ($\chi^2 (1, N = 739) = 92.18, p = 0.00$) (Table 6). Therefore, in the NKSE group a significantly larger percentage of students chose ‘bread’ and ‘taco shell’ at post-test compared to pre-test. These three analyses could not be conducted for the SEK group.

Item 9 – Circle the foods from the fruit group.

Banana, orange, and apple are the three possible correct response options for item nine. Fifty-five percent of SEK and 71% of NKSE students chose ‘banana’ at pre-test ($\chi^2 (1, N = 1400) = 56.69, p = 0.00$) and 64% of SEK and 79% of NKSE students chose this

answer at post-test ($\chi^2 (1, N = 1590) = 64.62, p = 0.00$); therefore, a significantly larger percentage of students in the NKSE group selected 'banana' at both pre- and post-test compared to the SEK group (Table 3, 4). Also, of the SEK group 55% of students at pre-test and 64% at post-test chose 'banana' $\chi^2 (1, N = 1321) = 16.87, p = 0.00$ (Table 5). Seventy-one percent of NKSE students chose 'banana' at pre-test compared to 79% at post-test $\chi^2 (1, N = 1669) = 21.55, p = 0.00$ (Table 6). Thus, a significantly larger percentage of students selected 'banana' at post-test compared to pre-test for both the SEK and NKSE groups.

At pre-test, 61% of SEK and 72% of NKSE students selected 'orange' ($\chi^2 (1, N = 1479) = 28.27, p = 0.00$) and at post-test 65% of SEK and 82% of NKSE students selected this answer $\chi^2 (1, N = 1637) = 80.12, p = 0.00$ (Table 3, 4). This shows that a significantly larger percentage of students in the NKSE group selected 'orange' compared to the SEK group at both pre-test and post-test time points. In addition, of the SEK group 61% and 65% of the students selected 'orange' at pre-test and post-test, respectively, $\chi^2 (1, N = 1403) = 3.92, p = 0.05$ (Table 5). Of the NKSE group, 72% of students at pre-test and 82% of students at post-test selected this response option $\chi^2 (1, N = 1713) = 32.25, p = 0.00$ (Table 6). Therefore, a significantly larger percentage of students in both the SEK and NKSE group selected 'orange' at post-test compared to pre-test.

Fifty-eight percent of SEK students and 73% of NKSE students chose 'apple' at pre-test ($\chi^2 (1, N = 1461) = 51.31, p = 0.00$) compared to 65% and 82%, respectively, at post-test ($\chi^2 (1, N = 1630) = 83.86, p = 0.00$) showing that a significantly larger

percentage of students in the NKSE group selected ‘apple’ at post-test and pre-test compared to the SEK group (Table 3, 4). Additionally, a significantly larger percentage of students in both the SEK and NKSE groups selected ‘apple’ at post-test compared to pre-test. Fifty-eight percent of the SEK group at pre-test and 65% at post-test selected this response option ($\chi^2 (1, N = 1367) = 9.06, p = 0.00$) and 73% and 82% of NKSE students chose ‘apple’ at pre-test and post-test, respectively, $\chi^2 (1, N = 1724) = 25.64, p = 0.00$ (Table 5, 6).

Item 10 – Circle the foods from the vegetable group.

For this item, the possible correct response options are bell pepper, lettuce, and cucumber. Seventy-seven percent of SEK and 56% of NKSE students selected ‘bell pepper’ at pre-test ($\chi^2 (1, N = 577) = 17.06, p = 0.00$) and 88% of SEK and 68% of NKSE students selected this response option at post-test $\chi^2 (1, N = 686) = 18.81, p = 0.00$ (Table 3, 4). So, a significantly larger percentage of students in the SEK group selected ‘bell pepper’ at both pre- and post-test compared to the NKSE group. Furthermore, a significantly larger percentage of students selected ‘bell pepper’ at post-test compared to pre-test for both the SEK and NKSE groups, which is shown by 77% of SEK students at pre-test and 88% at post-test ($\chi^2 (1, N = 184) = 4.38, p = 0.04$) and 56% of NKSE students at pre-test and 68% at post-test selected this response option $\chi^2 (1, N = 1079) = 22.91, p = 0.00$ (Table 5, 6).

For the response option ‘lettuce,’ at pre-test 90% of SEK and 66% of NKSE students selected this answer ($\chi^2 (1, N = 674) = 27.39, p = 0.00$) whereas, at post-test 96% of SEK and 71% of NKSE students selected it $\chi^2 (1, N = 724) = 33.79, p = 0.00$

showing that a significantly larger percentage of students in the NSEK group selected ‘lettuce’ compared to the SEK group at both pre- and post-test time points (Table 3, 4). Also, of the NKSE students 66% at pre-test and 71% at post-test chose this response option $\chi^2 (1, N = 1189) = 4.90, p = 0.03$ (Table 6). Therefore, a significantly larger percentage of students in the NKSE group selected ‘lettuce’ at post-test compared to pre-test. This analysis was not significant for the SEK group.

At pre-test, 87% of SEK and 65% of NKSE students selected ‘cucumber’ ($\chi^2 (1, N = 666) = 20.57, p = 0.00$) illustrating that a significantly larger percentage of students in the SEK group selected this response option at pre-test compared to the NKSE group (Table 3). This analysis is not significant for the post-test. In addition, of the NKSE group 65% of students at pre-test and 95% at post-test selected ‘cucumber’ $\chi^2 (1, N = 1396) = 240.06, p = 0.00$ (Table 6). Thus, a significantly larger percentage of students in the NKSE group selected this response option at post-test compared to pre-test. This difference is not significant for the SEK group.

Item 11 – Circle the foods from the milk group.

There are a total of three possible correct response options for this item. They include: ice cream, cheese, and yogurt. At pre-test, 51% of SEK and 59% of NKSE students selected ‘ice cream’ $\chi^2 (1, N = 1099) = 15.53, p = 0.00$ and 60% of SEK and 70% of NKSE students selected it at post-test $\chi^2 (1, N = 1288) = 22.19, p = 0.00$ (Table 3, 4). Thus, a significantly larger percentage of the NKSE group chose ‘ice cream’ compared to the SEK group at both pre- and post- time points. Additionally, 51% of SEK students chose ‘ice cream’ at pre-test whereas 60% chose it at post-test ($\chi^2 (1, N = 1100) = 15.68, p = 0.00$) and 59% of NKSE students chose ‘ice cream’ at pre-test

whereas 70% chose it at post-test $\chi^2 (1, N = 1287) = 22.35, p = 0.00$ (Table 5, 6). Hence, a significantly larger percentage of students in the SEK and NKSE groups selected 'ice cream' at post-test compared to pre-test.

Another correct response option, 'cheese,' was chosen by 40% of SEK and 56% of NKSE students at pre-test $\chi^2 (1, N = 962) = 51.70, p = 0.00$) as opposed to 59% of SEK and 72% of NKSE students at post-test $\chi^2 (1, N = 1310) = 40.31, p = 0.00$ (Table 3, 4). Thus, a significantly larger percentage of the NKSE group chose 'cheese' compared to the SEK group at both pre- and post- time points. Of the SEK students, 40% and 59% at pre- and post-test, respectively, selected this response option $\chi^2 (1, N = 989) = 70.08, p = 0.00$ (Table 5). On the other hand, 56% and 72% of NKSE students at pre- and post-test, respectively, chose 'cheese' as their response $\chi^2 (1, N = 1283) = 56.66, p = 0.00$ (Table 6). Therefore, a significantly larger percentage of students in both the SEK and NKSE groups selected 'cheese' at post-test compared to pre-test.

'Yogurt,' another possible correct answer, was selected by 53% of SEK and 65% of NKSE students at pre-test $\chi^2 (1, N = 1182) = 30.19, p = 0.00$ (Table 3). Then, at post-test 61% of SEK and 76% of NKSE students chose this response option $\chi^2 (1, N = 1368) = 51.42, p = 0.00$, which shows that a significantly larger percentage of students of the NSEK group chose 'yogurt' compared to the SEK group at both pre- and post- time points (Table 4). Additionally, a significantly larger percentage of students in both the SEK and NKSE group selected 'yogurt' at post-test compared to pre-test as shown by 53% of the SEK students at pre-test and 61% at post-test chose this response option (χ^2

(1, N = 1141) = 12.77, p = 0.00) and 65% of the NKSE students chose this option at pre-test and 76% at post-test χ^2 (1, N = 1409) = 27.70, p = 0.00 (Table 5, 6).

Item 12 – Circle the foods from the meat group.

Of the NKSE group, 91% answered ‘hot dogs’ at pre-test and about 100% of the students chose this response option at post-test, which shows that a significantly larger percentage of students in the NKSE group selected ‘hot dogs’ at post-test compared to pre-test χ^2 (1, N = 814) = 36.15, p = 0.00 (Table 6). ‘Turkey,’ another correct response, was selected by 93% of NKSE students at pre-test compared to about 100% at post-test showing a significantly larger percentage of students in the NKSE group selected ‘turkey’ at post-test compared to pre-test χ^2 (1, N = 823) = 30.29, p = 0.00 (Table 6). Neither of these analyses could be conducted for the SEK group.

Item 23 – Circle the best activity to do after sitting in school all day.

At post-test, 63% of the SEK group and 49% of the NKSE group selected ‘riding a bike’ (χ^2 (1, N = 384) = 14.26, p = 0.00), which shows that a significantly larger percentage of the SEK group chose this response option compared to the NKSE group at the post-test time point (Table 4). The difference between the NKSE and SEK groups is not significant at pre-test. Furthermore, a significantly larger percentage of students in both the SEK and NKSE groups selected ‘riding a bike’ at post-test compared to pre-test. In the SEK group, 45% and 63% chose this response at pre-test and post-test, respectively (χ^2 (1, N = 387) = 23.76, p = 0.00) and in the NKSE group, 38% of students at pre-test and 49% at post-test chose this response option χ^2 (1, N = 282) = 7.26, p = 0.01 (Table 5, 6).

Item 30 – Circle the things used to measure ingredients when cooking.

The possible correct response options are measuring spoons, dry measuring cups, and liquid measuring cups. Sixty-one percent of NKSE students at pre-test and 86% at post-test selected ‘measuring spoons’ $\chi^2 (1, N = 97) = 11.24, p = 0.00$ (Table 6).

Therefore, a significantly larger percentage of students in this group selected this response option at post-test compared to pre-test. This is also true with another correct response option, ‘dry measuring cups,’ as shown by 64% of NKSE students at pre-test and 85% at post-test selected this response $\chi^2 (1, N = 98) = 7.76, p = 0.01$ (Table 6).

However, for the third correct response, ‘liquid measuring cups,’ no significance was found for either variable. These analyses could not be conducted for the SEK group.

Questionnaire Items for Grades 3-6

Item 2 – I wash my hands before I touch or eat food.

Forty-five percent and 50% of the SEK group and 53% and 65% of the NKSE group answered ‘almost always’ at pre-test ($\chi^2 (1, N = 2950) = 38.69, p = 0.00$) and post-test ($\chi^2 (1, N = 3506) = 139.89, p = 0.00$), respectively, suggesting that at both pre- and post-, a larger percentage of the NKSE group selected this response option compared to the SEK group (Table 3, 4). In addition, for the SEK group 45% at pre-test and 50% at post-test selected ‘almost always’ $\chi^2 (1, N = 2880) = 19.71, p = 0.00$ (Table 5). For the NKSE group, 53% at pre-test and 65% at post-test selected this response option $\chi^2 (1, N = 3576) = 101.26, p = 0.00$; therefore, a larger percentage of individuals selected ‘almost always’ at post-test compared to pre-test for both the SEK and NKSE group (Table 6).

Item 4 – We should make a healthy snack. That’s a good idea. A healthy snack would be...

At post-test, a significantly larger percentage of students in the NKSE group selected 'fruit' compared to pre-test. Eighty percent of the students selected the correct answer at pre-test and 98% at post-test $\chi^2 (1, N = 1332) = 122.97, p = 0.00$ (Table 6).

The analysis could not be conducted for the SEK group.

Item 5 – Let’s have a healthy drink. OK, let’s have a...

Forty-four percent of SEK students and 63% of NKSE students answered 'glass of juice' at post-test, hence a significantly larger percentage of individuals in the NKSE group selected the correct response option at post-test compared to the SEK group $\chi^2 (1, N = 2086) = 142.03, p = 0.00$ (Table 4). The difference between the SEK and NKSE groups was not significant at pre-test. When comparing groups, a significantly larger percentage of students both the SEK and NKSE group selected the correct response at post-test compared to pre-test. Of the SEK group, 51% of the students answered correctly at pre-test and 44% at post-test $\chi^2 (1, N = 1820) = 16.55, p = 0.00$ (Table 5). Of the NKSE group, 51% and 63% of the students answered correctly at pre-test and post-test, respectively $\chi^2 (1, N = 2248) = 55.02, p = 0.00$ (Table 6).

Item 6 – Which is the healthiest snack choice?

At pre-test, 68% of the SEK and 72% of the NKSE students answered 'fruit juice and pretzels' $\chi^2 (1, N = 3359) = 7.99, p = 0.00$ (Table 3). Then, at post-test 70% of the SEK and 79% of the NKSE students answered the item correctly $\chi^2 (1, N = 3575) = 54.32, p = 0.00$ (Table 4). This shows that a significantly larger percentage of students in the NKSE group chose 'fruit juice and pretzels' compared to the SEK group at both the

pre- and post-test time points. Additionally, a significantly larger percentage of students in the NKSE group selected this response option at post-test compared to pre-test. This is shown by 72% of NKSE students at pre-test and 79% at post-test answered the item correctly $\chi^2 (1, N = 3810) = 34.59, p = 0.00$ (Table 6). The difference between the post-test and pre-test for the SEK group was not significant.

Item 13 – Which would be the best way to get the vegetables we should have in a day? I think the best choice is...

A significantly larger percentage of students in the NKSE group selected ‘raw carrots at lunch, and sweet potatoes and green beans for dinner’ at post-test compared to pre-test. Fifty-five percent of the NKSE group selected this response option at pre-test and 79% at post-test $\chi^2 (1, N = 442) = 46.06, p = 0.00$ (Table 6). This analysis could not be conducted for the SEK group.

Item 14 – How much food from the milk, yogurt, and cheese group should we eat each day? Hmmm, let me think...

At post-test, 56% and 84% of the students in the SEK and NKSE groups, respectively, selected ‘3 cups’ $\chi^2 (1, N = 1165) = 150.50, p = 0.00$, which illustrates that a significantly larger percentage of students in the NKSE group selected this response option at post-test compared to the SEK group (Table 4). This difference is not significant at pre-test. In addition, a significantly larger percentage of students in both the SEK and NKSE groups selected ‘3 cups’ at post-test compared to pre-test; as 46% of the SEK students at pre-test and 56% at post-test ($\chi^2 (1, N = 703) = 14.66, p = 0.00$) and 42% of the NKSE students at pre-test and 84% at post-test selected this response option $\chi^2 (1, N = 1163) = 356.32, p = 0.00$ (Table 5, 6).

Item 15 – From which MyPyramid food group SHOULD you eat most of you food?

The correct response for this item is ‘all of the groups.’ The difference in percentage of students in the NKSE group who selected this response option at pre-test and post-test is not significant. Additionally, this analysis could not be conducted for the SEK group.

Item 16 – I read food labels.

At pre-test, 14% of the SEK and 12% of the NKSE students $\chi^2 (1, N = 465) = 5.36, p = 0.02$) and 17% and 13% of the SEK and NKSE groups, respectively, at post-test selected ‘always’ $\chi^2 (1, N = 544) = 7.04, p = 0.01$ (Table 3. 4). Thus, a significantly larger percentage of the NKSE group chose ‘always’ compared to the SEK group at both pre- and post- time points. Furthermore, of the SEK group 14% at pre-test and 17% at post-test selected this response option $\chi^2 (1, N = 624) = 4.74, p = 0.03$, which shows that a significantly larger percentage of students in the SEK group selected ‘always’ at post-test compared to pre-test (Table 5). This difference is not significant for the NKSE group.

Item 17 – How many cups should we have from the milk group?

A significantly larger percentage of students in the NKSE group selected ‘3 cups’ at post-test compared to pre-test as shown by 45% at pre-test and 70% at post-test that selected this response option $\chi^2 (1, N = 806) = 94.02, p = 0.00$ (Table 6). This analysis could not be conducted for the SEK group.

Item 18 – How many cups of vegetables do you think we should eat each day?

Of the NKSE group, 65% of the group at pre-test selected ‘2-3 cups’ compared to 87% at post-test; therefore, a significantly larger percentage of students in the NKSE group selected this response option at post-test compared to pre-test $\chi^2 (1, N = 705) = 62.20, p = 0.00$ (Table 6). This analysis could not be conducted for the SEK group.

Item 19 – How much fruit do you think we should eat each day?

At pre-test, 65% of the NKSE group selected ‘1 ½ - 2 cups’ compared to 87% at post-test $\chi^2 (1, N = 705) = 62.20, p = 0.00$ (Table 6). This shows that a significantly larger percentage of students in the NKSE group selected this response option at post-test compared to pre-test. This analysis could not be conducted for the SEK group.

Item 20 – How many ounces should we eat from the grain group each day?

For this item, there are answers that are considered correct, which are 5 ounces and 6 ounces. Of the NKSE group, 27% of students selected ‘5 ounces’ at pre-test and 18% at post-test $\chi^2 (1, N = 168) = 7.86, p = 0.01$ (Table 6). This indicated that a significantly larger percentage of students in the NKSE group selected ‘5 ounces’ at pre-test compared to post-test. Then, for the response option, ‘6 ounces,’ 32% of the NKSE group selected it at pre-test compared to 70% at post-test $\chi^2 (1, N = 381) = 106.35, p = 0.00$, which indicates that a significantly larger percentage of students in the NKSE group chose this response option at post-test compared to pre-test (Table 6). Neither of these analyses could be conducted for the SEK group.

Item 21 – How many ounces should we eat from the meat and beans group each day?

The correct response option for item 21 is ‘5 ounces.’ Of the NKSE group, 46% of the students selected it at pre-test, whereas 78% selected it at post-test $\chi^2 (1, N = 202) = 35.19, p = 0.00$ (Table 6). This shows that a significantly larger percentage of students in the NKSE group selected ‘5 ounces’ at post-test compared to pre-test. This analysis could not be conducted for the SEK group.

Item 22 – How many ounces of whole grains should we eat from the grain group each day?

‘Three ounces’ is the correct response option for this item. Thirty-five percent of the NKSE group selected this response option at pre-test compared to 73% at post-test, which illustrates that a significantly larger percentage of this group selected ‘3 ounces’ at post-test compared to pre-test $\chi^2 (1, N = 416) = 114.53, p = 0.00$ (Table 6). This analysis could not be conducted for the SEK group.

Item 24 – I am physically active every day (I do things like run, play sports, walk to or from school, dance, ride a bike, exercise, or roller blade).

The best answer for this item is ‘almost always.’ At pre-test, 43% of the SEK group and 50% of the NKSE group selected this response option $\chi^2 (1, N = 647) = 7.07, p = 0.01$ (Table 3). Then, at post-test 50% and 62% of the SEK and NKSE groups, respectively, selected ‘almost always’ $\chi^2 (1, N = 776) = 19.31, p = 0.00$ (Table 4). This shows that a significantly larger percentage of the NKSE group selected this response option compared to the SEK group at both pre- and post- time points. Of the SEK group, 43% and 50% at pre- and post-test, respectively, selected ‘almost always’ ($\chi^2 (1, N = 640) = 6.73, p = 0.01$) and of the NKSE group 50% of the students at pre-test and 62% at

post-test selected this option $\chi^2 (1, N = 783) = 19.01, p = 0.00$ (Table 5, 6). Therefore, a significantly larger percentage of students in both the SEK and NKSE groups selected this response option at post-test compared to pre-test.

Item 25 – Why is running and playing so important?

For item 25, the best response is ‘all of the above.’ At post-test, 33% of the SEK group and 39% of the NKSE group selected this response option $\chi^2 (1, N = 737) = 7.78, p = 0.01$; therefore, the percentage of students in the NKSE group who selected ‘all of the above’ compared to the SEK group is significantly greater at the post-test time point (Table 4). This difference is not significant at the pre-test time point. Of the NKSE group, 34% of the students selected this response at pre-test compared to 39% at post-test $\chi^2 (1, N = 824) = 6.42, p = 0.01$ (Table 6). This shows that a significantly larger percentage of students in this group selected this response option at post-test compared to pre-test. This difference is not significant for the SEK group.

Item 26 – Eating breakfast every day...

At pre-test, 63% of the SEK group and 55% of the NKSE group selected the correct response option, ‘helps me to learn better in class’ $\chi^2 (1, N = 1267) = 12.50, p = 0.00$ (Table 3). Thus, a significantly larger percentage of students in the SEK group selected this response option compared to the NKSE group at pre-test. This difference is not significant at post-test. Also, of the SEK group, 63% and 70% selected this response at pre-test and post-test, respectively, $\chi^2 (1, N = 1194) = 10.23, p = 0.00$ (Table 5). Of the NKSE group, 55% of the students at pre-test and 68% at post-test selected the correct response option $\chi^2 (1, N = 1562) = 41.56, p = 0.00$ (Table 6). This illustrates that a

significantly larger percentage of students selected ‘helps me to learn better in class’ at post-test compared to pre-test for both the SEK and NKSE groups.

Item 27 – I eat breakfast every day.

The best response for this item is ‘always.’ At pre-test, 47% and 5% of the SEK and NKSE groups, respectively, selected this response option $\chi^2 (1, N = 198) = 139.80, p = 0.00$ (Table 3). Then at post-test, 51% of the SEK group and 15% of the NKSE group selected this response $\chi^2 (1, N = 242) = 93.54, p = 0.00$ (Table 4). Therefore, a significantly larger percentage of the SEK group selected ‘always’ compared to the NKSE group at both pre- and post- time points. Of the NKSE group, 5% at pre-test and 15% at post-test selected the best response $\chi^2 (1, N = 56) = 15.54, p = 0.00$ (Table 6). This indicates that a significantly larger percentage of students in this group selected ‘always’ at post-test compared to pre-test. This difference is not significant for the SEK group.

Item 28 – I’m skipping breakfast today. But, skipping meals is not good for you because...

The correct response option for this item is ‘your body needs food throughout the day so you don’t get tired and grouchy.’ The difference in percentage of students in the NKSE group who selected this response option at post-test compared to pre-test is not significant. Additionally, this analysis is not possible for the SEK group.

Item 29 – I ate breakfast or a snack before school today...

Of the NKSE group, 76% of the students at pre-test and 100% at post-test selected the response option, 'yes' $\chi^2 (1, N = 141) = 21.56, p = 0.00$, which shows that a significantly larger percentage of students in this group selected 'yes' at post-test compared to pre-test (Table 6). This analysis could not be conducted for the SEK group.

Item 31 – Which of these would you use to measure milk?

Of the NKSE group, 79% and 98% of the students at pre-test and post-test, respectively, selected the best response option, 'liquid measuring cups' $\chi^2 (1, N = 195) = 19.90, p = 0.00$ (Table 6). So, a significantly larger percentage of students in this group selected this response option at post-test compared to pre-test. This analysis could not be conducted for the SEK group.

Item 32 – Which of these would you use to measure cinnamon for a recipe?

'Measuring spoon' is the correct response option for this item. For the NKSE group, 91% of the students selected this response option at pre-test compared to 97% at post-test $\chi^2 (1, N = 217) = 4.00, p = 0.05$ (Table 6). Therefore, a significantly larger percentage of students in this group selected 'measuring spoon' at post-test compared to pre-test. This analysis could not be conducted for the SEK group.

Program Means of the Percent of Items Answered Correctly

The percent correct was calculated from the total of number of correct responses divided by the total number of responses and then used to determine the means of the percentage of students who chose the correct response options. (Table 7-12)

Table 7. Responses to Questions Regarding Hand Washing								
(n=62,324)								
Questions	Program	Time	A	B	C	D	% Correct	% Change
1. Reasons we wash our hands...	SEK	Pre-test	471	103	92	n/a	71	7%
		Post-test	479	61	72	n/a	78	
	NKSE	Pre-test	1298	27	13	100	97	2%
		Post-test	1191	7	7	197	99	
2. I wash my hands before I touch or eat food.	SEK	Pre-test	1365	764	193	n/a	59	7%
		Post-test	1536	678	108	n/a	66	
	NKSE	Pre-test	663	198	30	n/a	74	21%
		Post-test	930	46	7	n/a	95	

SEK = School Enrichment program via curriculum kits

NKSE = Non-kit School Enrichment program

Questions	Program	Time	A	B	C	D	E	F	% Correct	% Change
3. Snacks that are best for your body...	SEK	Pre-test	976	86	995	931	78	924	96	3%
		Post-test	1002	40	992	978	21	983	99	
	NKSE	Pre-test	421	118	405	321	81	360	88	8%
		Post-test	459	38	396	381	25	418	96	
4. A healthy snack would be...	SEK	Pre-test	35	0	0				100	0%
		Post-test	35	0	0				100	
	NKSE	Pre-test	607	25	58				88	10%
		Post-test	641	3	13				98	
5. A healthy drink would be...	SEK	Pre-test	39	973	369				70	6%
		Post-test	15	1047	319				76	
	NKSE	Pre-test	29	487	248				64	23%
		Post-test	7	683	93				87	
6. Which is the healthiest snack choice?	SEK	Pre-test	51	106	1544				91	4%
		Post-test	31	58	1580				95	
	NKSE	Pre-test	36	163	565				74	22%
		Post-test	4	27	745				96	

SEK = School Enrichment program via curriculum kits

NKSE = Non-kit School Enrichment program

Table 9. Responses to Questions Regarding My Pyramid & Dietary Guidelines

(n=62,324)

Questions	Program	Time	A	B	C	D	E	F	G	% Correct	% Change
8. Foods from the grain group.	SEK	Pre-test	0	0	0	0	0	0		n/a	
		Post-test	0	0	0	0	0	0		n/a	n/a
	NKSE	Pre-test	392	93	59	573	109	317		83	
		Post-test	429	41	28	935	46	874		95	12%
9. Foods from the fruit group.	SEK	Pre-test	0	88	627	693	94	663	661	94	
		Post-test	0	69	722	738	47	732	711	96	2%
	NKSE	Pre-test	7	43	590	560	54	604	568	96	
		Post-test	0	43	1038	1043	11	1053	1026	99	3%
10. Foods from the vegetable group.	SEK	Pre-test	86	22	9	9	101	97		88	
		Post-test	98	23	11	15	108	102		86	-2%
	NKSE	Pre-test	471	46	16	20	579	582		95	
		Post-test	781	20	5	7	1021	1172		99	4%
11. Foods from the milk group.	SEK	Pre-test	120	506	401	143	157	531		77	
		Post-test	47	594	588	92	85	610		89	12%
	NKSE	Pre-test	16	576	396	27	30	465		95	
		Post-test	9	823	628	6	19	880		99	4%
12. Foods from the meat group.	SEK	Pre-test	0	0	0	0	0	0		n/a	
		Post-test	0	0	0	0	0	0		n/a	n/a
	NKSE	Pre-test	19	517	50	16	511	38		89	
		Post-test	7	927	11	5	918	9		98	9%
13. What is the best way to get the vegetables we should have In a day?	SEK	Pre-test	0	0	0					n/a	
		Post-test	0	0	0					n/a	n/a
	NKSE	Pre-test	51	180	84					57	
		Post-test	29	262	40					79	22%
14. How much food from the milk, Yogurt, and cheese group should we each day?	SEK	Pre-test	80	316	132					60	
		Post-test	49	387	92					73	13%
	NKSE	Pre-test	62	199	62					62	
		Post-test	10	547	14					96	34%
	SEK	Pre-test	0	0	0	0	0	0		n/a	

15. From which MyPyramid food group should you eat most of your foods?		Post-test	0	0	0	0	0	0	n/a	n/a
	NKSE	Pre-test	18	35	19	29	46	190	56	
		Post-test	7	10	7	12	122	207	57	1%
16. I read food labels.	SEK	Pre-test	287	639	336	206			20	
		Post-test	337	682	306	143			23	3%
	NKSE	Pre-test	50	91	123	38			17	
		Post-test	59	157	91	15			18	1%
17. How many cups should we have from the milk group?	SEK	Pre-test	0	0	0	0			n/a	
		Post-test	0	0	0	0			n/a	n/a
	NKSE	Pre-test	72	342	108	65			58	
		Post-test	45	526	38	13			85	27%
18. How many cups of vegetables do you think we should eat each day?	SEK	Pre-test	0	0	0				n/a	
		Post-test	0	0	0				n/a	n/a
	NKSE	Pre-test	98	311	103				61	
		Post-test	61	420	27				83	22%
19. How much fruit do you think we should eat each day?	SEK	Pre-test	0	0	0				n/a	
		Post-test	0	0	0				n/a	n/a
	NKSE	Pre-test	144	282	185				46	
		Post-test	85	467	83				74	28%
20. How many ounces should we eat from the grain group each day?	SEK	Pre-test	0	0	0	0			n/a	
		Post-test	0	0	0	0			n/a	n/a
	NKSE	Pre-test	90	111	129	94			57	
		Post-test	36	74	285	37			83	26%
21. How many ounces should we eat from the meat and beans group each day?	SEK	Pre-test	0	0	0	0			n/a	
		Post-test	0	0	0	0			n/a	n/a
	NKSE	Pre-test	27	83	52	16			47	
		Post-test	14	142	19	7			78	31%
22. How many ounces of whole grains should we eat from the grain group each day?	SEK	Pre-test	0	0	0	0			n/a	
		Post-test	0	0	0	0			n/a	n/a
	NKSE	Pre-test	63	138	121	49			37	
		Post-test	19	300	36	16			81	44%

Table 10. Responses to Questions Regarding Physical Activity								
(n=62,324)								
Questions	Program	Time	A	B	C	D	% Correct	% Change
23. What is the best activity to do after sitting in school all day?	SEK	Pre-test	70	161	0	26	63	
		Post-test	23	226	0	8	88	25%
	NKSE	Pre-test	22	90	25	19	58	
		Post-test	13	113	15	11	74	16%
24. I am physically active everyday.	SEK	Pre-test	296	169	63		56	
		Post-test	344	143	41		65	9%
	NKSE	Pre-test	179	138	38		50	
		Post-test	244	109	20		65	15%
25. Why is running and playing so important?	SEK	Pre-test	310	100	15	271	39	
		Post-test	295	94	8	296	43	4%
	NKSE	Pre-test	100	44	11	136	47	
		Post-test	67	23	17	180	63	16%

SEK = School Enrichment program via curriculum kits

NKSE = Non-kit School Enrichment program

Table 11. Responses to Questions Regarding Breakfast									
(n=62,324)									
Questions	Program	Time	A	B	C	D	E	% Correct	% Change
26. Eating breakfast everyday...	SEK	Pre-test	75	565	11	40		82	
		Post-test	35	629	8	19		91	9%
	NKSE	Pre-test	69	233	19	26		67	
		Post-test	14	365	7	6		93	26%
27. I eat breakfast everyday.	SEK	Pre-test	0	0	46	67	194	63	
		Post-test	0	0	37	59	211	69	6%
	NKSE	Pre-test	16	50	103	87	15	6	
		Post-test	5	27	75	128	50	18	12%
28. Skipping meals is not good for you because...	SEK	Pre-test	0	0				n/a	
		Post-test	0	0				n/a	n/a
	NKSE	Pre-test	103	45				70	
		Post-test	125	23				84	14%
29. I ate breakfast or a snack before school today.	SEK	Pre-test	0	0				n/a	
		Post-test	0	0				n/a	n/a
	NKSE	Pre-test	233	93				71	
		Post-test	313	21				94	23%

SEK = School Enrichment program via curriculum kits

NKSE = Non-kit School Enrichment program

Table 12. Responses to Questions Regarding Food Preparation

(n=62,324)

Questions	Program	Time	A	B	C	D	E	F	% Correct	% Change
30. Things used to measure ingredients when cooking...	SEK	Pre-test	0	0	0	0	0	0	n/a	n/a
		Post-test	0	0	0	0	0	0	n/a	
	NKSE	Pre-test	1	25	3	25	19	1	93	2%
		Post-test	0	25	4	25	25	0	95	
31. Which of these would you use to measure milk?	SEK	Pre-test	0	0	0				n/a	n/a
		Post-test	0	0	0				n/a	
	NKSE	Pre-test	23	94	7				76	20%
		Post-test	3	115	2				96	
32. Which of these would you use to measure cinnamon for a recipe?	SEK	Pre-test	0	0	0				n/a	n/a
		Post-test	0	0	0				n/a	
	NKSE	Pre-test	7	112	3				92	6%
		Post-test	1	119	1				98	

SEK = School Enrichment program via curriculum kits

NKSE = Non-kit School Enrichment program

The percent correct for 10 questionnaire items were analyzed using paired t-tests. These t-tests compared the school enrichment kit program at pre- and post-test, the non-kit school enrichment program at pre- and post-test, and the school enrichment kit program and non-kit school enrichment program at post-test. Significance was found between pre- and post-test for the non-kit school enrichment program and between the school enrichment kit program and non-kit school enrichment program at post-test ($p \leq .05$) (Table 13).

TABLE 13

Table 13. Means of Percent Correct for SEK and NKSE at Pre- and Post-test		
Program Type	Time Point	Mean
SEK	Pre-test	78.6
	Post-test	83.5 ^{a*}
NKSE	Pre-test	80.6 ^a
	Post-test	93.2 ^b
*Means with different subscription are significantly different at $p < .05$ using paired t-tests		
SEK = School Enrichment kit program		
NKSE = Non-kit School Enrichment program		

The students from both programs started with similar baseline nutrition knowledge as shown by no significance between the means for SEK at pre-test ($M=78.6$) and NKSE at pre-test ($M=80.6$). Additionally, no significance was found from pre-test to post-test within the SEK group ($M=78.6$ and $M=83.5$, respectively). However, there was a significant difference between SEK and NKSE at post-test ($M=83.5$ and $M=93.2$, respectively). This shows that the average percent of items answered correctly for the non-kit school enrichment program was significantly greater; therefore the non-kit school enrichment program was more effective overall. Additionally, there was a significant

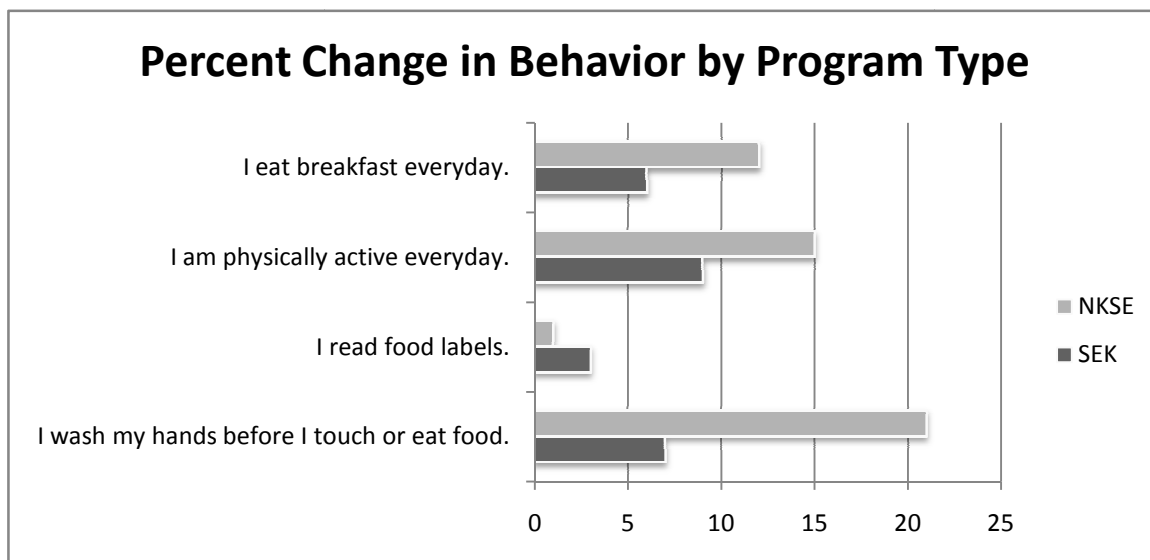
difference between pre- and post-test for the NKSE group (M=80.6 and M=93.2, respectively). This indicates that nutrition knowledge of the students in the non-kit school enrichment group significantly increased, whereas the nutrition knowledge did not significantly increase from pre- to post-test in the school enrichment kit program.

Changes in Behavior and Nutrition Knowledge of Students

The percent change in behavior and knowledge is the difference in percent correct for a questionnaire item at pre-test versus post-test. Then, these percentages were compared between the two groups, SEK and NKSE, to find if behavior and knowledge of students increased after each program was delivered.

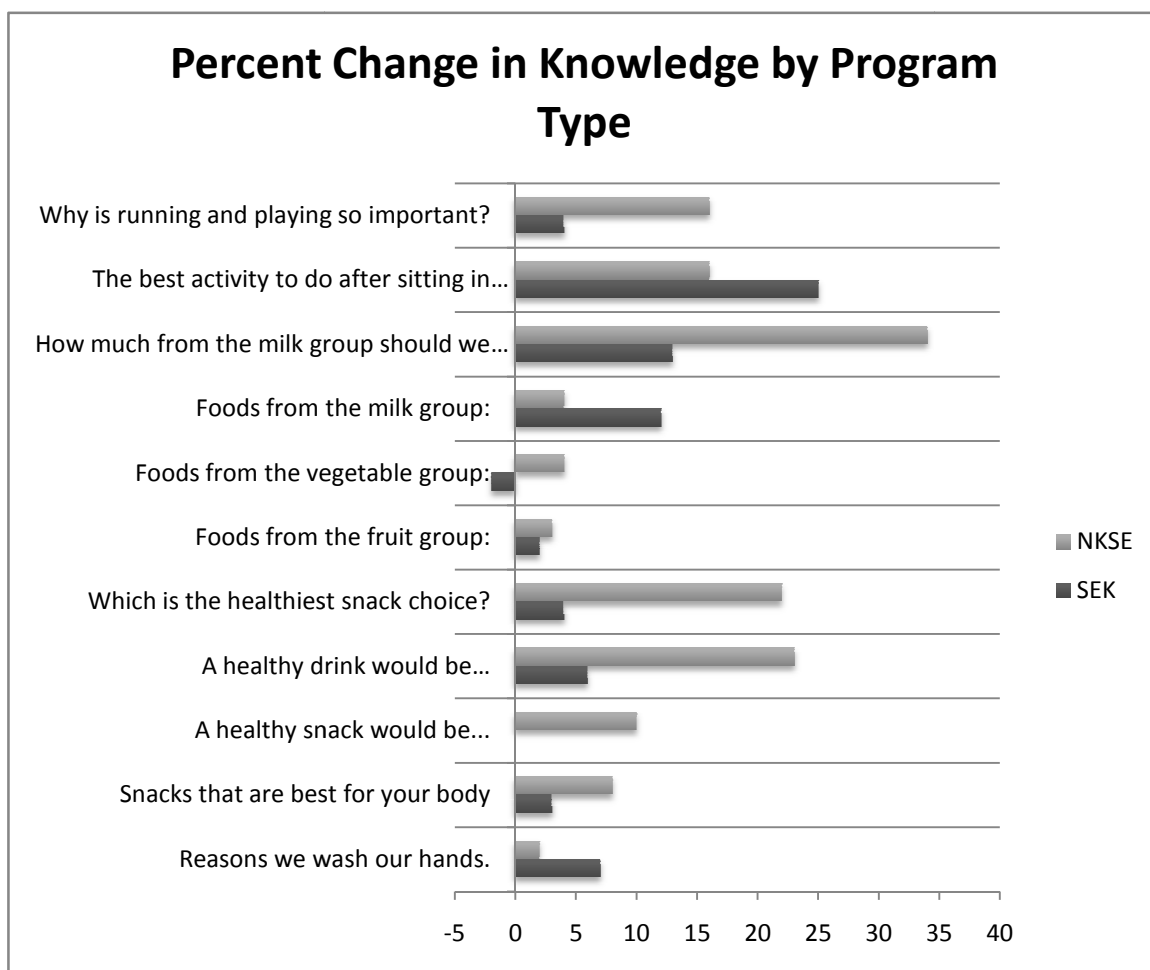
For each questionnaire item dealing with a change in behavior, there was an increase in the number of students who chose the correct response at post-test compared to pre-test. For example, for the question 'I eat breakfast everyday' there was a 12% increase in those who answered correctly for the NKSE group and a 6% increase for the SEK group. The other behavior questions and percent change for each group are as follows: 'I am physically active everyday,' 15% increase in the NKSE group at post-test and 9% increase in the SEK group; 'I read food labels,' 1% increase for the NKSE group and 3% increase for the SEK group; and 'I wash my hands before I touch or eat food,' 21% increase for the NKSE group and 7% increase for the SEK group (Figure 4).

FIGURE 4



With respect of percent change in knowledge, there was an increase in the number of students who answered each item correctly at post-test compared to pre-test in the NKSE group. However, for the SEK group, there were two items where there was either no change or a decrease in the number of students who answered the item correctly after completion of the program. The NKSE group had a greater percentage of students who answered the item correctly after completion of the program in eight out of twelve questionnaire items compared to the SEK group (Figure 5).

FIGURE 5



CHAPTER V

DISCUSSION

NEP helps limited resource families improve their diet quality by teaching them to prepare safe and nutritious foods while stretching. The major initiative of EFNEP is to assist adults, as well as youth in obtaining knowledge, skills, and behaviors that are necessary to contribute to personal development and improve families diets and nutritional well being (17). Youth EFNEP is delivered to children ages 3 to 19 years old through various sites such as schools, after-school care, youth clubs, day camps, residential camps, community centers, and home/community gardens (17).

SNAP focuses on fostering healthy lifestyles through eating right and being physically active (14). With 34% of Nebraska's children living in low-income families, SNAP-Ed is able to provide educational programs to these children (1,18). SNAP-Ed is delivered through two methods, one being school enrichment, which provides hands-on educational lessons and an easy to follow manual supplying teachers with everything needed to effectively teach nutrition to their students (15). These school enrichment kits meet health curriculum objectives and contain five one to two hour block lesson plans plus additional activities for students and are primarily used in Lancaster, Douglas/Sarpy and Adams/Hall counties (15). The second method, non-kit school enrichment program, is the method in which NEP staff completes all of the nutrition education. Topics taught include USDA's MyPyramid, individual food groups, hand washing, and healthy snacks. Each learning activity is tailored to meet the needs of the specific age group being taught.

The purpose of this research was to examine the youth data from the Nebraska SNAP-Ed program and determine the impact it has on youth knowledge and behaviors regarding nutrition. The objectives were to obtain current nutrition knowledge from students in grades K-6 participating in the SNAP-Ed program using a pre-test format, to determine if the nutritional information provided by the SNAP-Ed program impacts the nutrition knowledge and behaviors of K-6 students thru simple pre and post questionnaires, and to determine if there was a difference between the impact of the school enrichment kit program and the non-kit school enrichment program.

By increasing consumption of low fat dairy products, fruits, and vegetables; decreasing consumption of soft drinks; and increasing participation of regular physical activity within elementary school-aged children, the prevalence of nutrition-related problems, such as overweight, dental caries, poor growth and development, and long-term health problems like heart disease and diabetes, could be reduced (23). Nutrition education is a successful beginning to initiate these dietary and lifestyle behavior changes (23).

This study investigated if the nutrition education conducted through SNAP-Ed influenced children's, kindergarten through sixth grade, nutrition knowledge and behaviors through a pre- and post-questionnaire format. The results of this study are consistent with other studies in showing that nutrition education programs conducted in schools by NEP Extension staff positively effect dietary behavior and nutrition knowledge among school-aged children. In this study, children, who received nutrition education whether it was through the school enrichment kit program or the non-kit school enrichment program, positively changed their nutrition knowledge and some behaviors

from pre-test to post-test. These results are also similar to those of a study by Powers and colleagues, who found that by participating in as few as six hours of nutrition education, nutrition knowledge, including Food Guide Pyramid understanding, nutrient-food association, and nutrient-job association, significantly increased (23).

In several other studies of general nutrition education programs, the interventions lasted anywhere from four lessons in two to four weeks to 24 lessons in six months (25, 26). All of these studies showed nutrition knowledge gains, and for some programs, slight positive short-term behavior changes (25). In these studies, those teaching the nutrition lessons were volunteers and not paid staff, which is similar to the school enrichment kit program, where classroom teachers complete the nutrition education lessons. Additionally, the results of the school enrichment kit program were similar to the results of these studies, which were increases in nutrition knowledge and some short-term positive behaviors.

Furthermore, according to Youth YRBS Data in 2005, about 7.7% of students in Nebraska had not participated in any vigorous or moderate physical activity during the past seven days (9). The findings of this study show that more students reported they engaged in physical activity at the conclusion of each program, an additional 9% of school enrichment students and 15% of non-kit school enrichment students.

With regards to the 32-item questionnaire, generally the non-kit school enrichment group selected the correct response option more often than the school enrichment kit group at both pre- and post-test time points. There were only two items on the questionnaire where a significantly larger percentage of the school enrichment

group selected the correct response option at both pre- and post-test compared to the non-kit school enrichment group.

Additionally, when comparing pre- and post-test for the same group, both school enrichment and non-kit school enrichment groups more often than not showed an increase in knowledge and positive behaviors. There were 39 out of 48 response options where a significantly larger percentage of the non-kit school enrichment students selected the correct response option at post-test, compared to pre-test. This is compared to a total of 13 out of 48 response options where a significantly larger percentage of the school enrichment kit group choose the correct response at post-test, compared to pre-test. Therefore, this shows that the non-kit school enrichment group was more likely to choose the correct response option after completion of the nutrition education program.

The difference seen between the two programs could be mainly due to the differences in who is teaching the nutrition lessons to students. In the non-kit school enrichment program, the NEP staff that teach the nutrition lessons have strong backgrounds in nutrition. NEP staff members thus have a greater knowledge base regarding nutrition and have more experience in teaching nutrition; therefore, making them more comfortable and familiar with educating students about nutrition. As a consequence, these factors would create the non-kit school enrichment program to be more effective at impacting the nutrition knowledge and behavior of students. Additionally, the simple fact that there is an outside speaker coming into the classroom could have an effect on the impact of the lesson and how the students respond to the nutrition education.

Variability between classroom elementary teachers in the school enrichment group via kits could also account for the differences in the effectiveness of the programs. The motivations and interests of each elementary school teacher are likely to be very different; therefore, this would create a lot of variability in how the lessons are taught and if the teachers spent adequate amounts of time preparing for and administering the nutrition lessons. In the school enrichment program via kits, the nutrition lessons are required to be a part of the school curriculum; therefore, this could affect the program's outcome. On the other hand, in the non-kit school enrichment program the schools are requesting someone to teach nutrition to their students, which shows they are already interested and invested in educating their students about nutrition.

The amount of time spent teaching nutrition would also affect the change in students' nutrition knowledge and behaviors. However, the total amount of time spent teaching nutrition is similar in both programs. In the school enrichment program via kits, the total amount of time spent was greater than 120 minutes and in the non-kit school enrichment program the majority of the lessons were anywhere between 20 and 60 minutes per contact for an average of three contacts.

Overall, there were a total of eight questions where a significantly larger percentage ($p \leq .05$) of students in both the school enrichment kit and non-kit school enrichment groups choose the correct response option at post-test, compared to pre-test. Where significance is shown, either between time points or program types, the effect seen was large ($\chi^2 > .51$). Furthermore, with the exception of one item on the questionnaire, there was some increase in knowledge and positive behaviors reported by students suggesting that both the school enrichment kit and non-kit school enrichment nutrition

education programs were effective. The results of this study show that teaching students about nutrition and helping them build healthy eating and physical activity habits within the school system is effective.

CHAPTER VI

CONCLUSION

There is growing evidence supporting the effectiveness of nutrition education programs in the school system. Both the school enrichment program via kits and non-kit school enrichment program in this study were shown to be effective at increasing nutrition knowledge and show some evidence at positively changing behaviors. However, the non-kit school enrichment program was shown to be more effective than the alternative program. The main reason for the variation between these two programs is likely due to the difference in the person teaching the nutrition lessons. In the non-kit school enrichment program the NEP staff delivering the lessons has strong backgrounds in nutrition; therefore, are more successful at changing nutrition knowledge and behaviors of students. Overall, this study shows that the Supplemental Nutrition Assistance Program-Education is effective, as evidenced by increases in nutrition knowledge and positive changes in behavior of low-income, kindergarten through sixth grade students; therefore, supporting the role of school in obesity prevention.

LIMITATIONS

The main limitation in this study is that the data consisted solely of frequencies. Therefore, it was not possible to compare any two specific individuals or an individual's pre-test to post-test. Additionally, for the questionnaire items where there was more than one correct answer it was impossible to identify if the same individuals choose all of the correct responses, only one correct response, both correct and incorrect responses, or changed from one correct response to another. As a result, the statistical analyses that could be executed were limited to Chi-square Tests of Independence and one could only calculate the overall percent changes in nutrition knowledge and behavior.

Teacher variability within the school enrichment kit program is another possible limitation. The difference shown between the school enrichment kit and non-kit school enrichment programs could be partially due to the inability to monitor teachers and know how they are teaching the nutrition lessons to their students. Also, there is no guarantee that teachers were fully completing the nutrition lessons, which would also affect the programs outcome.

An additional limitation is associated with program fidelity, which is staying true to the original program design. Programs may often be adapted depending on the person delivering the lesson. A few possible risky adaptations are reducing the number or length of the lessons or how long students are involved, lowering the level of student engagement, eliminating key messages or skills learned, and removing topics. Without being able to control these adaptations, program fidelity becomes distorted.

Finally, there were many differences between the school enrichment program via kits and the non-kit school enrichment program; therefore, it was difficult to make exact comparisons. There were many variables between the two programs that were different other than the person teaching the nutrition lessons, making it hard to see the real differences between which method is more effective. For example, the demographics were different in respect to residence and one method was part of the school curriculum whereas the other was not.

RECOMMENDATIONS

For the school enrichment program via curriculum kits to be more effective, developing surveys to assess teachers' attitudes and perceptions towards food and nutrition, including motivation could greatly affect the program's outcome. Assessing the attitudes and perceptions as well as motivation of the students would also be helpful in determining a nutrition intervention.

Additionally, to increase the effectiveness of the school enrichment program via kits, it would be beneficial to start training with respect to nutrition education for the elementary school teachers. In-services would help elementary school teachers learn how to teach nutrition to their students and would allow them an opportunity to stay updated on current dietary trends in youth as well as general nutrition knowledge. To start, in-services would only need to be brief and once or twice per year.

In addition, the way these two programs are evaluated affects the results in respect to showing their effectiveness. The results of this study show that the strategy in which the programs are evaluated could be enhanced. Two types of evaluation could be considered, which include process evaluation and outcome evaluation.

Furthermore, to obtain better results it would be beneficial to change the responses in the database of questions. It would be easier to analyze the data if there were only one correct response per question. This would allow a greater variety of statistical analyses to be executed. Another change that could be implemented would be to make the evaluations the exact same for each program, which would make the programs easier to compare. Also, when entering the data, it would be beneficial to enter it by subject instead of by classroom. This would also allow more statistical analyses to

be executed and each subject could be compared to his/her pre-test and post-test. These suggestions would help to see the overall effectiveness of each program more clearly.

Last of all, if this study were to be repeated it would be constructive to include a control group as well as an intervention group. In order to better demonstrate the cause and effect of a hypothesis, research should show that a certain phenomenon occurs after a specific intervention is given to a subject and that the phenomenon does not occur in the absence of the intervention. The advantages to this type of research is that there would be greater internal validity, meaning greater confidence that the results came from the manipulation of the independent variable and not from unrelated variance. Using this method would allow the use of statistical analyses, such as ANOVA, t-tests, and regression on the data. Additionally, using a controlled research design is best for identifying causal relationships.

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APPENDIX A

APPENDIX B