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An Evaluation and Exploration of Nutrition Education in Elementary Schools

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AN EVALUATION AND EXPLORATION OF NUTRITION EDUCATION IN ELEMENTARY SCHOOLS

by

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Childhood obesity is a significant problem in the United States. Obese children suffer from a variety of physical, emotional, and social consequences. To curb or reduce this problem, school-based nutrition education interventions have become more common. However, little research has been conducted concerning nutrition-related socioeconomic disparities in behavior change constructs for low and high income children, which is integral to forming appropriate theory-based interventions and allocating resources appropriately. Research into classroom teachers' perspectives is also an area in need of strengthening to better inform interventions. Finally, the School Enrichment Kit Program (SEKP), a current interactive, classroom-based, nutrition and physical activity curriculum for K-2 grades is a unique intervention that necessitates evaluation to justify further use. The purposes of this study were to: (a) develop, validate, and test a survey instrument measuring behavior, self-efficacy, and knowledge for elementary students, (b) determine differences in behavior, self-efficacy, and knowledge for low and high income students, and the relationships between these constructs, (c) evaluate a novel K-2 nutrition and physical activity curricula, and (d) explore teachers' experience of nutrition education. Among all four studies, a total of 10 teachers and 482 students participated. Surveys with students were conducted in their regular classrooms and observations, interviews, and document analysis were conducted with teachers. The survey developed in this study was

found to be a valid and reliable tool for nutrition and physical activity measurement in fifth grade students. Comparison of low and high income schools demonstrated significantly lower knowledge and behavior scores in low income, as well as differences in construct relationships. SEKP was determined to be effective at improving vegetable consumption, breakfast consumption, and some knowledge. Finally, teachers identified five themes as part of their nutrition education experience: Meaningful roles, importance, mutual perceived influences, supplementary education and motivation, and barriers. These studies demonstrate that more resources may need to be allocated to the socioeconomically disadvantaged, the interactive SEKP is a promising intervention and should be further investigated, and teachers are highly invested in nutrition education, so efforts should be made to reduce their barriers.

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Chapter I. Introduction

Childhood obesity is a serious issue for the United States, causing physical, social, emotional, mental, and economic consequences for many children and their families. With obesity-related health issues developing in childhood, it is possible that the current generation will be the first generation to have a shorter lifespan than their parents' generation (Levi et al., 2012). Although recent research has shown a decrease in childhood obesity within some preschool populations, it still remains a significant health concern for all ages (Pan, Blanck, Sherry, Dalenius, Grummer-Strawn, 2010). Particularly, elementary-aged children have not yet shown the same decline as preschool-aged children have shown nationally. The most recent national data from 2012 demonstrates that approximately one fifth of children ages 6-11 years old are obese (Centers for Disease Control and Prevention (CDC), 2015). The overwhelming issue of childhood obesity is further complicated by socioeconomic status. Socioeconomically disadvantaged children show a higher likelihood of being obese than their advantaged counterparts, demonstrating an area of higher need within the youth population (Singh, Siahpush, & Kogan, 2010).

One key opportunity for intervention with primary grade children is within the school environment. Due to the amount of time that children spend in school and their familiarity with their classroom teacher, the classroom setting provides a prime opportunity to deliver a structured program in a formal learning environment by a familiar adult. Many theory-based interventions have been designed and implemented in schools to combat childhood obesity. Some of these interventions have demonstrated no success, while others have demonstrated successes ranging from improved health

behaviors to health outcomes (Dewar et al., 2013; Manios, Moschandreas, Hatzis, & Kafatos, 2002; Kriemler et al., 2010; Fitzgibbon et al., 2006). Overall, research demonstrates a variety of successes and failures in nutrition and/or physical activity interventions, however there is a lack of explanation for these outcomes.

The current dissertation addresses some possible issues that may cause these mixed findings, as well as evaluates an existing nutrition education program, with the goal of improving elementary nutrition education. One problem facing researchers is that there are a lack of validated, reliable measurement tools to measure elementary aged children's nutrition-related self-reported outcomes. Lack of such tools can play a role in whether a study can accurately detect the changes it intends to measure. This measurement validity issue may explain the high prevalence of mixed findings

A second problem is that although a number of nutrition interventions exist, there is a serious lack of explorative and associative information regarding the school environment, such as classroom teachers' perspectives on nutrition education and the differences between students from low and high income schools. Such population and intervention delivery factors may confound intervention results and explain mixed findings. With a better understanding of students attending high and low income schools (population), and teachers (component of intervention), there exists the potential to improve nutrition education programs.

In justification of studying students from low and high income schools, it is clear that socioeconomic status plays a role in childhood obesity, with socioeconomically disadvantaged students at a higher risk of childhood obesity. The type of intervention and delivery method necessary for a school with a majority of low income students may be

completely different than a school with a majority of high income students. The school environment, quality of teachers, resources, neighborhood, and students' achievement and ability to comprehend nutrition concepts may vary enough to justify additional resources or specialized programs. However, there are no known studies to date comparing Title I schools (schools with ≥ 40% of students receiving free or reduced lunch; an indicator of a large low income population) and non-Title I schools (schools with <40% of students receiving free or reduced lunch; an indicator of a large high income population). Students from each type of school should be compared to determine if any differences exist, which will form a foundation to better direct future research on the subject. It may also provide recommendations for the formation or modification of nutrition education programs.

Additionally, the mixed results from existing nutrition and physical activity interventions that rely on classroom teachers to deliver material may be due to the teachers themselves. Most interventions train teachers on the expected delivery of the provided program, but these interventions generally do not include the teacher in the development and planning process. With a number of state/federal standards for education, teachers are faced with barriers to program delivery that are not well addressed by existing research. Exploration of teachers' perspectives of nutrition education, along with examination of differences between students from low and high income schools, may help to create more successful interventions.

Although there is a clear gap in the literature concerning characteristics of schools that should be considered before program development, this should not discourage existing programs. Evaluation data on expected outcomes for existing programs can be

used in conjunction with data addressing students from high and low income schools and classroom teachers to improve and justify these programs. Therefore, the final problem this dissertation addresses is the lack of evaluation of the School Enrichment Kit Program (SEKP), a nutrition and physical activity education kit implemented in the Midwest United States. SEKP is a supplemental nutrition and physical activity education kit that was designed with constructs from the Social Cognitive Theory (SCT) by Extension. Extension, an arm of the university land grant system, provides outreach programs to communities. This 10-hour education kit contains five units, each with several lessons. Two lessons are taught by Extension staff, whereas the majority of the lessons are taught by students' regular homeroom teacher. Prior to this dissertation, the education kits were evaluated within a three-week time period through pre/post surveys, delivered before the first lesson and after the final lesson. No long-term evaluations of the program had been conducted before this dissertation. An evaluation of knowledge, self-efficacy, and behavior outcomes, in combination with teachers' perspectives on nutrition education, and determination of differences between students from Title I and non-Title I schools based on the measurement of a validated and reliable tool, can help to inform, improve, and justify SEKP. Additionally, much of this information can provide a foundation for future research into nutrition education with Title I schools, non-Title I schools, and classroom teachers.

This dissertation presents four studies. These studies are designed to meet the overall goal of improving nutrition education. The purpose and brief explanation of each study is described below:

(a) Study I: The purpose of this study was to develop, validate, and test a social cognitive theory-based instrument measuring knowledge, behavior, and self-efficacy in fifth grade elementary students, and to examine the relationships among these variables. It was hypothesized that the resulting instrument would be reliable due to the use of some already tested, published items, and the validation process with experts. It was also hypothesized that both knowledge and self-efficacy would predict behavior due to their basis in the social cognitive theory. This study combined published and created items for instrument development, validated these items with nutrition experts, and tested these items with fifth grade students from a Midwestern metro area. Cronbach's alpha was be calculated for reliability. This survey instrument was used in Study II. It also has the potential to be adapted for similar populations to gather baseline information before program development to improve future nutrition education interventions.

(b) Study II: The purpose of this study was is to determine the differences between knowledge, behavior, and self-efficacy for fifth grade students attending low income schools and fifth grade students attending high income schools, and to examine the relationship among these variables using the instrument developed from Study I. It was hypothesized that students from low income schools would score lower on all variables based on previous literature suggesting that lower income individuals have poorer nutrition behaviors, and based on availability of resources in high income neighborhoods. It was also hypothesized that all three variables would be related, based on the social cognitive theory, and that these relationships would be stronger in high income schools due to the resources available to these students. Fifth grade students from a Midwestern metro area were recruited from randomly selected elementary schools to

complete self-report surveys in their regular classrooms. These results were analyzed using t test to determine the differences between groups, and regression analysis to determine relationships among constructs.

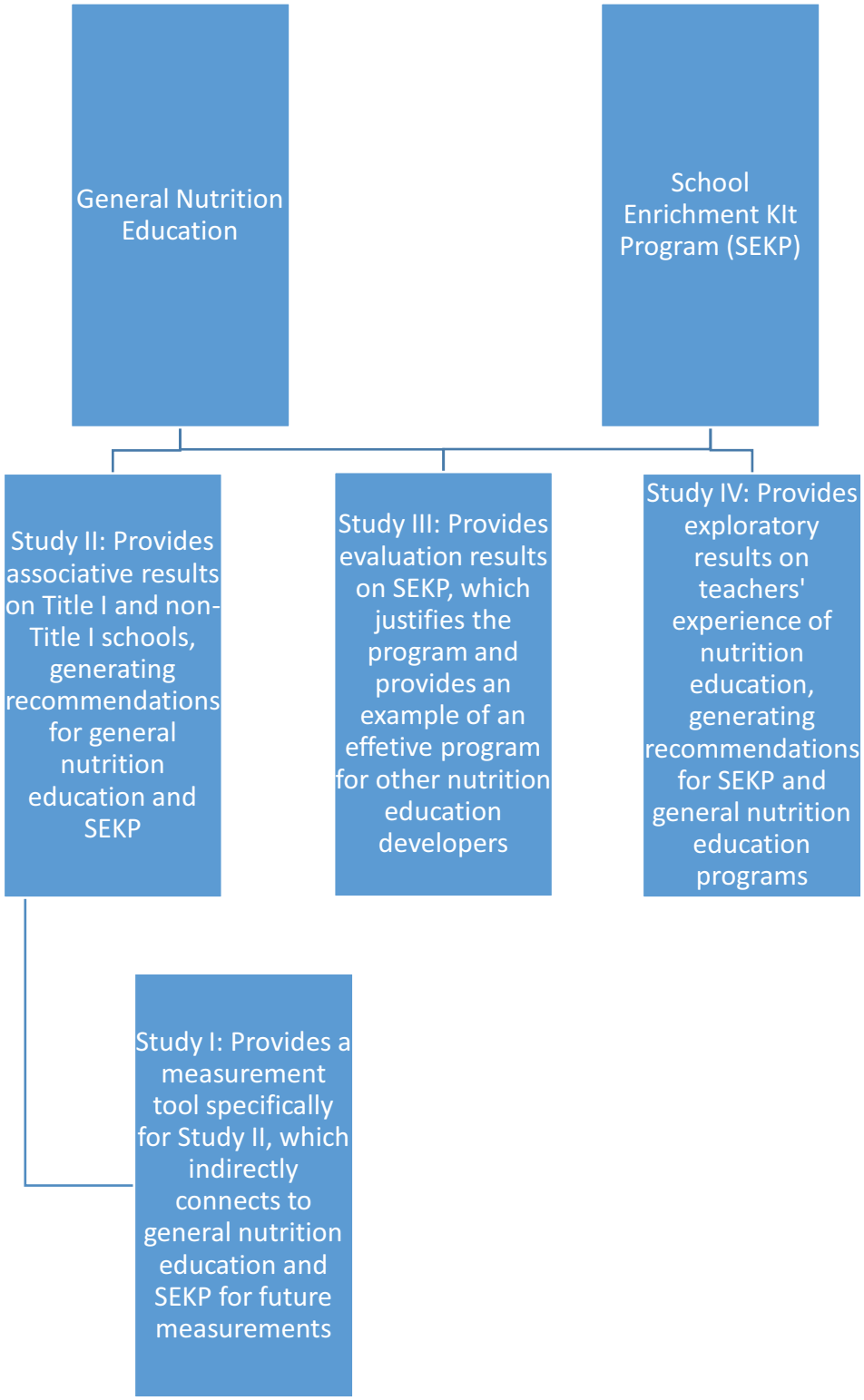
(c) Study III: The purpose of this study was to determine the effectiveness of the SEKP intervention by examining the differences in knowledge, behavior, and self-efficacy scores between third grade students who had received SEKP and third grade students who had not received SEKP. It was hypothesized that students that had received SEKP would score higher on all three variables. Third grade students who had received SEKP during K-2 were recruited from randomly selected intervention schools and third grade students who had not received SEKP were selected from control schools. Students were asked to complete identical validated surveys. Results were analyzed using t test to determine the differences between groups and regression analysis to determine the relationships among constructs.

(d) Study IV: The purpose of this study was to explore how teachers describe their experience with nutrition education within the context of a phenomenology. Due to the qualitative nature of this study, biases were bracketed and no hypotheses were generated. Teachers were selected using purposive sampling and asked to complete an interview, observation, and document analysis. Data were analyzed through a process of inductive coding, reduction, clustering, and identification of themes. Reliability and validity techniques, such as intercoder agreement and member checking were used.

The connection among these studies formed a hierarchical arrangement, with all studies relating back to SEKP, and more broadly, general recommendations for classroom-based nutrition education (Figure 1). On the first level, Study I aimed to create

a valid and reliable tool that directly led to Study II, which assessed self-efficacy, behavior, and knowledge between low and high income students. Study II, III, and IV are lateral to each other on the second level because these studies sought to provide correlational, qualitative, and evaluation results that all have the potential to contribute to the improvement of both SEKP and general nutrition education. Specifically, the purpose of Study II was to better understand the differences between students from Title I and non-Title I schools. Recommendations from this study could be applied to nutrition education broadly, since all public schools fall into one of these two categories. Recommendations could also be applied specifically to SEKP, which could adapt recommendations for its current low income target population and specialize material as it expands. The purpose of Study IIII was to evaluate SEKP, so directly relates to justification of the program, but can also provide general nutrition education developers guidance on effective programs. Finally, Study IV aimed to provide an essence of teachers' perspectives on nutrition education, which can be utilized by any classroom-based, teacher-delivered intervention, including SEKP. Therefore, at the top level, all studies directly or indirectly connect to improving both general classroom-based nutrition education and SEKP.

Figure 1. Connection of studies I-IV



The overall goals of these studies were to: (a) develop a survey instrument to measure knowledge, behavior, and self-efficacy that can be adapted and widely utilized by other programs, (b) improve the nutrition education experience for both students and teachers, (c) justify a novel approach to nutrition education, and (d) create recommendations for working with socioeconomically disadvantaged audiences. This dissertation will be arranged by addressing each study separately in its own chapter, then providing a general discussion of the studies' connections and implications.

Chapter II. Literature Review

Childhood Obesity

Childhood obesity has increased over the past two decades. Childhood overweight and obesity are defined by the Centers for Disease Control and Prevention (CDC) Body Mass Index (BMI)-for-Age percentiles. Overweight is defined as between the 85th percentile to less than the 95th percentile on the growth charts, whereas obesity is defined as at or above the 95th percentile on the growth charts (United States Department of Health and Human Services, 2012). Though the use of BMI is more highly debated in adult populations, due to its inability to account for sex, age, or body composition, the growth charts for children do account for sex and age. In addition, health complications are more likely to arise at these defined cutoffs.

Approximately one third of American children are presently overweight or obese, with 17% being obese (Levi et al., 2012). These rates are concerning for the future generation due to the many complications that can affect these children. Physical complications, such as Type 2 Diabetes, cardiac disease risk factors, breathing issues, and orthopedic issues are becoming more common in obese children (Steinbeck, 2010; Boulet, 2012). Aside from physical consequences, some studies show an increase of teasing and bullying and a decrease in self-esteem, self-concept, and body satisfaction (Lumeng et al., 2010; Daniels, Jacobson, McCrindle, Eckel, & Sanner, 2009). In addition, obesity creates an economic impact on the entire country, costing approximately $147-$210 billion dollars per year (Levi et al., 2012). These physical, social, emotional, mental, and economic consequences illustrate that the impact of childhood obesity is far-reaching. Transdisciplinary interventions targeting this area need to be developed.

Child Diet and Physical Activity

Concurrent with the concerning obesity trend, many children are not meeting basic dietary recommendations. The most recent Scientific Report of the 2015 Dietary Guidelines Advisory Committee reports that most of the United States (US) population, including children, did not meet the recommendations, by age and gender, for fruit, vegetables, whole grains, and dairy foods, while overeating refined grains, solid fats, and added sugars (United States Department of Health and Human Services & United States Department of Agriculture, 2015). This report uses data through 2012 from the National Health and Nutrition Examination Survey (NHANES), one of the largest data sets on Americans' diets.

NHANES data demonstrated that a few subgroups met the recommended intake for fruit, such as children 4 to 8 years old. However, children beginning at 9 years old rarely met the recommended intake (United States Department of Health and Human Services & United States Department of Agriculture, 2015). Even for those that met fruit recommendations, variety was lacking and approximately one third of fruit intake for all children was from non-100% fruit juice (Ramsay, Eskelsen, Branen, Armstrong Shultz, & Plumb, 2014). Variety is necessary to meet micronutrient recommendations for proper growth, development, and body function, so this is of particular concern for children.

Vegetable intake was much more of a concern, as few children met the recommended intake. Less than 5% of children ages 4-8 years old consumed the recommended daily intake of vegetables, and only 1% of males aged 9-13 met the recommendation. Vegetable intake declined from 2001-2004 to 2007-2010 for most Americans, but most significantly in children through age 13 (United States Department

of Health and Human Services & United States Department of Agriculture, 2015). Other NHANES data indicate that children consumed particularly low quantities of dark green vegetables, orange vegetables, and legumes, whereas approximately half met the recommendation for starchy vegetables (Krebs-Smith, Guenther, Subar, Kirkpatrick, & Dodd, 2010).

Although a majority of children met the recommendation for total grains, approximately 99% of children ages 4-13 did not meet the recommendation for whole grains (Krebs-Smith, Guenther, Subar, Kirkpatrick, & Dodd, 2010). Children ages 8-18 years old also consumed less than recommended intake of dairy, which is concerning because a majority of bone mass is acquired in childhood (Keast, Hill Gallant, Albertson, Gugger, & Holschuh, 2015). Macronutrient intakes were not the only concern for children. Children insufficiently consumed micronutrients, including Vitamin D, calcium, and potassium, which are critical for body functioning (Hess & Slavin, 2014).

Almost 40% of total energy consumed for 2- to 18-years olds came from empty calories, which is much higher than the discretionary allowance. For 4-8 year old children, out of an average consumption of 1802 kcal/day, 401 kcal/day came from solid fats and 329 kcal/day from added sugars. For 9-13 year olds, out of 2035 kcal/day, 450 kcal/day came from solid fats and 381 kcal/day from added sugars. The most common sources of solid fats included pizza, grain desserts, whole milk, regular cheese, and fatty meats. The most common added sugars included soda, fruit drinks, grain desserts, dairy desserts, and candy (Reedy & Krebs-Smith, 2010).

The sources for empty calories varied. Snacking occasions partially contributed to the high discretionary calorie consumption. Carbohydrates and added sugars were

overconsumed specifically on snacking occasions. Although snacks contributed 37% of children's total energy intake, they provided only 15-30% of recommended micronutrient intake (Hess & Slavin, 2014). Schools, fast-food restaurants, and stores were fairly equal sources of empty calories for children. Store foods provided the largest percentage of calories from added sugars whereas fast food and school food provided the highest percentage of calories from solid fats (Poti, Slining, & Popkin, 2014). Schools contributed approximately 20% of children's daily intake of two of the top sources of solid fats, whole milk and pizza, however school meal guidelines have recently changed, so it is possible that these numbers may decline in the future (Poti, Slining, & Popkin, 2014).

These trends are especially concerning in terms of obesity. Dairy, fruits, and legumes are negatively associated with the probability of being overweight in childhood, whereas consumption of soft drinks, fats, oils, and sodium have been positively associated with the probability of being overweight (Boumtje, Huang, Lee, & Lin, 2005).

Physical activity is also a concern. The daily recommendation for physical activity for children is at least 60 minutes per day (Centers for Disease Control and Prevention, 2015). NHANES data demonstrated that children ages 6-11 reported engaging in moderate to vigorous physical activity 88 minutes per day, above the recommended levels, however activity decreased to 33 and 26 minutes for 12 to 15 year olds and 16 to 19 year olds, respectively. Moreover, while an average of all normal weight children 6-19 years engaged in approximately 59 minutes of moderate to vigorous physical activity per day, overweight and obese children engaged in approximately 48 or 43 minutes of moderate to vigorous physical activity, respectively (Belcher, et al., 2010).

One limitation of assessing energy intake and physical activity is the measurements themselves. The largest, most representative data that are commonly used throughout the nutrition field are NHANES data. Recently, the reliability of these data have been questioned (Archer, Hand, & Blair, 2013). In fact, research using these data reveals that overweight and obese females older than 7 and males older than 10 demonstrate self-reported intake lower than that of their healthy weight peers. Whether this discrepancy is due to the difficulty in losing weight from obesity early in childhood, a decreased calorie requirement for energy balance due to lack of physical activity in overweight and obese children, or issues in self-reporting is unclear. Presently, there exist no other population samples this large or representative (Skinner, Steiner, & Perrin, 2012).

Socioeconomic Status

Whereas US children in general do not meet dietary recommendations, children of low socioeconomic status are even less likely to meet recommendations, as income barriers influence their diet. Higher income households are more likely to purchase more nutrient-dense, low-calorie foods, including whole grains, seafood, lean meats, low-fat milk, vegetables, and fruit. Low income households, on the other hand, are more likely to purchase fatty meats, cereals, pasta, potatoes, legumes, fats and sweets, and sweetened beverages (Drewnowski & Eichelsdoerfer, 2010). Energy-dense foods are chosen more often by low income families due to reasons such as cost, flavor, convenience, lack of cooking skills, time, and reduction of waste and spoilage (Drewnowski & Eichelsdoerfer, 2010). When low income households do purchase vegetables and fruits, variety is strongly limited, with the most common purchases limited to iceberg lettuce, potatoes,

canned corn, bananas, and orange juice (Drewnowski & Eichelsdoerfer, 2010; Darmon & Drewnowski, 2008). A lack of variety such as this can result in under-consumption of important vitamins and minerals, which has been demonstrated among low income families with dietary fiber, vitamin C, beta carotene, folate, vitamin E, and plant-based polyphenols, iron, calcium, potassium. Children are at particular risk of low intakes of vitamin C, folate, and iron (Darmon & Drewnowski, 2008). However, some research has demonstrated that income differences are less present among children than among adults. One hypothesis to explain this difference is that adults prioritize their child's diet over their own, however this area needs further investigation (Kirkpatrick, Dodd, Reedy, & Krebs-Smith, 2012).

Obesity becomes complicated in children as socioeconomic status (SES) is factored into the equation. Obesity is more prevalent among children from lower SES households. Children from low SES households have approximately 3-4 times higher odds of being obese than their high SES counterparts. Obesity is also increasing at a higher rate for those of low SES, with a 23-33% increase from 2003-2007 for those of low SES households compared to a 10% increase for all US children (Singh, Siahpush, & Kogan, 2010). NHANES data show that total energy intakes of US children began to decrease in 2003-2004 and continued that trend through 2009-2010, bringing total energy intakes down to levels comparable with 1989-1991. However, 2009-2010 total energy intakes for children from low-income families remained higher compared with the 1989-1991 intakes, demonstrating an important income-related disparity (Slining, Mathias, & Popkin, 2013).

Within the past two decades, an obesity-food insecurity paradox has arisen in the literature, in which overweight and obesity have been associated with food insecurity that plagues low socioeconomic families. Food insecurity occurs when the availability, safety, and ability to acquire food in socially acceptable ways becomes limited or uncertain. This idea is contradictory, as food insecurity is associated with lack of food and obesity with overconsumption. However, food insecurity can involve periods of minimal food followed by periods of compensatory overconsumption when families receive a paycheck or federal food assistance. Indeed, some research has demonstrated that receipt of federal food assistance is associated with prevalence of overweight (Townsend, Peerson, Love, Achterberg, & Murphy, 2001; Tolbert Kimbro & Rigby, 2010). During the period in which a family purchases food with federal food assistance, overconsumption may be exacerbated by the purchase of low-cost, calorically dense food in place of nutrient dense, low calorie foods due to cost and availability (Dinour, Bergen, & Yeh, 2007). However, other research has found that food assistance is a protective factor for overweight in young females (Jones, Jahns, Laraia, & Haughton, 2003). Reviews have demonstrated the complexity of this paradox with a variety of research showing positive, negative, and null associations between food insecurity and obesity in children (Eisenmann, Gundersen, Lohman, Garasky, & Stewart, 2011; Larson & Story, 2011). A variety of confounding factors such as federally funded school meal programs, caregivers' priority for child's hunger over their own, and degree of food insecurity may play a role in the extent of this paradox and, moreover, whether food assistance is a protective source or a contributing factor to overweight and obesity.

While literature exists examining nutrition-related behaviors in low income youth, little exists concerning nutrition-related behavior determinants for youth, such as self-efficacy and knowledge. Within a larger intervention, it was determined that youth from lower SES families had lower nutrition-related self-efficacy than their high SES counterparts (Ball et al., 2009). However, outside of this study, little is known about the differences between low and high income youth with respect to knowledge and self-efficacy and their relationships to each other and behavior. It is necessary to determine if disparities exist so that populations can be addressed accordingly based on their specific needs for behavior promotion.

School Environment

To curb or decrease the trend of childhood obesity for youth of all incomes, interventions have been designed throughout the country, focusing on areas of the social ecological model (McLeroy, Bibeau, Steckler, & Glanz, 1988). One main area that has been targeted that affects children and their formation of healthy or unhealthy habits is the school environment. With children spending approximately eight hours, or one third of their entire day at school, there is great potential for either the prevention or development of childhood obesity. With the implementation of new school meal standards from the Healthy, Hunger Free Kids Act, that better meet the goals of the Dietary Guidelines, there is promise for making the school environment healthier (United States Department of Agriculture (USDA), 2013).

On the other hand, there is presently no national standard requirement for physical education. Although the Shape of the Nation Report 2012, conducted by the American Heart Association and the National Association for Sport and Physical Education,

indicates that 74.5% of states mandate physical education, a majority of those schools do not have established requirements on the amount of physical education or allow students waivers (National Association for Sport and Physical Education & American Heart Association, 2012). The National Coalition for Promoting Physical Activity, an organization aimed at advocating for policy that increases physical activity, addresses several reasons for the decrease in physical activity. In 1989, 90% of schools had at least some recess, but since then, 40% of elementary schools have either decreased or eliminated recess time for children in favor of education time. Physical activity was hit hard with the passage of The No Child Left Behind Act of 2001, requiring increased accountability for schools to receive funding. This resulted in a reported 47% increase in instructional time devoted to reading, and a 37% increase in instructional time devoted to mathematics, decreasing physical education by 35% and recess by 28% (National Coalition for Promoting Physical Activity, 2011). With no incentives provided to states for offering physical education, but funding for schools dependent on standardized test scores, time devoted to health education and physical activity faces a significant battle.

In terms of health education, the National Health Education Standards were published in 1995 from a joint committee composed of members from the American Association for Health Education, the American Public Health Association, the American School Health Association, and the Society of State Leaders of Health and Physical Education (Centers for Disease Control and Prevention (CDC), 2013). These standards were created to provide a broad framework to assist schools in selecting curricula, but there is not a large emphasis on nutrition even though it is a vital aspect of health

education and behavior. The amount of emphasis on nutrition varies by individual schools and districts.

As of the 2006-2007 school year, all schools participating in the National School Lunch (or Breakfast) Program were required to establish a wellness policy, which required the inclusion of: 1. Nutrition and physical activity goals to promote student wellness 2. Nutrition guidelines for available school food 3. A plan for measuring the wellness policy implementation and, 4. Involvement of parents, students, and representatives of the school. Each of these would be subject to approval by the local educational agency (Public Law 108-265). Although this is a promising step toward healthier schools, guidelines are broad, and not all schools can select policies that will *improve* the health of their students.

Teachers

For improvement in physical activity and nutrition in schools, one area of study has been the impact of classroom teachers. Both the Social Cognitive Theory and the Social Ecological Model, two influential models in health promotion, involve significant adults in a child's life, such as teachers. Teachers can serve as an important influence on children that can help to produce knowledge, self-efficacy, and behavior change (Bandura, 1997; Stokols, 1996).

Previous research has demonstrated that high quality teachers that provide strong instructional and emotional support to students impact academic achievement (Hamre & Pianta, 2005; Becker & Luthar, 2002). Most research directed at the student-teacher relationship concerns core subjects and general academic achievement, however, there is potential to translate into impact on nutrition variables as well. Literature on theories of

self-determination, attachment, and social support emphasize the teacher's integral role in developing students' self, motivation, emotions, social skills, and academic skills (Ryan & Deci, 2000; Wentzel, 2010).

Attachment refers to the bond between two people. Attachment theory is most commonly associated with parents, however, the concept also applies to the student-teacher relationship, in which the level of security a child feels in this attachment to a teacher affects how they feel and behave in response to that teacher. Secure attachments have been associated with better performance in school, including higher grades and standardized test scores (Bergin & Bergin, 2009). For this theory to apply positively to nutrition education, such relationships would need to exist between students and teacher pre-intervention, however, this theory demonstrates the potential that teachers can improve nutrition-related classroom education in comparison to a guest instructor, with whom the child has no relationship. Indeed, Anderman et al. (2009) found that homeroom teachers are more influential for students than guest lecturers or temporary health educators.

Self-determination theory (SDT) assumes that humans have three basic needs that influence the quality of engagement or motivation toward any domain. These needs include autonomy, relatedness, and competence (Ryan & Deci, 2000). Research in SDT-based exercise interventions have demonstrated increased interpersonal involvement, positive affect, attendance rates, and need satisfaction (Edmunds, Ntoumanis, & Duda, 2008). Motivation is key to engagement in nutrition education, and moreover, to performing the target behaviors. Although SDT can be incorporated in interventions with a guest lecturer rather than a teacher, some strategies for increasing students' three basic

needs are best accomplished by teachers who are most familiar with the given students (Niemiec & Ryan, 2009). For example, providing challenging activities is one method of increasing confidence, however a guest lecturer with standardized material may not be familiar enough with the specific students to adapt activities for their current learning needs (particularly with students performing above or below grade level).

Social support theories generally relate to emotional support that teachers can provide to students, which have the potential to improve competence, social skills, and coping. Such skills may improve the overall classroom experience, reducing anxiety, and better preparing students to engage in the education experience (Wentzel, 2010). All of these theories hinge on teacher participation, so it is possible that teachers will not perform any actions to make these theories successful, and the benefits may not apply to nutrition education. However, the documented research concerning academic and social accomplishments in relation to positive relationships with teachers makes the teacher a promising source to deliver nutrition education (Wentzel, 2010).

As role models, teacher behavior can significantly impact students. Not only has smoking research shown that teacher practices are a significant factor in student learning and behavior, but it has also been tested with physical activity. Donnelly et al. (2009) found that if a teacher participated in a physical activity program, this would significantly improve the chances of their student doing so, supporting the idea that the teachers' behaviors do influence students' behaviors. Research in nutrition education has shown promising results as well by using classroom teachers as the vehicles to nutrition education. Perikkou et al. (2013) found that an intervention including nutrition education

and a weekly snack of fruit, with the homeroom teacher consuming the snack in front of the students, resulted in a significant increase in student fruit consumption.

A teacher's attitude toward nutrition and attitude toward role modeling healthy behaviors might also be important in creating a consistent message with what is being taught (Palardy & Rumberger, 2008). Prelip et al. (2006) explored the roles of elementary school teachers regarding nutrition, using structured interviews in a qualitative study. These authors found that teachers believed that role modeling and motivating children were important in regard to nutrition, but that barriers existed, such as limited class time and teacher training on the subject (Prelip et al., 2006).

School-Based Intervention

Various interventions have been conducted within schools, focusing on nutrition and/or physical activity, however there is no clear method to best improve behavior. Although some studies have shown significant changes in weight and lifestyle behaviors, others have not, and no optimal intervention can be identified (Peterson & Fox, 2007). The most effective strategies to reducing weight and/or modifying health behaviors have included: combined diet and physical activity interventions, interventions with a family component, interventions lasting at least one year, simple interventions with minimal components, the existence of a supporting policy and school environment to complement intervention messages, specific behaviors identified through goals, and separate and distinct interventions for each targeted behavior (Peterson & Fox, 2007; Khambalia, Dickinson, Hardy, Gill, & Baur, 2011). Significant outcomes in school-based interventions have included increased physical activity and nutrition knowledge and preferences, improved fitness, increased physical activity, increased fruit and vegetable

intake, decreased fat intake, and decreased television viewing (Brown & Summerbell, 2009; Nemet, Geva, & Eliakim, 2011).

An additional factor to consider is that interventions should be tailored to the gender(s) included in the study. Findings have shown that male and female students respond differently to different obesity interventions (Brown & Summerbell, 2009; Cook-Cottone, Casey, Feeley, & Baran, 2009; Kropski, Keckley, & Jensen, 2008). For example, females might respond better to interventions involving educational components and social learning, whereas males might respond better to structural and environmental changes. Although this tendency has not been extensively studied, it is an area of consideration when creating and evaluating interventions.

Another important consideration in school interventions is designing a realistic intervention for the school at hand. McFarlin et al. (2013) used a more intensive method in their study, employing a school-based intervention that involved four days per week of 45-minute bouts of exercise and one day per week of nutritional counseling for six months. This study found a significant improvement in both body mass index (BMI) and disease biomarkers, such as resistin, adiponectin, and leptin (McFarlin et al., 2013). Although the above study provides promising results and may work in some schools, taking 45 minutes away from regular teaching time every day for six months is an unrealistic time commitment and would not be implementable in many schools with the stringent requirements teachers have to meet.

A final consideration in developing a school-based program is the incorporation of a behavior change theory. A variety of behavior change theories exist for health promotion programs. No one theory has been identified as more optimal than another.

The choice of theory should be based upon how well it can meet a program's objectives, practicality or feasibility given current circumstances and setting, and target population (McKenzie, Neiger, & Thackeray, 2013). Previous research on the success or failure of similar theory-based programs may also provide an indication of the appropriateness of a particular theory for a given problem.

Social Cognitive Theory

Albert Bandura's Social Cognitive Theory (SCT), originally the social learning theory, is one widely used model for developing these programs (Glanz & Bishop, 2010). This theory emphasizes that human behavior depends on the reciprocal interaction of personal, behavioral, and environmental factors (Glanz, Rimer, & Viswanath, 2008). SCT is commonly used with young audiences and low income audiences due to the incorporation of environmental factors, which are a struggle for these particular populations. With the social learning theory's transition into the SCT, more components that effect human information processing were incorporated. Key constructs of the theory include: outcome expectations, self-efficacy, collective-efficacy, self-regulation, observational learning, behavioral capacity, incentive motivation, and social support (Glanz et al., 2008; Bandura, 2004). Knowledge is sometimes identified as its own construct, in terms of knowledge of risks and benefits of performing a particular behavior, and as a component of behavioral capacity (Bandura, 2004).

Key constructs, their definitions, and examples of their uses are listed in Table 1.

Table 1. Key Constructs of the Social Cognitive Theory		
Key Construct	**Definition**	**Implementation**
Outcome expectations	An individual's beliefs about how likely and how important (expectancies) the consequences of a particular behavior will be	When teaching or demonstrating a behavior, emphasize the positive outcomes of choosing the desired behavior
Self-efficacy	An individual's beliefs about their personal ability to complete a behavior	Allow participants to perform behavior and affirm successes, allow participants to see peers or role models succeed, socially persuade an individual that they can succeed
Collective-efficacy	An individual's beliefs about the ability of a group to complete a behavior	Create group activities in which participants can work together to achieve a goal and affirm successes
Self-regulation	Controlling oneself to achieve or continue a desired behavior	Encourage and teach self-monitoring, goal-setting, feedback, self-reward, self-instruction, and enlistment of social support
Observational learning	Learning to complete a behavior by watching a display of this behavior, through media, role models, or peers	Use peers or role models to demonstrate the desired behavior
Behavioral Capacity	A person's individual knowledge and skills that influence the performance of a behavior	Provide education to increase knowledge, provide skill training, and arrange an environment that most optimally overcomes individual/group barriers to change
Incentive motivation	Using rewards and punishments to encourage a desired behavior	Provide rewards specific and valuable to the individual to encourage behavior change
Social Support	Support for desired behavior change from social relations meaningful to a specific person	Recruit meaningful social relations, such as family, role models, peers, and friends, to support and encourage desired behavior change

Adapted from Glanz, Rimer, & Viswanath; Bandura; DiClemente, Salazar, & Crosby

(Glanz et al., 2008; Bandura, 2004; DiClemente, Salazar, & Crosby, 2013)

As described in Table 1, the SCT incorporates eight key constructs, although not all constructs are always employed in an intervention, which is controversial in the literature. While many studies have used a combination of constructs from different theories, or used only some constructs of one theory, not all researchers deem this acceptable (Lippke & Ziegelmann, 2008). The main concern with combining theories, or not using theories in their entirety, is that researchers may not know how to accurately measure or analyze their new combination, making it difficult to determine the role of theory (Glanz & Bishop, 2010). The combination of these findings imply that it is acceptable to use a portion of a theory, or combine theories, but that measurement tools and analysis procedures need to fit the chosen constructs to produce results that will accurately evaluate an intervention.

The first key construct of the SCT is self-efficacy. Bandura states that self-efficacy highly relies on behavioral capacity, the knowledge and skills to perform a behavior (Bandura, 1977). This is because different tasks vary by difficulty and barriers, so the necessary knowledge and skills to perform a given behavior will vary as well. Individuals provided little information on a topic, therefore having little knowledge, and given no change to practice to a behavior, therefore having little skill, will not likely have high confidence in performing a given behavior, and vice versa.

Although all of the constructs that are encompassed within the SCT are building blocks to making change, self-efficacy is one key construct that sets a foundation for the others. Self-efficacy has been cited throughout literature, and even incorporated into other behavior change models, emphasizing the importance of this particular construct. As Bandura indicates, a person's belief in their ability to change will either give them a

pessimistic or optimistic outlook, contributing substantially to motivation and choice to even attempt behavior change (Bandura, 2001).

Self-efficacy can influence other constructs, such as outcome expectations. For example, the central belief of whether or not a person is capable of change can cause them to have more negative outcome expectations, or to have none at all, as they no longer consider change a possibility. Self-efficacy can affect what challenges a person chooses to face, how much effort they will put toward change, how long to persevere when challenges arise, and how they respond to failure (Bandura, 2001). A person cannot employ other key constructs of the SCT to achieve a behavior change if they don't believe that they can change the behavior in the first place.

Collective-efficacy is very similar to self-efficacy; it is the belief about a group's ability to perform a particular behavior. Collective-efficacy functions in a similar process to self-efficacy with the exception of the number of people involved.

Another key construct of the SCT is outcome expectations, which is the likelihood of a consequence of a target behavior occurring. The level of importance that a person rates this particular consequence is referred to as the expectancy, which is equally important. A person may believe that a negative consequence is likely to occur, but if they find that consequence to be of low importance, it likely will not have a significant effect on their behavior. Outcome expectations can, at times, have little to no effect due to their lack of connection to behavior. When education programs do not specifically tie meaningful outcomes to a consequence of *behavior*, participants may begin to believe that these outcomes are consequences of external processes. This can detract from both motivation and self-efficacy, as the person no longer believes that changing their

behavior is what will result in a desired outcome, but that chance or "luck" is the power at work (Bandura, 1977). Thus, in this theory, it is pertinent that outcome expectations are specifically linked to changing behavior. For example, explaining to children that eating more fruits and vegetables will decrease their risk of disease because the vitamins and minerals help keep their body healthy is a clear connection that links back to the behavior of increasing the intake of fruits and vegetables.

Both self-efficacy and outcome expectations set the stage for the next construct, self-regulation. Self-regulation is controlling oneself to achieve or continue a desired behavior. This would include behaviors such as setting goals, planning tasks to meet those goals, and monitoring progress (Anderson, Winett, & Wojcik, 2007). This may also involve enlisting social support when needed. Individuals who have higher confidence and have more positive outcome expectations will be more likely to initiate self-regulation tools that will assist them in achieving and/or maintaining target behaviors (Anderson et al., 2007).

Incentive motivation is a slightly different construct, in that it targets external rewards. This construct is the most highly debated in its effectiveness. It is questioned whether providing extrinsic rewards for performing a target behavior will only produce success in the short run, but lack longevity and the long-term benefits that the behavior seeks to gain. Another concern is that it could possibly detract from intrinsic motivation, which is the stronger, inner motivation that a person has to perform a behavior. Incentives have been studied in the educational setting, and it has been found that if incentives are connected to a specific and targeted goal, that they are successful in getting the student to

perform the given behavior. Unfortunately, the long-term success is still unclear, which is why behavior change programs are implemented (Gneezy, Meier, & Rey-Biel, 2011).

Social Cognitive Theory-Based Interventions

SCT has been used many times in research and health promotion interventions. Research has suggested that SCT constructs are predictors of healthy nutrition choices in adults (Anderson et al., 2007). Although research in adults is more frequent in the literature than in children, studies have shown that the SCT applies to the youth population as well. SCT constructs such as self-efficacy and social support from peers have been found to be predictors for physical activity in 10-14 year olds (Martin, McCaughtry, Flory, Murphy, & Wisdom, 2011).

Interventions have also demonstrated the positive results of the SCT in action. The "TigerKids" intervention, based on the observational learning component of the SCT, implemented in a population of 3-6 year old children resulted in a significant increase in the proportion of children with high fruit and vegetable intake compared with a control group. These results were sustainable long after the 6 month intervention, showing similar results at 18 months (Bayer et al., 2009). Moreover, a review of interventions on 4-6 year old children found that the SCT was effective in causing a significant decrease in weight, and a significant change in physical activity and/or dietary behaviors (Nixon et al., 2012). SCT intervention in the adolescent population has also shown promising results, including decreased sedentary activities (Dewar et al., 2013).

One problem with the existing literature is that many interventions lack long-term follow-up and are unable to show whether interventions create a lasting behavior change. The Integrated Nutrition and Physical Activity Program, a 6-month intervention program

using both the SCT and Piaget's cognitive development theory did follow-up on 2nd grade students during their 5th through 8th grade years, but did not have promising results. Although students who had received the intervention showed long-term retention of nutrition knowledge and attitudes, there was no long-term retention of self-efficacy or behavior change (Puma et al., 2013).

SEKP

SEKP is a SCT-based, nutrition and physical activity curricula for kindergarten through second grade students. This 10-hour long program was developed by nutrition experts at the University of Nebraska-Lincoln (UNL), UNL Extension, and Lincoln Lancaster County Extension. The SCT-based curricula incorporate outcome expectations, self-efficacy, self-regulation, social support, observational learning, and behavioral capacity. Lessons include topics such as MyPlate/food groups, digestion, physical activity, food safety, healthy breakfasts, meal preparation, healthy snacking, and "sometimes" foods (foods that are less nutrient dense, and should only be eaten in moderation), with the largest emphasis on the food groups.

SEKP is hypothesized to be effective in increasing nutrition and physical activity-related knowledge, self-efficacy of performing positive nutrition and physical activity-related health behaviors, and the frequency of positive nutrition and physical activity-related health behaviors.

SEKP is proposed to be effective for several reasons. First, it takes a transdisciplinary approach to controlling childhood obesity by involving nutrition experts, classroom teachers, and parents. It has become clear that programs involving several disciplines have the potential to be more effective, as they encompass research

and perspectives from several areas of expertise, offer adult social support from several important adults in the child's life, and often address more issues due to the varied perspectives. SEKP begins with a teacher in-service before the school year to increase the teacher's knowledge and self-efficacy of teaching the nutrition and physical activity curricula. Extension educators come to participating homeroom classrooms and teach a "Hand Washing" lesson to students. Homeroom teachers are then provided with a kit of educational activities divided into five lessons with several SCT-based activities in each lesson. Teachers are given three weeks to teach the lessons, then Extension educators return to the classroom to provide one final "Healthy Snacking" lesson to the class.

In terms of cognitive psychology, SEKP is thought to be effective by utilizing a variety of learning strategies to improve knowledge. SEKP incorporates social learning activities, activates prior knowledge through class discussion, provides adjunct aids to reduce cognitive load, combines visual and textual material, and links related lessons, all of which have been associated with improved learning (Bruning, 2011).

In terms of addressing behavior, the main support of the hypothesis that this program will be effective is the use of the well-known SCT. Programs based on behavior change theories are generally more effective at changing behavior than those that are not theory-based. As described above, several SCT-based interventions have been effective in the youth population in terms of nutrition and physical activity, so it is hypothesized that this program will follow suit. This program incorporates many of the SCT constructs, except for incentive motivation. Through these constructs, its instructional basis in cognitive psychology, and its transdiscliplinary approach, it is proposed to be effective at changing knowledge, self-efficacy, and behavior.

Literature Gap and Justification for Study

As previously described, a variety of nutrition education interventions for children exist, however most interventions focus on specific objectives, such as increased intake of fruits and vegetables, therefore existing measurement tools for children lack variety, particularly in the domain of self-efficacy. Therefore, the purpose of Study I was to develop, validate, and test a social cognitive theory-based instrument measuring knowledge, behavior, and self-efficacy in fifth grade elementary students and to examine the relationships among these variables.

In addition, although NHANES data provide information on the intake of children from low and high socioeconomic households, little research has been conducted comparing the knowledge and self-efficacy of these two groups, or these factors' relationship to behavior (Nemet et al., 2011; Nemet, Perez, Reges, & Eliakim, 2007). For school interventions to be successful, more research needs to be conducted to understand these disparities so that resources are allocated to schools that most need them. Therefore, the purpose of Study II was to determine the differences between knowledge, behavior, and self-efficacy for fifth grade students attending low income schools and fifth grade students attending high income schools, and to examine the relationships among these variables using the validated instrument from Study I.

One existing intervention for low income students is the previously described SEKP. Since SEKP began, it has undergone regular process evaluation, but before this dissertation, had not undergone a long-term outcome evaluation. Although it was hypothesized that this program would be effective, and the justifications for this are based in the literature, there had been no evaluation in place to test this hypothesis. In order to

justify SEKP's continued use in practicing schools and to expand its use to additional schools, the program needed to be evaluated on a long-term basis. Because this program lacks any type of follow-up longer than immediate post-program, an evaluation using a 1-year time period was conducted in third grade students. Thus, the purpose of Study III was to determine the effectiveness of the SEKP intervention by examining the differences in knowledge, behavior, and self-efficacy scores between third grade students who had received SEKP and third grade students who had not received SEKP, one year post intervention.

Last, little qualitative research exists that explores teachers' experience of nutrition education, which is vital to the success of a nutrition education intervention. The majority of research explores the perspectives' of all school staff, making the voice of the teacher less prominent. Other studies focus on only a few specific factors, such as barriers. Still missing is an in-depth exploration of teachers' overall perspectives and experience, so Study IV was intended to fill that gap. The purpose of Study IV was to explore how teachers describe their experience with nutrition education within the context of a phenomenology.

The overall goals of the four studies are to develop a youth survey tool to measure knowledge, behavior, and self-efficacy, improve the nutrition education experience for both students and teachers, justify a novel approach to nutrition education, and make recommendations for working with socioeconomically disadvantaged audiences.

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CHAPTER III. STUDY I

Development and Validation of a Social Cognitive Theory-Based Survey for Elementary Nutrition Education Program

Abstract

The Social Cognitive Theory (SCT) is a widely used model for developing elementary nutrition education programs; however, few instruments are available to assess the impact of such programs on the main constructs of the SCT. The purposes of this study were to: (a) develop and validate a SCT-based survey instrument that focuses on knowledge, behavior, and self-efficacy for fifth grade students; (b) assess the relationships between knowledge, behavior, and self-efficacy; and (c) assess knowledge, behavior, and self-efficacy for healthy eating among the fifth grade students. A 40-item instrument was developed and validated using content validity and tested among 98 fifth grade students for internal consistency reliability. Relationships between knowledge, behavior, and self-efficacy were assessed using Pearson Correlation Coefficients. Differences in behavior and knowledge scores between children with high and low self-efficacy were examined using t-test. Cronbach's alphas for self-efficacy (0.70) and behavior (0.71) subscales of the survey were acceptable, although lower for knowledge (0.56). Summary scores for self-efficacy and behaviors were positively correlated (r=0.40, p=0.0001); however, summary knowledge scores were not associated with self-efficacy (r=0.02, p=0.88) or behavior scores (r=0.14, p=0.23). Participants with high self-efficacy also had significantly higher scores on consuming fruits (p=0.0009) and dairy products (p=0.009), eating breakfast (p=0.008), helping plan family meals (p=0.0006) and total behaviors for healthy-eating (p=0.001) compared to those with low self-efficacy. In addition, approximately two thirds of the fifth grade students reported that they did not eat any fruits or vegetables or ate them only once on one day recall. The developed instrument is a reliable and useful tool to assess SCT-based elementary nutrition education programs,

particularly for self-efficacy and behavior. Results also indicated that strategic interventions are necessary to improve dietary behaviors regarding fruit and vegetable consumptions among elementary school students.

Introduction

Childhood obesity is a serious issue in the United States that affects approximately 17% of youth ages 2-19 years old (Levi, Segal, Laurent, Lang, & Rayburn, 2012). These rates are concerning for the current generation due to the many health complications that can affect these children and have the potential to lead into adulthood (Steinbeck, 2010; Boulet, 2013). The school environment is one of the main target areas for children to develop healthy behaviors. Various interventions have been conducted within schools that focus on nutrition and/or physical activity.

The Social Cognitive Theory (SCT) is a widely used model for developing such programs. This theory emphasizes that human behavior depends on the reciprocal interaction of personal, behavioral, and environmental factors (Glanz, Rimer, & Viswanath, 2008). Several interventions grounded in the SCT among 4-6 year old children have demonstrated positive outcomes in creating changes in healthy eating and/or physical activity (Nixon et al., 2012). In adolescents, school-based interventions have resulted in decreased sedentary behaviors and increased physical activity (Dewar et al., 2013; Dzewaltowski et al., 2009). After-school programs, using SCT-based invention, also showed improvements in nutrition behaviors such as intakes of fruits and vegetables, healthy snacks, water, and sugar-free beverages as well as physical activity among 8-13 year old children (Branscum, Sharma, Wang, Wilson, & Rojas-Guyler, 2013; Branscum, Kaye, & Warner, 2013). Outside of the school environment, behavioral improvements were also observed among preadolescents and adolescents after the completion of SCT-based nutrition and/or physical activity interventions (Rosenkranz, Behrens, & Dzewaltowski, 2010; Thompson et al., 2009; Black et al., 2010).

Several existing survey instruments on nutrition and physical activity primarily measure knowledge and behavior (Kelder et al., 2005; Baranowski et al., 2000; Townsend, Johns, Shilts, & Farfan-Ramirez, 2006; De Bourdeaudhuij et al., 2005), but few assess self-efficacy, which is a significant component of the SCT (Bandura, 2004). The most cited self-efficacy items for nutrition interventions among elementary school children were created by the Gimme 5 program (Baranowski et al., 2000) and "Smart Bodies" (Tuuri et al., 2009); however, both programs exclusively focused on fruits and vegetables. In addition, the self-efficacy component from the After-School Student Questionnaire, modified from the Health Behavior Questionnaire, focuses only on dietary behaviors related to sodium and fat intake (Townsend et al., 2006; Edmundson et al., 1996).

With the increasing need for theory-based intervention programs that target behavior changes (Hernandez-Garbanzo, Brosh, Sarrano, Cason, & Bhattarai, 2013), a valid and useful measurement tool is needed to assess the impact of SCT-based nutrition interventions on the main constructs of the theory, particularly self-efficacy. Contento and colleagues conducted a review of instruments for nutrition education programs and suggested that measurement tools should reflect the study design, intervention, and objectives while still having substantial validity and reliability (Contento, Randell, & Basch, 2002). Furthermore, according to the SCT, knowledge of health risks and benefits is a construct that creates the precondition for change (Bandura, 2004; DiClemente, 2013). Behavioral capacity, another construct of the SCT, is composed of the knowledge and skills necessary to perform a health behavior (Edberg, 2015; McKenzie, 2013); however, beliefs of self-efficacy are needed for most people to overcome the barriers to

adopting and maintaining healthy lifestyle habits (Bandura, 2004). Therefore, the purposes of this pilot study were to: (a) develop and validate a SCT-based survey instrument that focuses on knowledge, behavior, and self-efficacy for fifth grade students; (b) assess the relationships between knowledge, behavior, and self-efficacy, the main constructs of the SCT; and (c) assess knowledge, behavior, and self-efficacy for healthy eating among the fifth grade students.

Methods

Participants and procedures

This investigation was approved by the University of Nebraska Internal Review Board (Appendix A-1). A total of 98 fifth grade students (aged 9-12 years) were recruited from four local elementary schools that had never been exposed to any supplementary nutrition education curriculum and had various numbers of students receiving free and reduced price meals (6.5-47.3%). Surveys were administered in the students' regular classrooms. Students were directed to answer each question to the best of their ability, and if at any point they did not understand a word or question or what a question was asking, or were confused for any other reason, to circle what was confusing on the survey and write why it confused them. Parent consent and youth assent for each participant were obtained before data collection (Appendices B-1 and B-2).

Survey instrument construction and scoring

The current instrument, The Healthy Habits Survey (Appendix C-1), was developed to assess the long-term impact for Growing Healthy Kids (GHK), a SCT-based, nutrition and physical activity curriculum for elementary students. The instrument uses the constructs of knowledge, behavior, and self-efficacy with topic areas including

digestion, physical activity, healthy meals, healthy snacking, food groups, breakfast, and meal planning, which were applicable to material covered in GHK. Items on the survey were selected or modified from the following programs or instruments: KidQuest (Jensen, Kattelmann, Ren, & Wey, 2009), Network for a Healthy California Youth Survey (California Department of Public Health, 2012), Nutrition Education Program (Wisconsin Nutrition Education Program, 2015), SIRK (California Department of Public Health, 2012), CATCH (Kelder et al., 2005), and PizzaPlease (Struempler & Raby, 2005). Certain knowledge questions and all self-efficacy questions were created because existing knowledge and self-efficacy items did not address topics relevant to GHK. The combination of existing and new items generated a 77-item instrument. The reading level was found to be appropriate for the fifth grade level based on a combination of common readability indicators (Readability Formulas, 2013).

For behavior questions, the responses to the items were scored from 1 to 4 (or 1 to 5 if there were 5 responses to the question) with a higher score reflecting a more positive response. Items were reversely scored when questions were related to an unhealthy behavior. Similarly, items for self-efficacy were scored from 1 to 3, indicating low, medium, and high self-efficacy, respectively. For each of the knowledge items, "1" was given if the participant had the correct answer, and if not, "0" was marked for the item.

Content validation of survey instrument

Content and face validation were used to validate the survey instrument (Rubio, Berg-Weger, Tebb, Lee, & Rauch, 2003). Initially, the survey included 77 items focusing on knowledge, behavior, and self-efficacy. Two content experts reviewed and reduced the survey to 68 items. The survey was then validated using an additional nine nutrition

experts (content validation) and three lay experts (face validation). The nine content experts were Extension educators, assistants, and program leaders involved with implementing school-based nutrition and physical activity curriculum, of which five were Registered Dietitians and seven had Masters degrees or higher.

For content validation, all experts received a cover letter, an instruction sheet, and a draft of the survey instrument. The cover letter provided an overview and the purpose of the study, asking each expert for their input on the survey. Experts were asked to independently rate each survey item on a 1 to 4 scale based on two validity factors: relevance and clarity (Rubio et al., 2003). Relevance referred to the item's ability to represent the lessons covered through GHK (1=the survey item is not representative, 2= major revisions are needed to be representative, 3=minor revisions are needed to be representative, 4=the survey item is representative). Clarity represented how clearly the item was worded (1=the item is not clear, 2=major revisions are needed to be clear, 3=minor revisions are needed to be clear, 4=item is clear). Experts were also asked to provide additional comments addressing repetition, difficulty, appropriateness to income level; what was unclear about any question; and general suggestions they had on each item. An average rating of relevance and clarity for each item was calculated. Items scoring less than 3.0 in the relevance or clarity category were removed from the instrument. Items scoring between 3.0 -4.0 were either removed or edited based on handwritten comments from the experts. Face validity was conducted among three fifth grade teachers (lay experts) who gave qualitative feedback on the survey.

Data analysis

For quantitative validation data, mean relevance and clarity scores were calculated based on the nine experts' average ratings. The internal consistency/reliability for each section (knowledge, behavior and self-efficacy) was analyzed using Cronbach's alpha with a value of 0.60 or higher deemed acceptable (Contento et al., 2002). Qualitative data for content validation and pilot testing were transcribed, coded, and grouped into reoccurring comments or themes for each item identified.

Scores on self-efficacy questions regarding healthy eating in the survey were summarized and the median value was identified by ranking all of the participants based on their summary scores (total self-efficacy scores). After excluding individuals with the median value of summary self-efficacy scores (n=19), remaining participants were stratified into "high self-efficacy" and "low self-efficacy" groups based on the following criteria: high self-efficacy group, summary self-efficacy scores > median value; low self-efficacy group, summary self-efficacy scores < median value. In addition, each subject's scores for healthy eating related behavior questions and knowledge items were totaled. Differences in means of summary and individual behavior scores and summary knowledge scores between the two groups (high self-efficacy vs. low self-efficacy group) were examined using t-test. The relationships between behavior, self-efficacy, and knowledge summary scores were assessed using Pearson Correlation Coefficient.

Due to the multi-dimensional nature of the constructs, factor analysis was used to identify underlying main factors/patterns associated with behavior or self-efficacy variables, with the assumption that participants responded similarly to certain questions that are all associated with a latent variable (factor). SPSS 22 (SPSS, Inc, Chicago, IL)

was used for all statistical analyses with a two-sided p value of <0.05 considered statistically significant.

Results

Content and face validity

Qualitative comments from the nine experts are presented in Table 1. Four items in the relevance category had an average score of < 3.0 and were removed from the scale. Among the 64 items that scored between 3.0 - 4.0 in the relevance category, 38 were removed and 17 were edited based on handwritten comments addressing repetition, difficulty, appropriateness to income level, and general suggestions. Seven items in the clarity category had an average score of < 3.0 and were removed from the scale (three of which had already been targeted for removal due to low relevance scores). Sixty-one items had scores between 3.0 - 4.0 and were edited based on comments indicating what was unclear about each question. Seven additional items were added to compensate for removed items. The final survey instrument used in pilot testing contained 37 items including sections of demographics (4), knowledge (11), behavior (12), and self-efficacy (10). Results reported in the present study were based upon this 37-item survey. For face validity, the qualitative feedback from the three fifth grade teachers varied; however, the disagreements appeared to focus on the knowledge questions and were not consistent enough to warrant further editing (Table 1).

Pilot testing and internal consistency

All fifth grade students (n=98) completed the survey instrument, which took approximately 30 minutes. Cronbach's alpha for knowledge was 0.41 and increased to 0.56 after removing items with low reliability. Qualitative results from student feedback showed difficulty in understanding words such as "carbohydrate" and "vitamin" although

these items were validated at a fifth grade level. Therefore, knowledge items were primary replaced with alternate published items at a lower level of difficulty (Jensen et al., 2009; Wisconsin Nutrition Education Program, 2015; Struempler, 2005), but still rated at a fifth grade level.

Cronbach's alphas for behavior and self-efficacy were 0.60 and 0.67, respectively. The corresponding values were increased to 0.71 and 0.70 when the items with low reliability were excluded. Removal of some behavior questions necessitated the addition of published beverage items (California Department of Public Health, 2012) to address topics that were eliminated due to low reliability. This led to a final, fully developed survey instrument (which will be used to assess the Growing Healthy Kids nutrition education curriculum) that included 40 items with basic demographics (3 items) and knowledge (14 items), behavior (12 items), and self-efficacy (11 items) assessing the following topics: healthy meals, food groups, healthy snacking, healthy beverages, physical activity, breakfast, daily recommendation, and meal planning. The added items (e.g., knowledge items on food groups and daily recommendations) in the final survey were not re-tested because they were validated previously. Furthermore, notes from qualitative observations while students completed the survey indicated that (a) students rushed to complete survey; (b) students failed to complete the entire survey; or (c) students had difficulty with demographic questions.

Demographics, behaviors, self-efficacy, and knowledge

Among 98 fifth grade students from four schools who completed the survey, 40% were males and 60% were females. The majority of students (56%) identified that they were not Hispanic/Latino and 37% identified that they were white. However, relatively

high numbers of students did not know whether they were Hispanic (36%) or their race/ethnicity (23%) (Table 2).

Two thirds of the participants reported that they ate fruits (63.2%) or vegetables (67.4%) less than twice per day with approximately one third indicating no consumptions of either fruits (27.4%) or vegetables (28.4%). However, the majority stated that they ate whole grain (73.4%) or lean protein foods (60.7%), or ate/drank dairy products (77.9%) at least two times per day, with over one third consuming whole grains (41.5%) or dairy (36.8%) at least three times per day. Almost two thirds reported that they ate breakfast every day (61.7%) and 59.0% said that they did not drink any sweetened beverages such as pop, punches, sport drink, or fruit flavored drink. Over 50% (51.1%) of the participants reported that they helped plan family meals at home at least 3 days per week. Self-efficacy scores tended to be high, with 89.7% to 98.0% of the participants having either high (very sure) or medium levels (somewhat sure) of self-efficacy on the relevant variables. Greater than 90% of the participants answered correctly on knowledge questions regarding healthy snack, healthy meal, healthy breakfast and healthy beverage; however, a majority of the participants had difficulties on questions on specific nutrients such as vitamin A (14.9% scored correctly) and vitamin C (18.5% scored correctly) (Table 2). Because an interest of this study was to assess healthy eating behavior, self-efficacy, and knowledge among study participants, results of physical activity related items (2 in behavior, 2 in self-efficacy, and 1 in knowledge section) were not included in the present study.

Table 3 demonstrates behavior and summary knowledge scores based on the self-efficacy profiles. Compared to the low self-efficacy group, the high self-efficacy group

had significantly higher scores on eating fruits (p=0.0009), consuming dairy products (p=0.009), eating breakfast (p=0.008) and helping plan family meals at home (p=0.0006), and higher summary behavior scores on healthy eating (p=0.001). There were no differences in summary scores of nutrition knowledge between the two groups (p=0.74). Summary scores of self-efficacy and behavior were positively correlated (r=0.40, p=0.0001); however, summary knowledge scores were not associated with self-efficacy (r=0.02, p=0.88) or behavior summary scores (r=0.14, p=0.23).

Factor analysis results for healthy eating related behavior and self-efficacy variables are shown in Table 4. It appeared that the behavior or self-efficacy construct was each associated with the main underlying factors: consuming healthy foods (Factor 1), consuming unhealthy foods (Factor 2), and eating breakfast and eating lean protein (Factor 3) for behavior; identifying/choosing healthy meals and snacks (Factor 1), planning/choosing a meal with different food groups (Factor 2), and eating breakfast every morning and choosing healthy meals at school (Factor 3) for self-efficacy. For behavior, Factor 1 of consuming healthy foods captured most of the variance (22.07%), and eating fruits (factor loading, 0.74) and vegetables (factor loading, 0.76) had the strongest associations with this latent variable (Factor 1). Factor 1 was also highly associated with consuming dairy products (factor loading, 0.63) and eating whole grains (factor loading, 0.53). In addition, drinking sweetened beverages (factor loading, 0.74) and eating French fries or chips (factor loading, 0.72) were strongly correlated to Factor 2 of consuming unhealthy foods. With respect to self-efficacy, a higher portion of the variance was explained by Factor 1 of “identifying/choosing healthy meals and snacks” (27.53%). “Choosing a healthy meal at home” (factor loading, 0.79) and “choosing a

healthy meal when your friends do not" (factor loading, 0.79) had the strongest correlations with this factor.

Discussion

Results from this study indicate that the Healthy Habits Survey is both a valid and useful tool to measure knowledge, behavior, and self-efficacy for SCT-based nutrition education programs among 9-12 year old students. Results also suggested that participants with higher self-efficacy scores were more likely to report healthful eating behaviors.

The unique aspect of this survey instrument is the self-efficacy component. Self-efficacy is one of the important constructs of the SCT and limited surveys on nutrition education programs address this issue. Even within the existing instruments, none have assessed self-efficacy for a wide array of nutrition-related topics among children ages 9 to 12 years. Gimme 5, a SCT-based curriculum focusing on fruits and vegetables evaluated its impact on self-efficacy. The 22-item survey instrument, created for the target population of third to fifth grade students had an average alpha reliability of 0.90, but it only focused on assessing self-efficacy for eating fruits and vegetables (Baranowski et al., 2000). "Smart Bodies" is another educational intervention based upon the SCT, targeting fourth and fifth grade students (Tuuri et al., 2009). Similar to Gimme 5, the survey instrument demonstrated high alpha reliabilities for pre (0.92) and post lessons (0.90), but also had its main focus on fruits and vegetables (Tuuri et al., 2009). The Coordinated Approach to Child Health (CATCH) study utilized modified items for self-efficacy from the Health Behavior Questionnaire; however, these items focus more on

salt and fat intake and physical activity rather than a broad array of items (Kelder et al., 2005).

Although this study does not demonstrate the highest alpha reliabilities existing in the literature, the reliability is statistically acceptable, and mirrors reliability of existing instruments. For instance, the Integrated Nutrition and Physical Activity program found alpha reliabilities ranging from 0.72-0.75 for their self-efficacy items (Puma et al., 2013), which were similar to our results (Cronbach's alpha: initial survey=0.67; revised survey=0.70). The reliability results (Cronbach's alpha: initial survey=0.60; revised survey=0.71) for the behavior section were consistent with what was hypothesized since all of the items in this section were taken from existing, validated instruments (Jensen et al., 2009; California Department of Public Health, 2012).

However, the internal consistency/reliability of knowledge questions appeared to be lower than hypothesized (Cronbach's alpha: initial survey = 0.41; revised survey = 0.56), even though a majority of the knowledge questions were taken verbatim or modified from existing, validated instruments. There are several possible explanations. The difficulty level of the knowledge questions might be higher for the students who had not received supplementary nutrition education, which was the case for these pilot participants. The study sample and the samples in the original studies from which these questions were taken may have been inherently different in certain demographics such as race/ethnicity, gender, and socioeconomic status. In addition, a broad range of knowledge items were measured, including knowledge necessary to conduct nutrition related health behaviors and knowledge of certain nutrients, such as carbohydrates and vitamins. The reasons for including the measures of the more specific nutrition knowledge were: (a)

knowing the benefits of vitamins and carbohydrates, for instance, would demonstrate the importance for children to eat a healthy and balanced meal; and (b) the knowledge scale was created for assessing GHK, where health benefits of carbohydrate and vitamins were taught in the curriculum.

In this study, relationships among variables were also examined. Self-efficacy and behavior (for healthy eating) summary scores were positively associated; however, there were no associations of knowledge scores with behavior or self-efficacy. The present results demonstrated that participants with high self-efficacy also had higher behavior scores (eat fruits, eat/drink dairy products, eat breakfast, help plan family meals at home, and summary behavior scores) than those with low self-efficacy, suggesting that self-efficacy may be more relevant than knowledge in terms of influencing children's eating behaviors. However, the low reliability of Cronbach's alpha for knowledge may have influenced the relationship between knowledge and behavior. This study's findings were consistent with the SCT, which suggests that self-efficacy plays an important role in an individual's behavioral changes (Bandura, 2004). Indeed, Ramirez, Hodges Kulinna, and Cothran (2012) found self-efficacy to be a predictor of physical activity in fourth to sixth grade students (Ramirez et al. 2012). Results from Farm to School programs have also demonstrated an association between behavior and self-efficacy in fourth to sixth grade students based on self-report data (Roche et al., 2012). Factor analysis results suggest that consuming healthy foods and choosing/identifying healthy meals and snacks were key underlying factors for behavior and self-efficacy constructs, respectively. It also suggested that eating fruit and vegetables was more relevant in terms of the consumption of healthy foods.

Within the relationships between constructs, particular behavior items varied by self-efficacy levels. The observed differences in behavior variables regarding fruit or dairy intakes, and eating breakfast between participants with high and low self-efficacy scores may be explained in part by the ongoing efforts to improve healthy eating made by schools in concert with several national programs such as the United States Department of Agriculture's Fresh Fruit and Vegetable Program (United States Department of Agriculture (USDA), 2015), the Healthy, Hunger-Free Kids Act of 2010 (USDA, 2015), and the National School Lunch and School Breakfast Programs (USDA, 2015). These programs increase the accessibility of fruits, dairy foods, and breakfast in the school environment, thereby raising self-efficacy of improving these eating behaviors among the students, leading to enhanced performance of target behavior. However, it appeared that self-efficacy did not influence students' vegetable intake even though making fresh vegetables more accessible was also part of the efforts from some of these programs (USDA, 2015). It is possible that the taste of fresh fruits was more appealing to children as compared to that of fresh vegetables. Future studies with a larger sample size are necessary to confirm findings.

In terms of specific behaviors, two thirds of the fifth grade students in this study reported that they either ate fruits or vegetables only once or did not eat them at all on a typical day, with approximately half indicating no consumptions of any of these foods. Although the present results need to be further confirmed in the studies in which the participants are randomly drawn from a large population, they in general, reflect a pattern of dietary behaviors among children in the Midwestern area because the four elementary schools involved in our study had similar demographics (i.e., race/ethnicities,

socioeconomic status of the schools) compared to the overall student population in the area. Findings that a relatively high proportion of the fifth grade students tended to consume few or no fruits or vegetables suggest that strategic interventions are needed to address this ongoing problem among elementary school children.

The present investigation is the first study that developed and validated a survey instrument that includes self-efficacy assessment for an educational program covering a variety of nutrition-related topics for older elementary school students (9 to 12 years). There are several strengths of the study. The study population was diverse in terms of race/ethnicity and school socioeconomic status, providing a wide range of perspectives that reflect both the Title I ($\geq$ 40% students receiving free or reduced price school meals) and non-Title I (< 40% students receiving free or reduced price school meals) schools that this instrument will evaluate in the future. The survey instrument developed in this study was validated using various methods, including content validity, face validity, and internal consistency reliability. Furthermore, the constructs of the survey were strengthened by the significant correlation between behavior and self-efficacy scores and the factor analysis outcomes that identified the key patterns related to healthy eating behaviors and self-efficacy. Additionally, the inclusion of measurements of behavior and self-efficacy and the necessary knowledge to perform nutrition related health behaviors would allow this instrument to apply to many SCT-based nutrition programs beyond GHK; however, as with many surveys, it may need to be modified to fit into each individual program and the specific population associated with the program.

This study has limitations. Participants (fifth grade students) were recruited from schools that had never been exposed to any nutrition interventions. Therefore, results,

particularly for knowledge, may not be generalized among other fifth grade students who have received supplementary nutrition education. Also, due to the nature of convenience sampling, findings regarding children's dietary behaviors may not completely represent the entire fifth grade student population; nevertheless, the present study population varied in race/ethnicity and socio-economic status. Furthermore, although measures were validated, additional assessments such as food diaries/records or behavioral observation may help provide a more accurate evaluation of behaviors and reduce self-report/response bias, particularly among children. There may also have been issues with common method variance, though this study employed different means to minimize this type of bias, including the use of different scale types for different constructs, incorporation of both negative and positive behavior items, use of familiar survey format, and assurance of anonymity to encourage truthful answers. Last, according to the qualitative results, children had difficulty with demographic questions and the feeling of being rushed and missing items, leading to potential information bias. For future implementation of this instrument among children of this age group, this study recommends to simplify demographic items and remind students to check every page of their surveys when finishing so that all the survey questions are completed.

Conclusion

Results indicate that the Healthy Habits Survey is a valid and useful tool to evaluate the effectiveness of SCT-based nutrition education programs that teach broad knowledge of nutrition and physical activity among older elementary school students. In addition, results suggest that participants with higher self-efficacy scores were also associated with higher behavior scores for healthy eating. However, the fact that

relatively high proportions of the fifth grade students in this study had low intakes of fruits or vegetables warrants strategic interventions to facilitate the behavior change.

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Table 1. Summary of comments from content experts (n=9) for content validity and lay experts (n=3) for face validity

Themes	Quotes
Content validity results (n=9)	
Repetition	"Question may not be necessary." "Only need 1-2 of these types of questions." "Repetitive."
Difficulty	"Whole grains are sometimes hard for them to understand." "They won't know what these are." "These choices will be a bit confusing."
Appropriateness to income level	"Our students do skip meals but not because they want to, because they do not have food." "This is the parent's responsibility not the child's." "I think #12 may make some students feel bad or sad that they do not participate especially if it is because of money. It may not be a choice for the kids." "This question could make students feel bad about being in a low income family."
Face validity results (n=3)	
Too Difficult	"I couldn't answer some of these vitamin questions myself." "I don't know if students can answer all of these questions [pointing to vitamin questions]." "We don't teach all of these topics here, so they probably won't know some of this stuff."
Appropriate for grade level	"These all look good." "All of these are appropriate for the grade level." "I don't think students would have difficulty with any of these questions."

Note: Content validity was conducted using 9 content experts and face validity was conducted using 3 5th grade teachers (lay experts).

Table 2. Demographics and healthy eating behavior, self-efficacy, and knowledge of study participants (the fifth grade students, n=98)

Demographics	N (%)
Gender	
Male	39 (40)
Female	59 (60)
Race/ethnicity	
American Indian or Alaska Native	5 (5)
Asian	9 (9)
Black or African American	3 (3)
White/Caucasian	36 (37)
Two or more races	9 (9)
Other, not listed	14 (14)
I don't know	22 (23)
Hispanic/Latino	
Yes	8 (8)
No	55 (56)
I don't know	35 (36)
Behavior*	
Eat fruits	
None	26 (27.4)
1 time/day	34 (35.8)
2 times/day	14 (14.7)
3 or more times/day	21 (22.1)
Eat vegetables	
None	27 (28.4)
1 time/day	37 (39.0)
2 times/day	21 (22.1)
3 or more times/day	10 (10.5)
Eat whole grains	
None	4 (4.3)
1 time/day	21 (22.3)
2 times/day	30 (31.9)
3 or more times/day	39 (41.5)
Eat lean protein	
None	9 (9.6)
1 time/day	28 (29.8)
2 times/day	34 (36.2)
3 or more times/day	23 (24.5)
Eat/drink dairy foods/drinks	
None	3 (3.2)
1 time/day	18 (19.0)
2 times/day	39 (41.1)
3 or more times/day	35 (36.8)
Eat French fries or chips	
None	57 (60.0)
1 time/day	22 (23.2)
2 times/day	12 (12.6)
3 or more times/day	4 (4.2)
Drink sweetened beverages (pop, punches, sport drink, etc)	
None	56 (59.)
1-2 time/day	33 (34.7)
3-4 times/day	5 (5.3)
5 or more times/day	1 (1.1)

Eat doughnuts, cookies, brownies, cakes, candy	
None	32 (33.7)
1-2 time/day	52 (54.7)
3-4 times/day	8 (8.4)
5 or more times/day	3 (3.2)
Eat breakfast	
0 days/week	2 (2.1)
1-2 days /week	5 (5.3)
3-4 days / week	6 (6.4)
5-6 days /week	23 (24.5)
7 days /week	58 (61.7)
Help plan family meals at home	
0 days/week	19 (20.2)
1-2 days /week	27 (28.7)
3-4 days / week	30 (31.9)
5-6 days /week	6 (6.4)
7 days /week	12 (12.8)
Self-efficacy*†	
Identify a healthy meal	
High	55 (56.7)
Medium	40 (41.2)
Low	2 (2.1)
Choose a healthy meal at home	
High	61 (62.9)
Medium	33 (34.0)
Low	3 (3.1)
Choose a healthy meal at school	
High	53 (55.2)
Medium	39 (40.6)
low	4 (4.2)
Choose a healthy meal when your friends do not	
High	34 (35.8)
Medium	54 (56.8)
Low	7 (7.4)
Choose a meal with all five food groups	
High	32 (33.0)
Medium	55 (56.7)
Low	10 (10.3)
Plan a meal with at least three different food groups	
High	63 (65.0)
Medium	29 (29.9)
Low	5 (5.1)
Choose a healthy snack	
High	64 (66.7)
Medium	30 (31.3)
Low	2 (2.1)
Eat breakfast every morning	
High	62 (64.6)
Medium	28 (29.2)
Low	6 (6.3)
Knowledge*	% of the participants answered correctly
Healthy snack	92.9
Healthy meal	79.6
Healthy breakfast	99.0

Healthy beverage	99.0
Digestion	81.4
Nutrients like carbohydrate	55.1
Nutrients like protein	85.6
Nutrients like calcium	82.3
Nutrients like vitamin A	14.9
Nutrients like vitamin C	18.5

*1 to 9 participants had missing data on the behavior, self-efficacy, or knowledge variables.

†High self-efficacy, very sure; medium self-efficacy, somewhat sure; low self-efficacy, not sure at all.

Table 3. Scores of heathy eating behaviors and nutrition knowledge based on self-efficacy profiles of study participants (the fifth grade students)

	Scores (mean ± SD)		
	Low self-efficacy* (n = 38)	High self-efficacy* (n = 39)	P value†
Summary self-efficacy‡	11.00 ± 0.91	15.89 ± 2.00	<0.0001
Behavior			
Eat vegetable	2.08 ± 1.02	2.23 ± 0.96	0.50
Eat fruits	1.94 ± 1.01	2.76 ± 1.06	0.0009
Eat whole grains	3.13 ± 0.84	3.21 ± 0.86	0.71
Eat lean protein	2.62 ± 1.01	2.92 ± 0.77	0.15
Eat dairy	2.97 ± 0.88	3.44 ± 0.60	0.009
Drink less sweetened beverages (soda, punches, etc.)	3.61 ± 0.59	3.41 ± 0.72	0.20
Eat less French fries or chips	3.50 ± 0.73	3.33 ± 0.90	0.37
Eat less donuts, cookies, brownies, cakes, candies	3.08 ± 0.75	3.33 ± 0.62	0.11
Eat breakfast	4.08 ± 1.22	4.68 ± 0.57	0.008
Help plan family meals at home	2.16 ± 1.08	3.10 ± 1.21	0.0006
Summary behavior‡	32.75 ± 4.17	35.92 ± 3.75	0.001
Summary nutrition Knowledge‡	7.84 ± 1.37	7.74 ± 1.33	0.74

*The scores of each participant's responses to healthy eating related self-efficacy questions were summarized and the median value of the summary scores for the participants was obtained; Low self-efficacy participants were those with self-efficacy summary scores < the median value and high self-efficacy participants were those with self-efficacy summary scores > the median value. Participants with the median value of self-efficacy summary scores were not included (n=19)

†P values for differences between participants in high and low self-efficacy groups by t test.

‡ Summary self-efficacy = summary scores of self-efficacy items related to healthy eating; Summary behavior = summary scores of behavior items related to healthy eating; Summary nutrition knowledge = summary scores of nutrition knowledge items.

Table 4. Factor analysis for healthy eating behavior and self-efficacy among study participants (the fifth grade students, n=98)

	Factor 1†	Factor 2†	Factor 3†
Behavior variables			
Factor loading*			
Eat vegetable	0.76	-0.07	0.09
Eat fruits	0.74	-0.01	0.30
Eat whole grains	0.53	0.11	0.35
Eat lean protein	0.35	0.05	0.65
Eat/drink dairy	0.63	0.32	-0.08
Drink sweetened beverages (soda, punches, etc.)	0.22	0.74	-0.28
Eat French fries or chips	0.03	0.72	0.16
Eat donuts, cookies, brownies, cakes, candies	-0.07	0.65	0.47
Eat breakfast	0.09	0.03	0.67
Variance explained			
Total	1.99	1.60	1.41
% of variance	22.07	17.78	15.76
Self-efficacy variables			
Factor loading*			
Identify a healthy meal	0.68	-0.04	0.21
Choose a healthy meal at home	0.79	0.15	0.01
Choose a healthy meal at school	0.38	0.20	0.62
Choose a healthy meal when your friends do not	0.79	0.05	-0.06
Choose a meal with all five food groups	0.20	0.69	0.25
Plan a meal with at least three different food groups	-0.01	0.82	-0.23
Choose a healthy snack	0.57	0.36	0.08
Eat breakfast every morning	-0.10	-0.12	0.84
Variance explained			
Total	2.20	1.35	1.25
% of variance	27.53	16.86	15.60

*Factor loading: Correlation of each behavior or self-efficacy variable with each factor using factor analysis. Higher absolute values represent higher correlations; "1" or "-1" represents the maximal correlation strength.

†For behavior: Factor 1 = consuming healthy foods, Factor 2 = consuming unhealthy foods; Factor 3 = eating breakfast and consuming lean protein; for self-efficacy, Factor 1 = identifying/choosing healthy meals and snacks, Factor 2 = choosing/planning a meal with different food groups, Factor 3 = eating breakfast every morning and choosing healthy meals at school.

CHAPTER IV: STUDY II

Relationships Between Nutrition-Related Knowledge, Self-Efficacy, and Behavior for Fifth Grade Students Attending Title I and Non-Title I Schools

Abstract

The Social Cognitive Theory (SCT) is a widely used theory for nutrition education programming. Better understanding the relationships between knowledge, self-efficacy, and behavior among children of various income levels can help to form and improve nutrition programs, particularly for socioeconomically disadvantaged youth. The purpose of this study was to determine the relationships between knowledge, self-efficacy, and behavior among fifth grade students attending Title I (≥40% of students receiving free or reduced school meals) and non-Title I schools (<40% of students receiving free or reduced school meals). A validated survey was completed by 55 fifth grade students from Title I and 122 from non-Title I schools. Differences in knowledge, self-efficacy, and behavior scores between groups were assessed using t test and adjusted for variations between participating schools. Regression analysis was used to determine the relationships between knowledge, self-efficacy, and behavior. In adjusted models, the Title I group had significantly lower scores on several knowledge items and summary knowledge (p=0.04). The Title I group had significantly lower scores on several behavior variables including intakes of fruits (p=0.02), vegetables (p=0.0005), whole grains (p=0.0003), and lean protein (p=0.047), physical activity (p=0.002) and summary behavior (p=0.001). However the Title I group scored higher on self-efficacy for meal planning (p=0.04) and choosing healthy snacks (p=0.036). Both self-efficacy (β=0.70, p<0.0001) and knowledge (β=0.35, p=0.002) strongly predicted behavior; however, only self-efficacy remained significant in the Title I group (self-efficacy, β=0.82, p=0.0003; knowledge, β=0.11, p=0.59). Results demonstrate disparities in nutrition knowledge and behavior outcomes between students surveyed from Title I and non-Title I schools,

suggesting more resources may be necessary for lower income populations. Findings suggest that future nutrition interventions should focus on facilitating the improvement of children's self-efficacy.

Introduction

Despite many efforts that have been made into nutrition-related research and intervention, childhood and adolescent obesity remain a health issue for the United States (US), affecting approximately 17% of youth ages 2-19 years old (Centers for Disease Control and Prevention (CDC), 2014). Many factors are linked to childhood obesity, including poor eating behaviors and lack of physical activity (Popkin, 2001; Swinburn, Caterson, Seidell, & James, 2001). The 2010 Dietary Guidelines for Americans recommended children and adolescents consume more fruits, vegetables, whole grains, lean protein, and dairy food (United States Department of Agriculture (USDA) & US Department of Health and Human Services, 2011). However, research demonstrated that the majority of youth did not meet these recommendations (Kimmons, Gillespie, Seymour, Serdula, & Blanck, 2009).

Children and adolescents of low socioeconomic status (SES; a measure of income, education, and employment) are particularly at risk. In a national sample of more than 40,000 US children aged 10 to 17 years old, children from low SES households had 3.4-4.3 times higher odds of being obese than their high SES counterparts (Singh, Siahpush, & Kogan, 2010). This same study demonstrated that while obesity prevalence increased only 10% for all US children from 2003-2007, it increased 23-33% for children of low SES. Additional research has demonstrated that the association with income may be more complicated, with trends within poverty-stricken households varying based on age, race, and ethnicity (Miech et al., 2006).

Behaviors of children and adolescents from low SES households may be a contributing factor to the higher rate of obesity in this population. For instance, research

shows that youth and adults of low SES tend to consume fewer fruits, vegetables, and high fiber foods, while consuming more high fat foods as compared to their counterparts of high SES (Kant & Graubard, 2007; Ball et al., 2009). The relationship between sedentary behaviors and physical activity with SES has shown mixed results throughout the literature, but is still an area of concern due to the higher rate of obesity among lower SES households (Whitt-Glover et al., 2009).

The school environment may also affect behaviors of students in low SES areas. Title I schools, defined as having ≥40% of the student population receiving free or reduced price school meals, have been identified as schools with higher rates of poverty (US Department of Education, 2014). Students of Title I schools generally perform poorer on standardized academic tests than non-Title I schools, but whether this disparity is also demonstrated for nutrition and physical activity knowledge, and moreover how any disparity relates to behavior outcomes, has not been researched (Stullich, Eisner, & McCrary, 2007). Determining and understanding the differences between students from Title I and non-Title I schools for nutrition- and physical activity-related behavioral constructs is vital to creating school-based interventions.

Although there are serious concerns that socioeconomic inequality may significantly influence an individual's lifestyle habits, leading to poor health conditions, the underlying mechanisms of how the variation in SES can affect nutrition behaviors among children and adolescents has not been fully established. Albert Bandura's social cognitive theory (SCT) is one widely used model for behavior change (Glanz & Bishop, 2007). This theory emphasizes that human behavior depends on the reciprocal interaction of personal, behavioral, and environmental factors (Glanz, Rimer, & Viswanath, 2008).

Key constructs include knowledge, outcome expectations, self-efficacy, collective-efficacy, self-regulation, observational learning, behavioral capacity, incentive motivation, and social support (Glanz et al., 2008; Bandura, 2004); DiClemente, Salazar, & Crosby, 2011; Edberg, 2015; McKenzie, Neiger, & Thackery, 2013). According to the SCT, knowledge of health risk and benefits, along with knowledge as a component of behavioral capacity, creates the precondition for change (Bandura, 2004). However, beliefs of self-efficacy are needed for most people to overcome the barriers to adopting and maintaining healthy lifestyle habits (Bandura, 2004). Previous literature suggests that the influences of cognitive factors, such as nutrition knowledge, attitude, and beliefs about health behaviors are varied across SES. For example, in a study of 2529 Australian adolescents, Ball and colleagues reported that participants of low SES had lower positive attitudes, self-efficacy, and perceived importance toward healthy eating than their high SES counterparts (Ball et al., 2009).

Many SCT-based nutrition interventions target the improvement of knowledge and self-efficacy in addition to behavioral change; however, little research has been conducted to examine the relationships of knowledge and/or self-efficacy with behavior for children and adolescents of different income levels. Elucidating these relationships can be instrumental in forming SCT-based interventions for the socioeconomically disadvantaged youth population. Thus, the purposes of this study were to: (a) determine the relationships between knowledge, self-efficacy, and behavior among fifth grade students; (b) compare the difference in behavior predicting relationships among students from Title I and non-Title I schools; and (c) examine the differences in scores of knowledge, self-efficacy, and behavior variables between Title I and non-Title I school

participants. With the integral nature of knowledge, self-efficacy, and behavior within the SCT, the present study's hypothesis was that there would be significant relationships among all three constructs among study participants. A second hypothesis was that students attending non-Title I schools would demonstrate stronger relationships between knowledge, self-efficacy, and behavior as well as higher scores of nutrition related knowledge, self-efficacy, and behavior variables, due to better resources and support they receive as compared to those attending Title I schools.

Methods

Participants and Procedures

This investigation was approved by the Internal Review Boards of the University of Nebraska-Lincoln and the participating school district (Appendix A-1). Title I (≥40% of students receiving free or reduced price school lunch) and non-Title I (<40% of students receiving free or reduced price school lunch) schools were compared to represent schools whose majority of attendees came from lower and higher income homes, respectively (US Department of Education, 2014). Eligibility for free school lunch is defined as being ≤130% of the Federal poverty guidelines while eligibility for reduced price school lunch is defined as being >130% and ≤185% of Federal poverty guidelines, based on the National School Lunch Program guidelines (USDA, 2014). This indicator represents a good reflection of the income level of attending students. Some Title I schools are eligible for government funded nutrition programs, such as the Fresh Fruit and Vegetable Program (USDA, 2014), which are not offered to non-Title I schools.

A total of 193 fifth grade students (aged 9-12 years) were recruited from eight public elementary schools. Four Title I and four non-Title I elementary schools were

randomly selected from one Midwestern school district. Principals of each school were contacted and invited to participate; one Title I school with three classrooms (n=58) and three non-Title I schools with six classrooms (n=135) agreed to participate. Among the participating schools, one non-Title I school participated in Fuel up to Play 60 (National Dairy Council, 2015), and the Title I school participated in the Fresh Fruit and Vegetable Program (USDA, 2014). The Title I school received some supplementary educational resources due to assistance funding allotted for low income schools. However, school nutrition and physical education and wellness environments remained similar due to identical district expectations for health learning objectives, allotment of teaching time for nutrition, district-provided nutrition and physical activity education resources, wellness policy, physical education objectives and movement experiences, and daily menus meeting the National School Lunch and Breakfast Program guidelines (USDA, 2014). Permission was obtained from the school district, principals, and teachers from the four participating elementary schools. Parent notification letters were sent home with each student (Appendix B-3). Youth assent for each student was obtained before data collection (Appendix A-1).

The Healthy Habits Survey (Appendix C-1) was administered by the primary researcher and two assistants in fifth grade students' regular classrooms during a two-week period in spring 2014 so that the research would not interfere with schools' regular academics (Hall, Chai, Koszewski, & Albrecht 2015). Prior to administering the survey, the trained research team read a standardized script that provided instructions to students on completing the survey and allowed time for questions. The research team abided by the following guidelines when answering student inquiries during the survey: (a) Helped

students read an item or clarify a word that they did not understand, unless clarification would lead to influencing an answer to a knowledge item; (b) Provided no leading or assistance in answering knowledge items; and (c) Encouraged students to pick the *best* answer that represented their self-efficacy or behavior *most of the time* when students were unsure. The students took approximately 20-30 minutes to complete the survey. Data collection was performed by the same research team across all four participating schools.

Survey Instrument

The Healthy Habits Survey, including knowledge, self-efficacy, and behavior sections was previously validated for fifth grade students attending both Title I and non-Title I schools (Hall et al., 2015). Behavior items (12 items) measured nutritional intake in a count per day format, focusing on the five food groups, salty foods, sugary foods, and beverages. Breakfast intake, family meal planning, and physical activity were measured in a count per week format. Knowledge items (14 items) measured knowledge of food groups, nutrition benefits, physical activity recommendations and benefits, recommended daily intake, healthy snacks, and breakfast benefits. Twelve items had only one correct answer, while two items had multiple correct answers. Self-efficacy items (10 items) assessed confidence concerning physical activity, healthy meal identification, healthy meal choices, food group choices, meal planning, healthy choices in the presence of social pressure, healthy snack choices, and breakfast consumption.

For behavior questions, the responses to the items were scored from 1 to 4 (or 1 to 5 if there were 5 responses to the question) with a higher score reflecting a more positive response. Items were reversely scored when questions were related to an unhealthy

behavior. Similarly, items for self-efficacy were scored from 1 to 3, indicating low, medium, and high self-efficacy, respectively. For each of the knowledge items, "1" was given if the student had the correct answer, if not, "0" was marked for the item. The two multi-answer knowledge questions each were scored with a total of 5 points, with "1" point given for each correct answer and "0" given for each incorrect answer.

Data Analysis

Initially there were 193 participants (58 in Title I group and 135 in non-title I group); however not all surveys were complete. Data analyses were based on 177 participants (55 in Title I group and 122 in non-title I group) who completed all survey. The average scores for each item as well as the respective summary scores for all the knowledge, self-efficacy, and behavior items between the Title I and non-Title I groups were compared using t test. Analyses were repeated after adjusting for gender, race, and Hispanic ethnicity using the General Linear Model and results did not change materially. Analysis of Variance (ANOVA) was used to determine if there were any differences in knowledge, self-efficacy, and behavior items among the participants from the three non-Title I elementary schools. To account for the variations associated with participating schools, the model was further adjusted by including participating schools as a covariate in the model (a total of four schools [four levels]). Multiple regression analysis was used to determine the relationships between knowledge, self-efficacy, and behavior and how they predicted each other among our study participants (e.g., how knowledge and/or self-efficacy predicted behavior outcomes). The regression analysis was repeated for students attending Title I school and for those attending non-Title I schools.

Power analysis for this study was in part based on the results from a previous pilot study that was conducted with participants within the same age range (fifth grade students) from both Title I and non-Title I schools that used the same survey instrument (Hall et al., 2015). To have statistical power of 80%, approximately 64 subjects would be needed in each group for a t-test comparing means between two groups, assuming medium effect size (d=0.50) (Cohen 1992) and α=0.05 (2-tailed). In the present study, there were 55 and 122 students (who had no missing items in the survey) in the Title I and non-Title I groups, respectively. With 55 participants in Title I group, we had 74% statistical power to detect the differences between the two groups. SPSS 22 (SPSS, Inc, Chicago, IL) was used for all statistical analyses with a two-sided p value of <0.05 considered statistically significant.

Results

Demographics

Table 1 provides the demographics for the Title I and non-Title I groups. A total of 193 students participated in the study and 177 (76 males and 101 females) completed all survey items. A majority of students were white (42.4%), however, 21.4% did not know their race. Hispanic or Latino students made up 5.2% of the sample, although 30.7% of students reported that they did not know whether they were Hispanic/Latino or not. Race was different between Title I and non-Title I groups (p=0.003); no significant differences in gender were observed between the two groups (p=0.39). The average percentage of students receiving free or reduced price school lunch was 68.78% and 21.76% (9.12%, 24.34%, and 31.82%) for the Title I and non-Title I schools, respectively (Nebraska Department of Education, 2015). The collected school lunch percentages

included only those who have applied and are approved for receiving free or reduced price school lunch, not all those that are eligible.

Knowledge, self-efficacy, and behavior

Scores on knowledge, self-efficacy, and behavior items among participants from the three non-Title I schools are presented in Table 2. For knowledge items, differences were observed for identifying food items in the grains (p=0.04) and vegetable (p=0.04) groups, whole grains versus refined grains (p=0.01), recommended amount of physical activity (p=0.02), recommended daily intakes of fruit and vegetables (p=0.02) and healthy snack choices (p=0.03) among the three participating non-Title I school groups. With respect to behavior items, there were differences in scores for intakes of vegetables (p=0.018), whole grains (p=0.002), and sweets (p=0.01), physical activity (p=0.004), and summary behavior score (summary of all behavior items; p=0.04). The non-Title I school that had the highest percentage of students receiving free and reduced school meals (31.8% vs. 24.3% and 9.1%) had lower scores on the majority of the above items compared to either one or both of the remaining non-Title I schools (Table 2). There were no differences in scores of self-efficacy items among the three non-Title I schools.

Overall, the non-Title I group scored better than the Title I group for knowledge variables, including significantly higher average scores for knowledge when identifying food in the vegetable (p=0.026) and lean protein (p=0.008) groups, whole grains versus refined grains (p=0.01), recommended amount of physical activity (p=0.006), benefits of physical activity (p=0.03), and recommended daily intakes of fruit and vegetables (p=0.004), after adjusting for participating schools. The summary knowledge score

(summary of all the knowledge items) was also higher in the non-Title I than the Title I group (p = 0.04), after adjusting for the covariate (participating schools) (Table 3).

The self-efficacy results for Title I and non-Title I groups are presented in Table 4. The non-Title I group scored slightly higher for the majority of the self-efficacy variables. However, compared to the non-Title I group, the Title I group had higher average scores on confidence for planning a meal with different food groups (p=0.04) and choosing healthy snacks (p=0.036) after adjustment for participating schools. There were no statistically significant differences in the summary score of self-efficacy (summary of the all self-efficacy items) between the two groups (p=0.43).

Overall, the non-Title I group scored higher than the Title I group for the majority of the behavior variables. The average scores for several items were higher in the non-Title I group, including daily intake of fruits (p=0.02), vegetables (p=0.0005), whole grains (p=0.0003), and lean protein (p=0.047), physical activity (p=0.002), and summary behavior (p=0.001), after adjusting for participating schools (Table 5).

SCT Construct Relationships

Table 6 shows the relationships among constructs of knowledge, self-efficacy, and behavior and how they predict each other. For all participants, behavior was positively correlated with knowledge (p=0.001) and self-efficacy (p<0.0001). Positive correlations between behavior and self-efficacy were also observed in both non-Title I (p<0.0001) and Title I (p<0.0001) groups. Knowledge and self-efficacy were not correlated overall (p=0.21) or among the non-Title I participants (p=0.95) but were correlated in the Title I group (p=0.001). Correlations between knowledge and behavior were observed in the non-Title I group (p=0.02) but not in the Title I group (p=0.10),

possibly due to the relatively smaller sample size (n=55) in the Title I as compared to the non-Title I group (n=122).

Although both knowledge and self-efficacy significantly predicted behavior outcomes among all participants and non-Title I participants, self-efficacy appeared to be a stronger predictor than knowledge for behavior (all participants: knowledge, P=0.002, self-efficacy, $p<0.0001$; non-Title I: knowledge, $p=0.01$, self-efficacy, $p<0.0001$). For the Title I group, self-efficacy ($p=0.0003$), but not knowledge ($p=0.59$), was a significant predictor for behavior. As for knowledge, behavior, not self-efficacy, was a strong predictor overall (behavior, $p=0.002$; self-efficacy, $p=0.65$) and among non-Title I participants (behavior, $p=0.01$; self-efficacy, $p=0.21$). Finally, self-efficacy was strongly predicted by behavior but not knowledge overall (behavior, $p<0.0001$; knowledge, $p=0.65$), and among Title I (behavior, $p=0.0003$; knowledge, $p=0.067$) and non-Title I participants (behavior, $p<0.0001$; knowledge $p=0.21$). In addition, results for construct relations were similar after the adjustment for participating schools.

Discussion

In this study, overall there were significant differences in approximately half of the measured variables for knowledge and behavior, but few significant differences in self-efficacy variables between the Title I and non-Title I groups after the adjustment for participating schools. The Title I group had significantly lower scores for several knowledge items such as knowledge of food in the vegetable and protein groups, whole versus refined grains, recommended amount of physical activity, physical activity benefits, daily recommended intake for fruits and vegetables, and summary knowledge scores. The Title I group also demonstrated lower scores on behavior items including

daily intakes of fruit, vegetables, whole grains, and lean protein, physical activity, and summary behavior compared to the non-Title I group. However, Title I schools had higher scores on self-efficacy of meal planning with different food groups and choosing a healthy snack.

Although this study demonstrated lower nutrition knowledge for Title I students, nutrition knowledge of children from high- and low-income households has not been well studied. However, academic achievement, a reflection of general knowledge gained in the school setting, has been examined in many studies in terms of how it was affected by income and/or SES. Most research suggests that parental SES is one of the strongest predictors of academic achievement of a child (Reardon, 2011). As a result, students entering kindergarten from families of the bottom quintile of SES scored more than a standard deviation lower than those of the top quintile of SES on math and reading. These differences did not decrease as children continued with their schooling (Reardon, 2011). It is suggested that home environment, parental involvement, school environment, and neighborhood conditions of low SES areas account for low reading achievement (Aikens & Barbarin, 2008). Such low reading achievement may affect student ability to read and comprehend assessment items, even if they are written at the given grade level, such as the survey used in this study.

The most recent evaluation from the US Department of Education (2009) found that 82% of the 13,103 schools identified for improvement in 2006-2007 were Title I schools. These schools did not show adequate yearly progress toward students reaching proficiency for math and reading by 2013-2014, demonstrating a gap between Title I and non-Title I schools, which has the potential to effect nutrition education, as more time

may need to be dedicated to core subjects to meet proficiency. State assessments demonstrate that although there has been a small reduction in the achievement gap between low-income and all students, this reduction has not been statistically significant (Stullich, Eisner, & McCrary, 2007).

The home environment may also cause emotional and psychological problems for students that can affect their learning abilities at school. For example, children with lower SES parents are more likely to have behavior problems that impact their learning ability, attention, and interest (Morgan, Farkas, Hillemeier, & Maczuga, 2009). Additionally, family stress caused by low income has been shown to cause emotional distress in children, leading to poor academic performance (Mistry, Benner, Tan, & Kim, 2009). Children from these homes were also more likely to be absent from school (Zhang, 2003), which affects the amount of knowledge they receive in a formal educational setting.

Aside from the home environment, the school setting itself also plays a significant role in students' achievement. The No Child Left Behind Act of 2001's key provisions state that all teachers of core academic subjects must meet requirements of highly qualified teachers (US Department of Education, 2009). However, several studies suggest that more qualified teachers are employed at schools serving higher income areas, and those that do serve lower income areas may switch schools (Glazerman & Max, 2011; Luebchow, 2009; Muijs, Harris, Chapman, Stoll, & Russ, 2004; Lankford, Loeb, & Wyckoff, 2002; Clotfelter, Ladd, Vigdor, & Wheeler, 2007; Clotfelter, Ladd, & Vigdor, 2006; Hanushek, Kain, & Rivkin, 2004). New teachers at low-income schools also report having no mentor or having an inexperienced mentor, a lack of curricular guidance,

impersonal hiring procedures, and curriculum that is too prescriptive, which may reduce satisfaction and affect student success (Johnson, Kardos, Kauffman, Liu, & Donaldson, 2004). Since experience and teacher training quality are correlated with academic achievement (Gimbert, Bol, & Wallace, 2007), this places students attending Title I schools at a disadvantage. These barriers with educators may have influences not only on core subjects but also on overall education, including nutrition education, as supported by our results that significantly lower scores on several knowledge items as well as knowledge summary scores were observed in those with low SES.

Though research on nutrition knowledge is limited, SES has been shown in several studies to have significant effects on nutrition-related behaviors. Measurement of diet quality and biomarkers from the National Health and Nutrition Examination Survey (NHANES) showed that poor diet quality was associated with lower SES (Kant & Graubard, 2007). Higher SES families are more likely to consume foods such as fresh fruits and vegetables, whole grains, and low-fat dairy (Darmon & Drewnowski, 2008). Sedentary behavior was also found to be more common in adolescents from lower SES households (Hanson & Chen, 2007). Indeed, results further showed that the fifth grade students from Title I schools had lower scores on fruit, vegetable, whole grain, and lean protein intakes, physical activity, and summary behavior than those attending non-Title I schools. Poor food environments may also contribute to these low behavior scores. For example, research shows that the number of students eligible for free or reduced price school meals is also associated with a higher number of convenience stores surrounding their schools, which has the potential to worsen eating behaviors (Sturm, 2008). Higher crime rate and lower street quality were also observed around elementary schools in low

income neighborhoods, which could affect the amount of time for students to be physically active outside (Zhu & Lee, 2008).

Contrary to behavior and knowledge results, two self-efficacy variables, confidence for meal planning and choosing healthy snacks, scored significantly higher for Title I students compared to non-Title I students. Previous literature has reported that a variety of interventions for low income students resulted in increased self-efficacy for these students (McCarthy, Wolff, Biano-Simeral, Crozier, & Goto, 2012). However, there is no evidence in the literature that compares nutrition-related self-efficacy for low and high income students. With many parents from low income households working multiple jobs, particularly in single-parent households, it is possible that youth from these households are responsible for making meals for themselves, and in some cases, for siblings. This responsibility and experience may be related to high self-efficacy for meal planning, however should be further researched. It is possible that participation in the Fresh Fruit and Vegetable Program contributed to Title I students' confidence that they could choose healthy snacks since this program provides them with this healthy snack resource on a consistent basis. Future studies are necessary to confirm and further investigate the current findings regarding group differences in aforementioned self-efficacy variables.

In this study, there were significant differences in scores of several knowledge and behavior items among the students from the three non-Title I schools. Among these items, participants from the school with the highest percentage of students receiving free and reduced school meals (31.8% vs. 24.3% and 9.1%) had significantly lower scores in four areas of knowledge and five areas of behavior as compared to either one or both of

the remaining non-Title I schools, supporting the overall conclusion from our study that students attending lower income schools (as defined by the percentage of students receiving free and reduced school meals) had poorer nutrition-related knowledge and behaviors than those attending higher income schools. In addition to the proportion of the students from low income families, the school's exposure to nutrition education programs may play a role. Among the three non-Title I schools, only one school (with 24.3% students receiving free and reduced school meals) participated in additional nutrition intervention (Fuel up to Play 60). Knowledge and behavior scores obtained from participants attending this school were more aligned with those attending the school with the lowest percentage of low income students (9.1%), demonstrating that it may be beneficial to implement nutrition interventions and increase resources for schools which are not qualified for government funded nutrition programs, but still have a considerable number of students from low income families.

Our results demonstrated significant, positive relations between nutrition related knowledge, self-efficacy, and behavior among our fifth grade participants. Although both significant, relative to knowledge, self-efficacy appeared to be a stronger predictor for behavior in the current study population. Similarly, behavior had a much stronger relation with self-efficacy than knowledge did. Our finding was in agreement with the SCT, which also suggests that self-efficacy is a focal determinant because it affects behavior both directly and by its influence on other determinants. According to the SCT, health related knowledge creates the precondition for change; however, additional self-influences are needed for most people to overcome the barriers of adopting new lifestyle

habits and maintaining them. Therefore, beliefs of self-efficacy play a central role in personal change and are the foundation of human motivation and action (Bandura, 2004).

Interestingly, our results indicated that self-efficacy played a much stronger role in predicting behavior outcomes in the Title I group which was defined by low income, contradicting our hypothesis that knowledge would also play a role. Generally, self-efficacy is higher in high-income groups due to the resources available to develop confidence (Schunk & Meece, 2005), however behavior in the Title I group was only predicted by self-efficacy and not knowledge. Although previous studies have shown the association between self-efficacy and behavior for this age group (Thompson, Bachman, Baranowski, & Weber Cullen, 2007), to our knowledge, none have separated findings by Title I and non-Title I schools, an essential criteria of the school-based learning environment. Our conclusion was further supported by the findings reported by Ball et al. (2009) that cognitive factors, especially self-efficacy and the perceived importance of healthy behavior were important mediators of socioeconomic variations in fruit consumption from a community-based sample of 2529 adolescents in Australia.

Our findings on construct relations, coupled with our results showing low knowledge and behavior scores for Title I relative to non-Title I students demonstrate a general need for increased nutrition education and resources for low income students, considering that many Title I schools are eligible for receiving government-funded nutrition programs. In fact, the Title I school in this study participated in the Fresh Fruit and Vegetable program as an extra resource for students; however, students from this school still had significantly lower fruit and vegetable intakes. Other behavior variables, both dietary and physical activity, were also lower in the Title I group, even though all

schools offered the same breakfast and lunch menus daily. This suggests that a lack of resources may be preventing families from providing healthy foods and movement opportunities, so this should be further investigated to determine whether additional resources in schools can be justified to assist students who may not have enough resources at home.

Knowledge results imply a need for increased nutrition education in Title I schools. Due to the pressures of standardized testing in this age group, particularly in lower achieving schools, nutrition education may be compromised to meet academic achievement goals. Although health objectives exist, there is no standardized testing for nutrition and little accountability or incentive for teaching it. Districts should strengthen wellness policies and implement systems that hold schools and teachers more accountable for completing nutrition education and meeting health objectives. In addition to policy, nutrition education interventions should directly target the improvement of self-efficacy of children who are socioeconomically deprived. A movement away from traditional lecture-based learning toward interactive programs can engage students in mastery experience through hands-on learning, and verbal/social persuasion through group learning, which can improve self-efficacy (Glanz et al., 2008; DiClemente, Salazar, & Crosby, 2011).

Moreover, nutrition professionals can improve school nutrition education through working with teachers to educate them on simple ways to integrate more education and self-efficacy improvement strategies without sacrificing preparation for standardized testing. Nutrition professionals should train teachers on methods to enhance a given curriculum to improve student learning and self-efficacy. Teachers can integrate

techniques into any curriculum, such as role modeling, adapting curriculum or scaffolding to assure curriculum is at an appropriate level for their specific students (particularly low achieving students that are more prevalent in Title I schools), affirming successes, and helping students apply learning strategies from other disciplines to nutrition. These techniques may help to improve both learning and self-efficacy, to help translate to behavior change.

This study is one of the few studies which assessed main SCT constructs including nutrition knowledge, self-efficacy, and behavior and their relations in children with both high and low income. There are limitations of this investigation. After the random selection, only one Title I school agreed to participate in the study. Therefore, the results may not fully represent the fifth grade students from all Title I schools in the district. Although the survey instrument used in this study was validated, additional objective indicators may have helped to provide a more accurate evaluation of behaviors and reduce self-report/response bias, particularly among children. Title I schools may receive nutrition-related government benefits that non-Title I schools do not receive, which might have minimized the differences demonstrated between the two groups. There were also variations in the percentage of low income students and the degree of exposure to nutrition inventions among non-Title I schools which might influence the results. However, the group differences (Title I vs. non-Title I group) remained significant or became significant after the adjustment for participating schools. Furthermore, despite the relatively small sample size in the Title I group, results nevertheless indicated a strong association between self-efficacy and behavior in this

group, providing valuable insights for future directions of nutrition interventions among socioeconomically deprived children.

Conclusions

The present results indicate that children from Title I schools had lower knowledge and behavior scores compared to their counterparts from non-Title I schools, suggesting that more resources should be allocated for implementing nutrition education interventions among Title I schools. By targeting programing at those who particularly need it, nutrition professionals can help to reduce the divides which may lead to the perpetuation of health disparities in the future. Findings that self-efficacy was a much stronger predictor compared to knowledge for behavior outcomes, especially among socioeconomically disadvantaged children, further suggest that future nutrition interventions should focus on facilitating the improvement of self-efficacy.

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Table 1
Demographics of study participants (n = 177)

Demographic	Title I school participants N (%)	Non-Title I school participants N (%)	P value[†]
Gender			0.39
Male	21 (38.2)	55 (45.1)	
Female	34 (61.8)	67 (54.9)	
Race			0.003
White	19 (34.6)	56 (45.9)	
American Indian/Alaska Native	2 (3.6)	6 (4.9)	
Asian	4 (7.3)	1 (0.8)	
Black/African American	6 (10.9)	2 (1.6)	
Native Hawaiian/Other Pacific Islander	0 (0)	1 (0.9)	
Two or more races	8 (14.5)	10 (8.2)	
Other, not listed	10 (18.2)	14 (11.5)	
I don't know	6 (10.9)	32 (26.2)	
Ethnicity			0.73
Hispanic Latino	3 (5.5)	6 (5.0)	
Non-Hispanic or Latino	33 (60.0)	80 (65.5)	
I don't know	19 (34.5)	36 (29.5)	
Free & Reduced School Lunch Percentage	63.16%	22.30%	

[†]P values calculated by Chi-square test.

Table 2
Knowledge, self-efficacy, and behavior scores of participants from non-Title I schools

Variable	School 1 (n= 30) Mean ±SD	School 2 (n=68) Mean ±SD	School 3 (n=24) Mean ±SD	P value*
Free & Reduce School Lunch %	31.82%	24.34%	9.12%	
Knowledge				
Food Groups-In a Meal	0.80 ± 0.40	0.82 ± 0.38	0.92 ± 0.28	0.47
Food Groups-Grains	0.87 ± 0.35[a]	0.68 ± 0.47[b]	0.88 ± 0.34[a]	0.04
Food Groups-Vegetables	0.93 ± 0.25[a]	1.00 ± 0.00[b]	1.00 ± 0.00[ab]	0.04
Food Groups-Fruits	1.00 ± 0.00	0.97 ± 0.17	1.00 ± 0.00	0.45
Food Groups-Protein	0.90 ± 0.31	0.97 ± 0.17	1.00 ± 0.00	0.14
Food Groups-Dairy	0.87 ± 0.35	0.97 ± 0.18	0.96 ± 0.20	0.12
Whole Grains vs. Refined Grains	0.37 ± 0.49	0.67 ± 0.47	0.65 ± 0.49	0.01
Nutrition Benefits	1.00 ± 0.00	0.97 ± 0.17	1.00 ± 0.00	0.47
Amount of Physical Activity	0.67 ± 0.48[a]	0.90 ± 0.31[b]	0.83 ± 0.38[b]	0.02
Physical Activity Benefits	0.47 ± 0.51	0.65 ± 0.48	0.46 ± 0.51	0.13
Daily Intake-Fruit &Vegetables	0.07 ± 0.25[a]	0.24 ± 0.43[ab]	0.38 ± 0.49[b]	0.02
Daily Intake-Dairy	0.53 ± 0.51	0.60 ± 0.49	0.54 ± 0.51	0.77
Snacks	4.60 ±0.77[a]	4.09 ± 1.00[b]	4.42 ± 0.83[ab]	0.03
Breakfast	3.57 ±1.11	3.44 ± 1.24	3.13 ± 0.90	0.36
Summary Knowledge[†]	16.86 ± 2.86	16.94 ± 2.96	17.23 ± 2.69	0.90
Behavior				
Dairy Intake	3.28 ± 0.75	3.33 ± 0.92	3.33 ± 0.92	0.50
Fruit Intake	2.20 ± 0.92	2.51 ± 1.04	2.71 ± 0.81	0.18
Vegetable Intake	1.76 ± 0.69[a]	2.32 ± 1.09[b]	2.46 ± 1.02[b]	0.018
Whole Grain Intake	2.20 ± 1.00[a]	2.90 ± 1.04[b]	3.09 ± 0.95[b]	0.002
Lean Protein Intake	2.50 ± 0.90[a]	2.76 ± 0.98[ab]	3.17 ± 0.87[b]	0.038
Intake Less French Fry/Chip	3.27 ± 0.64	3.24 ± 0.79	2.83 ± 1.01	0.08
Intake Less Fruit Drink	3.40 ± 0.73	3.18 ± 0.79	2.96 ± 0.81	0.12
Drink Less Soda	3.47 ± 0.78	3.47 ± 0.76	3.54 ± 0.66	0.91
Intake Less Sweets	2.90 ± 0.76[a]	3.34 ± 0.59[b]	3.33 ± 0.87[b]	0.01
Breakfast	4.57 ± 0.86	4.48 ± 0.89	4.67 ± 0.56	0.62
Physical Activity	3.77 ± 0.97[a]	4.24 ± 0.85[b]	4.54 ± 0.66[b]	0.004
Meal Planning	2.73 ± 1.11	2.66 ± 1.21	2.58 ± 1.14	0.90
Summary Behavior[†]	36.03 ± 3.71[a]	38.36 ± 5.47[b]	39.00 ± 3.26[b]	0.04
Self-Efficacy				
Be Physically Active	2.70 ± 0.53	2.76 ± 0.46	2.83 ± 0.38	0.58
Healthy Meal Identification	2.67 ± 0.48	2.62 ± 0.52	2.79 ± 0.42	0.33
Healthy Meal Choice at Home	2.63 ± 0.49	2.59 ± 0.53	2.75 ± 0.44	0.40
Healthy Meal Choice at School	2.43 ± 0.68	2.56 ± 0.56	2.50 ± 0.66	0.64
Food Groups	2.43 ± 0.63	2.50 ± 0.56	2.50 ± 0.51	0.86
Meal Planning	2.80 ± 0.48	2.82 ± 0.38	2.88 ± 0.34	0.78
Social Pressure	2.43 ± 0.57	2.51 ± 0.56	2.38 ± 0.49	0.52
Choosing Healthy Snacks	2.70 ± 0.53	2.65 ± 0.51	2.50 ± 0.60	0.37
Physical Activity Instead of Screen	2.30 ± 0.60	2.53 ± 0.61	2.54 ± 0.51	0.17
Breakfast	2.80 ± 0.48	2.69 ± 0.53	2.79 ± 0.41	0.51
Summary Self-Efficacy[†]	25.90 ± 3.69	26.24 ± 3.07	26.46 ± 1.96	0.79

Note: Mean values within a row with different superscript letters (a,b,c) are significantly different (Post Hoc analysis [Tukey test], P< 0.05)

*P values were estimated by Analysis of Variance (ANOVA)

[†]Summary scores of all knowledge items, or all behavior items, or all self-efficacy items

Table 3
Knowledge scores of Title I and non-Title I school participants

Variable	Model I*			Model II†		
	Title I school (N=55) Mean ±SD	Non-Title I schools (N=122) Mean ±SD	P value*	Title I school (N=55) Mean (95% CI)‡	Non-Title I schools (N=122) Mean (95% CI)‡	P value†
Food Groups-In a Meal	0.78 ± 0.42	0.84 ± 0.37	0.39	0.67 (0.52, 0.87)	0.87 (0.78, 0.97)	0.15
Food Groups-Grains	0.65 ± 0.48	0.76 ± 0.43	0.14	0.66 (0.46, 0.87)	0.76 (0.65, 0.87)	0.50
Food Groups-Vegetables	0.94 ± 0.26	0.98 ± 0.13	0.14	0.88 (0.79, 0.96)	1.01 (0.96, 1.05)	0.026
Food Groups-Fruits	1.00 ± 0.00	0.98 ± 0.13	0.16	1.00 (0.95, 1.05)	0.98 (0.96, 1.01)	0.52
Food Groups-Protein	0.84 ± 0.37	0.95 ± 0.20	0.025	0.76 (0.64, 0.89)	0.99 (0.93, 1.06)	0.008
Food Groups-Dairy	0.89 ± 0.32	0.94 ± 0.23	0.27	0.81 (0.69, 0.94)	0.97 (0.91, 1.04)	0.06
Whole Grains vs. Refined Grains	0.49 ± 0.50	0.60 ± 0.49	0.12	0.27 (0.04, 0.50)	0.69 (0.57, 0.82)	0.01
Nutrition Benefits	1.00 ± 0.00	0.98 ± 0.13	0.16	1.00 (0.95, 1.05)	0.98 (0.96, 1.01)	0.64
Amount of Physical Activity	0.64 ± 0.49	0.83 ± 0.38	0.01	0.51 (0.31, 0.70)	0.89 (0.78, 0.99)	0.006
Physical Activity Benefits	0.24 ± 0.43	0.57 ± 0.50	<0.0001	0.22 (0.01, 0.44)	0.57 (0.45, 0.69)	0.03
Daily Intake-Fruit &Vegetables	0.16 ± 0.37	0.22 ± 0.42	0.36	-0.06 (-0.24, 0.13)	0.32 (0.22, 0.42)	0.004
Daily Intake-Dairy	0.64 ± 0.49	0.57 ± 0.50	0.43	0.62 (0.39, 0.85)	0.58 (0.46, 0,70)	0.80
Snacks	4.04 ± 1.07	4.28 ±0.94	0.32	4.19 (3.74, 4.65)	4.21 (3.96, 4.45)	0.97
Breakfast	3.07 ± 1.13	3.41 ± 1.15	0.22	3.37 (2.83, 3.90)	3.28 (3.00, 3.56)	0.82
Summary Knowledge§	15.52 ± 2.91	16.97 ± 2.87	0.003	15.17 (13.78, 16.56)	17.13 (16.40, 17.85)	0.04

*Model I: Basic model without the adjustment for any covariates; P values (for Model I) for differences between Title I school and non-Title I school groups using t test.

† Model II: Model with the adjustment for participating schools (four participating schools [4 levels]); P values (for Model II) for differences between Title I school and non-Title I school group adjusting for participating schools using the General Linear Model.

‡ Mean and 95% confidence interval (95% CI) for the mean after the adjustment for participating schools.

§ Summary Knowledge=summary scores of all knowledge items

Table 4
Self-efficacy scores of Title I and non-Title I school participants

Variable	Model I*			Model II†		
	Title I school (n=55) Mean ±SD	Non-Title I schools (n=122) Mean ±SD	P value*	Title I school (n=55) Mean (95% CI)‡	Non-Title I schools (n=122) Mean (95% CI)‡	P value†
Be Physically Active	2.76 ± 0.47	2.76 ± 0.46	0.99	2.67 (2.46, 2.89)	2.80 (2.69, 2.92)	0.39
Healthy Meal Identification	2.74 ± 0.52	2.66 ± 0.49	0.32	2.67 (2.44, 2.90)	2.70 (2.57, 2.82)	0.86
Healthy Meal Choice at Home	2.62 ± 0.59	2.63 ± 0.50	0.88	2.54 (2.29, 2.79)	2.67 (2.54, 2.80)	0.46
Healthy Meal Choice at School	2.33 ± 0.70	2.52 ± 0.61	0.068	2.27 (1.97, 2.56)	2.54 (2.39, 2.70)	0.18
Food Groups	2.38 ± 0.59	2.48 ± 0.56	0.28	2.33 (2.07, 2.60)	2.51 (2.36, 2.65)	0.36
Meal Planning	2.60 ± 0.53	2.83 ± 0.40	0.006	2.55 (2.30, 2.81)	2.46 (2.32, 2.59)	0.04
Social Pressure	2.53 ± 0.57	2.47 ± 0.55	0.51	2.55 (2.35, 2.76)	2.85 (2.74, 2.96)	0.59
Choosing Healthy Snacks	2.78 ± 0.46	2.63 ± 0.53	0.07	2.92 (2.68, 3.16)	2.57 (2.44, 2.70)	0.036
Physical Activity Instead of Screen	2.40 ± 0.62	2.48 ± 0.59	0.44	2.21 (1.94, 2.49)	2.56 (2.41, 2.71)	0.07
Breakfast	2.81 ± 0.48	2.74 ± 0.49	0.34	2.83 (2.60, 3.06)	2.73 (2.61, 2.85)	0.55
Summary Self-Efficacy§	26.04 ± 2.80	26.20 ± 3.04	0.74	25.62 (24,23, 27.01)	26.38 (25.65, 27.11)	0.43

*Model I: Basic model without the adjustment for any covariates; P values (for Model I) for differences between Title I school and non-Title I school groups using t test.

† Model II: Model with the adjustment for participating schools (four participating schools [4 levels]); P values (for Model II) for differences between Title I school and non-Title I school group adjusting for participating schools using the General Linear Model.

‡ Mean and 95% confidence interval (95% CI) for the mean after the adjustment for participating schools.

§ Summary self-efficacy=summary scores of all self-efficacy items

Table 5
Behavior scores of Title I and non-Title I school participants

Variable	Model I*			Model II†		
	Title I school (N=55) Mean ±SD	Non-Title I schools (N=122) Mean ±SD	P value*	Title I school (N=55) Mean (95% CI)‡	Non-Title I schools (N=122) Mean (95% CI)‡	P value†
Dairy Intake	3.15 ± 0.93	3.24 ± 0.81	0.47	2.97 (2.58, 3.36)	3.32 (3.11, 3.53)	0.20
Fruit Intake	2.28 ± 0.98	2.48 ± 0.98	0.22	1.91 (1.46, 2.37)	2.64 (2.40, 2.88)	0.02
Vegetable Intake	2.02 ± 0.95	2.21 ± 1.02	0.23	1.52 (1.06, 1.98)	2.44 (2.20, 2.69)	0.0005
Whole Grain Intake	2.45 ± 1.09	2.76 ± 1.06	0.08	1.80 (1.31, 2.29)	3.06 (2.80, 3.32)	0.0003
Protein Intake	2.83 ± 0.98	2.77 ± 0.96	0.71	2.37 (1.93, 2.81)	2.99 (2.75, 3.22)	0.047
Intake Less French Fry/Chip	3.02 ± 1.04	3.16 ± 0.82	0.36	3.29 (2.89, 3.70)	3.04 (2.82, 3.26)	0.37
Intake Less Fruit Drink	2.83 ± 0.86	3.18 ± 0.78	0.009	3.14 (2.77, 3.52)	3.05 (2.85, 3.25)	0.72
Drink Less Soda	3.35 ± 0.73	3.48 ± 0.74	0.31	3.30 (2.95, 3.64)	3.51 (3.33, 3.69)	0.37
Intake Less Sweets	3.24 ± 0.86	3.23 ± 0.71	0.96	2.92 (2.57, 3.27)	3.37 (3.19, 3.56)	0.06
Breakfast	4.50 ±0.96	4.54 ± 0.83	0.84	4.44 (4.04, 4.84)	4.57 (4.35, 4.78)	0.66
Physical Activity	4.02 ±1.13	4.18 ± 0.88	0.35	3.46 (3.02, 3.90)	4.43 (4.20, 4.67)	0.002
Meal Planning	2.58 ±1.23	2.66 ± 1.17	0.67	2.68 (2.13, 3.23)	2.62 (3.33, 2.92)	0.89
Summary Behavior§	36.19 ± 4.32	37.92 ± 4.82	0.028	33.94 (31.74, 36.14)	38.90 (37.75, 40.04)	0.001

*Model I: Basic model without the adjustment for any covariates; P values (for Model I) for differences between Title I school and non-Title I school groups using t test.

† Model II: Model with the adjustment for participating schools (four participating schools [4 levels]); P values (for Model II) for differences between Title I school and non-Title I school group adjusting for participating schools using the General Linear Model.

‡ Mean and 95% confidence interval (95% CI) for the mean after the adjustment for participating schools.

§ Summary behavior=summary scores of all behavior items

Table 6
Relations between constructs of knowledge, self-efficacy, and behavior*

		All participants (n = 177)		Title I school participants (n = 55)		Non-Title I school participants (n = 122)	
Construct Equation	Predictor in the equation	β coefficient for the predictor†	P value†	β coefficient for the predictor†	P value†	β coefficient for the predictor†	P value†
B = K	K	0.41	0.001	0.36	0.10	0.36	0.02
B = SE	SE	0.72	<0.0001	0.83	<0.0001	0.68	<0.0001
B = K + SE	K	0.35	0.002	0.11	0.59	0.37	0.01
B = K + SE	SE	0.70	<0.0001	0.82	0.0003	0.69	<0.0001
K = B	B	0.15	0.001	0.15	0.10	0.13	0.02
K = SE	SE	0.10	0.21	0.37	0.001	-0.01	0.95
K = B + SE	B	0.17	0.002	0.06	0.59	0.16	0.01
K = B + SE	SE	-0.04	0.65	0.32	0.067	-0.12	0.21
SE = K	K	0.08	0.20	0.13	0.01	-0.01	0.95
SE = B	B	0.28	<0.0001	0.34	<0.0001	0.27	<0.0001
SE = K + B	K	-0.03	0.65	0.23	0.067	-0.12	0.21
SE = K + B	B	0.29	<0.0001	0.31	0.0003	0.29	<0.0001

Note: B=behavior; K=knowledge, SE=self-efficacy

*Summary scores of each construct (i.e. summary scores of all behavior items, summary scores of all knowledge items, summary scores of all self-efficacy items) were used to compute the associations

† Values were estimated using regression analysis.

CHAPTER V: STUDY III

Evaluation of a K-2 Elementary Nutrition Education Program

Abstract

This study compared nutrition-related knowledge, behaviors, and self-efficacy between third grade students who received a School Enrichment Kit Program (SEKP) (intervention) and those who did not (control). One survey was administered to intervention (n=79) and control (n=112) students. Group differences and relationships between constructs were assessed using t-test and regression analysis, respectively. The intervention group had significantly higher scores on some knowledge variables, summary knowledge score, vegetable and breakfast consumption, and summary behavior score ($p<.05$). Females scored higher than males on most variables. Self-efficacy ($\beta=.54$, $p<.0001$) was a stronger predictor than knowledge ($\beta=.08$, $p=.435$) for behavior outcomes. SEKP appeared to be an effective K-2 nutrition intervention for improving behaviors such as vegetable and breakfast consumption, and some nutrition knowledge.

Introduction

Childhood obesity is a growing global issue with physical, mental, and economic costs (Reilly & Kelly, 2011; Kumar Saha, Sarkar, & Chatterjee, 2011; Pulgaron, 2013; Gunnarsdottir, Njardvik, Olafsdottir, Craighead, & Bjarnason, 2012; Russell-Mayhew, McVey, Bardick, & Ireland, 2012; Cawley & Meyerhoefer, 2012; Wang, McPherson, Marsh, Gortmaker, & Brown, 2011). As of 2012, approximately 18% of children ages 6-11 years old in the United States were obese (Centers for Disease Control and Prevention (CDC), 2015). One main strategy for preventing childhood obesity is school-based nutrition interventions, because children spend approximately one third of their day in the school environment. Various interventions have been conducted within schools, focusing on nutrition and/or physical activity. Though some studies have shown improvements in weight and lifestyle behaviors, such as increased physical activity and fruit and vegetable intakes, others have not (Katz, 2009; Khambalia, Dickinson, Hardy, Gill, & Baur, 2012; Peterson & Fox, 2007; Burke, Meyer, Kay, Allensworth, & Gazmararian, 2014). To date, although some strategies have shown effectiveness, no best practices have been identified yet to improve health behaviors and/or reduce childhood obesity rates (Katz, 2009; Khambalia et al., 2012; Peterson & Fox, 2007; Gonzalez-Suarez, Worley, Grimmer-Somers, & Dones, 2009; Brown & Summerbell, 2009; Katz, O'Connell, Njike, Yeh, & Nawaz, 2008).

Many health promotion programs are based on behavior change theories. Albert Bandura's social cognitive theory (SCT) is one frequently used model for developing these programs (Glanz & Bishop, 2010). This theory emphasizes that human behavior depends on the reciprocal interaction of personal, behavioral, and environmental factors

(Glanz, Rimer, & Viswanath, 2008). The most commonly acknowledged constructs include: outcome expectations, self-efficacy, collective-efficacy, self-regulation, observational learning, behavioral capacity (including knowledge and skills), incentive motivation, and social support (Glanz et al., 2008; Bandura, 2004; DiClemente, Salazar, & Crosby, 2011; Edberg, 2015; McKenzie, Neiger, & Thackeray, 2013). Knowledge, as a part of behavioral capacity, and self-efficacy are two constructs of particular importance due to the former's basis in any educational program and the latter's incorporation into many interventions, regardless of theory.

The School Enrichment Kit Program (SEKP) intervention is a supplementary nutrition and physical activity education program for elementary students developed based on the SCT (Vierregger et al., in press). It incorporates some previously identified effective strategies for behavior changes, such as combined nutrition and physical activity education, hands-on skill building activities, and teacher training (Katz, 2009; Khambalia et al., 2012). The program has been implemented in some Midwest United States public schools for approximately 15 years. Despite the ongoing process evaluation, no outcome assessment has been conducted to determine the effectiveness of the intervention with respect to knowledge, self-efficacy, and behavior, which this program aims to improve. Thus, the primary purpose of this study was to assess the effectiveness of the program by comparing nutrition-related knowledge, behaviors, and self-efficacy between third grade students who received SEKP during kindergarten through second grade (K-2) (intervention) and those who did not (control). The first hypothesis of this study was that the intervention group would score significantly higher on knowledge, behavior, and self-efficacy than the control group. In addition, we sought to determine relationships between

selected SCT constructs (knowledge, behavior, and self-efficacy) as well as to determine if nutrition behavior was predicted by self-efficacy and knowledge among the students with and without exposure to SEKP. The second hypothesis was that the three constructs would be significantly related in both groups.

Methods

Participants

This investigation was approved by the Internal Review Boards of the University of Nebraska-Lincoln and the participating school district (Appendix A-2). Supplemental Nutrition Assistance Program Education (SNAP-Ed) funded schools (≥50% of students receiving free or reduced price school lunch) were used in this study, as only these schools in selected districts receive SEKP on a regular basis.

Intervention participants received SEKP during K-2 and were selected to be surveyed for evaluation during third grade, one year post-intervention. A total of 191 third grade students from five public and private elementary schools participated in this study. The intervention group was recruited from four randomly selected public schools that received SEKP in K-2; two schools agreed to participate (n=79), with five participating classrooms. For the control group, nine school districts were approached to participate and two agreed, including one private school with one participating classroom (n=19) and two public schools with five participating classrooms (n=93). The intervention and control schools were matched primarily by the percentage of students who were receiving free and reduced school meals (>50%) and the location of both intervention and control schools was within or within close proximity to a major metropolitan area, providing similar access to food sources. In addition, both participated

in the National School Lunch Program, offering breakfast and lunch under standardized national guidelines (United States Department of Agriculture (USDA), 2015). During the span of the K-2 intervention, and during the one-year follow-up period prior to evaluation, one intervention and one control school each participated for only one year in the Fuel up to Play 60 program, focusing on both nutrition and physical activity, however there were no other nutrition-related programs.

Procedure

Permission was obtained from the school district, principals, and teachers from the five elementary schools. The SEKP Survey was administered in third grade students' regular classrooms during January through May 2015, one year post intervention. Students were directed to answer each question to the best of their ability. Parent notification letters were sent home with each student (Appendix B-5 & B-6). Youth assent for each student was obtained before the data collection (Appendix B-4).

SEKP Intervention

SEKP is a 10-hour interactive, supplementary nutrition and physical activity elementary curricula delivered each year beginning in kindergarten (Vierregger et al., in press). The intervention has been implemented since 1999 in SNAP-Ed funded schools, in which at least 50% of the students receive free or reduced school meals. The education materials were created by County and University Extension Educators, compiled into an easy-to-use education kit, and reviewed by a panel of experts. Teachers were trained at the beginning of the program to familiarize themselves with the intervention. There is a joint effort between the Extension Educators and classroom teachers to deliver the program. Extension Educators deliver one pre-lesson to classrooms, then classroom

teachers are given three weeks to complete the 10-hour kits, followed by a post-lesson by Extension Educators. The kits are designed to teach nutrition and physical activity concepts in a fun and interactive format, with games, hands-on and group activities, and science experiments. Lessons include topics such as MyPlate/food groups, digestion, physical activity, food safety, healthy breakfasts, meal planning, healthy snacking, and "sometimes" foods (foods that are less nutrient dense, and should only be eaten in moderation), with the largest emphasis on the food groups. SEKP was developed based on the SCT and incorporates all constructs of the theory except incentive motivation, however self-efficacy is the most emphasized construct. In addition, the intervention incorporates well documented techniques to increase learning, including: Social learning activities, activation of prior knowledge, adjunct aids to reduce cognitive load, and the combination of visual and textual material (Bruning, 2011).

Instrument

Due to the limited time period that schools allow teaching time to be used for in-classroom evaluation and research, and the expected outcomes of the intervention, only knowledge, behavior, and self-efficacy from the SCT were measured. The SEKP Survey (Appendix C-2) included knowledge, behavior, and self-efficacy sections with items used or modified from the following validated instruments: CATCH Kids Club (Kelder et al., 2005), Eating right is fun (EFNEP) (Michigan State University, 2001), Purdue Extension (Purdue Extension, 1993), Wisconsin Extension (Wisconsin Nutrition Education Program, 2005), Shaping up my choices (Dunton et al., 2012), and the Healthy Habits Survey (Hall, Chai, Koszewski, & Albrecht, 2015). Behavior items (9 items) measured frequency of intake for breakfast, fruit, vegetables, dairy, soda pop, whole grains,

complete meals, and healthy snacks, as well as physical activity. These items were measured using a 3-point Likert Scale (never, sometimes, or always). Knowledge items (10 items) measured knowledge of "sometimes foods," physical activity, breakfast benefits, variety, food groups, complete meals, healthy snacks (2 items), and benefits of healthy foods (2 items). One additional knowledge item measured knowledge of whole grains, but was included to assess baseline knowledge for future program development, not for program evaluation. Self-efficacy items (7 items) assessed confidence concerning physical activity, meal planning, choosing healthy meals, choosing healthy meals despite social pressure, choosing healthy snacks, choosing to be physically active over screen time, and eating breakfast daily.

For behavior questions, responses were scored from 1 to 3 with a higher score reflecting a more positive response. Items were reversely scored when questions were related to an unhealthy behavior. Similarly, items for self-efficacy were scored from 1 to 3, indicating low, medium, and high self-efficacy, respectively. For each of the knowledge items, "1" was given if the student had the correct answer, if not, "0" was marked for the item.

Data Analysis

Average scores for each item as well as the respective summary scores for all the behavior, knowledge and self-efficacy items between the intervention and control groups were compared using t-test. T-test was also used to assess the differences in behavior, knowledge, and self-efficacy variables between males and females. The analyses were repeated after adjusting for sex (for differences between intervention and control participants) and presence of intervention (for differences between males and females).

Regression analysis was used to determine the relationships between knowledge, behavior and self-efficacy, and how they predicted each other. Cronbach's alpha was used to assess the internal consistency reliability for knowledge, behavior and self-efficacy subscales of the survey. SPSS 22 (SPSS, Inc, Chicago, IL) was used for all statistical analyses with a two-sided *p* value of <.05 considered statistically significant.

Results

Demographics

A total of 191 students completed surveys, 94 identifying as males and 96 identifying as females. One participant did not provide a response for sex. Sex was not significantly different between intervention and control groups (*p*=.45). The average percentage of students receiving free or reduced price school lunch in the intervention schools was 74.50% (ranging from 68.35% to 80.84%) and was 65.19% in the control schools (ranging from 62.30% to 69.46%)

Knowledge, Behavior, and Self-Efficacy

Scores in knowledge, behavior, and self-efficacy variables for participants in intervention and control groups are presented in Table 1. The intervention group scored higher than the control group for knowledge variables, including significantly higher average scores for knowledge of food group items (*p*=.002) and complete meals (*p*=.003). The summary knowledge score (summary of all knowledge items) was also higher for the intervention group than for the control group (*p*=.030). The intervention group scored higher than the control group on most behavior variables, including statistically significantly higher scores on frequency of breakfast consumption (*p*=.025), frequency of vegetable consumption (*p*=.042), and summary behavior score (summary of all the

behavior items, p=.046). There were no significant differences in any of the self-efficacy variables, including summary self-efficacy (summary of all the self-efficacy items), between intervention and control groups. However, the intervention group was borderline significantly higher for self-efficacy associated with breakfast consumption (p=.063). Adjustment for sex did not materially change the results, although the differences in summary knowledge score (p=.055), summary behavior score (p=.062) and vegetable intake (p=.065) between intervention and control groups were attenuated. Cronbach's alphas for knowledge, behavior, and self-efficacy subscales were .42, .61, and .68, respectively.

Sex

Overall, females scored higher on most knowledge, behavior, and self-efficacy variables compared to males. The differences are significant for knowledge of breakfast (p=.001), intake of whole grains (p=.018), self-efficacy for choosing a healthy meal (p=.041), summary knowledge (p=.020), summary behavior (p=.012), and summary self-efficacy scores (p=.049). Significance remained after adjustment for presence of intervention except for summary self-efficacy score (p=.051). Additionally, females in the intervention group scored higher for knowledge of food groups (p=.022) and food groups involved in a complete meal (p=.011) and intakes of breakfast (p=.043) and vegetables (p=.004) than females in the control group, while males in the intervention group only scored higher than males in the control group for healthy snack intake (p=.022) (Table 2).

SCT Construct Relationships

Table 3 shows the relationships between selected SCT constructs: Knowledge, behavior, and self-efficacy. Among all participants, both knowledge (β=.29, p<.0001) and self-efficacy (β=.59, p<.0001) were associated with behavior outcomes. However, when knowledge and self-efficacy were both included in the model, self-efficacy was more strongly associated with behavior than knowledge (knowledge, β=.15, p=.017; self-efficacy, β=.55, p<.0001). The control group exhibited similar patterns (knowledge, β=.16, p=.042; self-efficacy, β=.57, p<.0001). For the intervention group, only self-efficacy was correlated with behavior (knowledge, β=.08, p=.435; self-efficacy, β=.54, p<.0001) when the model included both parameters. In addition, knowledge was associated with behavior in the control group (β=.33, p<.0001) but not in the intervention group (β=.19, p=.10). Similarly, associations between self-efficacy and knowledge were observed among all participants (β=.26, p<.0001) and control participants (β=.30, p<.0001) but not in individuals in the intervention group (β=.20, p=.071)

After stratification by sex, self-efficacy also appeared to be more strongly associated with behavior as compared to knowledge in both males (knowledge, β=.16, p=.065; self-efficacy, β=.54, p<.0001) and females (knowledge, β=.10, p=.246; self-efficacy, β=.55, p<.0001). In males, there were significant and positive associations between behavior and self-efficacy (β=.59, p<.0001), behavior and knowledge (β=.34, p=.001), and self-efficacy and knowledge (β=.32, p=.001). However, only the association between behavior and self-efficacy was statistically significant for females (β=.56, p<.000) (Table 3).

Discussion

Results demonstrate that students receiving SEKP have significantly higher scores in vegetable intake and breakfast consumption as well as nutrition knowledge of food groups and food groups involved in a complete meal one year post-intervention compared with students not receiving SEKP.

Results mirror positive outcomes observed in several previous SCT-based interventions. The "TigerKids" intervention, based on the observational learning component of the SCT, implemented in a population of 3-6 year old children resulted in a significant increase in the proportion of children with high fruit and vegetable intake compared with a control group. TigerKids intervention results were sustainable long after the 6 month intervention, showing similar results at 18 months (Bayer et al., 2009). A review of interventions with 4-6 year old children found that SCT-based programs were effective in causing a significant decrease in weight status, and positive changes in physical activity and/or dietary behaviors (Nixon et al., 2012). Additionally, SCT intervention in the adolescent population has shown promising results, including decreased sedentary activities, BMI z-score rate of decline, and BMI percentile decrease (Lazorick et al., 2014; Dewar et al., 2013). However, not all interventions have been successful. The Integrated Nutrition and Physical Activity Program, a 6-month intervention program using both the SCT and Piaget's cognitive development theory, demonstrated only long-term retention of nutrition knowledge and attitudes, but no long-term retention of self-efficacy or behavior change (Puma et al., 2013).

Some programs with a longer intervention period have shown more positive behavior results, such as the Body Quest program, which provided 17 weekly 45-minute

education periods and resulted in an increase in both fruit and vegetable consumption (Struempler, Parmer, Mastropietro, Arsiwalla, & Bubb, 2014). The AVall study included a three hour per week intervention period over two years, resulting in weight reduction, increased fruit consumption and after-school physical activity participation (Llargues et al., 2011). However, not all long duration programs have shown positive results, and a clear pattern between duration and successful outcomes has not been established yet (Sharma, 2006). Additionally, these long duration interventions are impractical for many classrooms. Current preparation for testing requirements has drastically limited the time that teachers can dedicate to nutrition education. Therefore, SEKP provides a more realistic and practical option for teachers to integrate an interactive nutrition and physical activity curriculum into their busy classroom schedules. The effectiveness of SEKP was demonstrated by the current results that students exposed to the program had higher scores in some nutrition knowledge and behavior items than those who did not one year after the conclusion of the intervention.

Overall females scored higher on most knowledge, behavior, and self-efficacy variables compared to males. Females who received SEKP had significantly higher scores on knowledge items associated with food groups and food groups in a complete meal and behavior items associated with eating breakfast and vegetable intakes compared to females who did not receive SEKP. However, in males, the intervention group only scored significantly higher than the control group on the behavior item of healthy snacking, suggesting that the intervention may be more effective for females. Research indicates that interventions vary greatly with their effect on males and females, which appears to depend on the outcome variable measured and the mode of intervention

(Struempler et al., 2014; Kain, Uauy, Vio, Cerda, & Leyton, 2004). Males and females already exhibit a difference in some nutrition behaviors before receiving any intervention, and these sex-associated differences may confound the intervention outcomes (Rasmussen et al., 2006). One meta-analysis reported that although research has not been consistent about which sex is more responsive to an intervention, more studies demonstrated a stronger effect of intervention for females than males (Stice, Shaw, & Marti, 2006). Our results are supported by research suggesting that females may be more responsive to social learning, while males may be more responsive to environmental changes (Kropski, Keckley, & Jensen, 2008). The social learning concept was incorporated into SEKP's intervention activities in our study. Furthermore, the differences in knowledge, behavior, and self-efficacy variables between intervention and control group remained significant or borderline statistically significant after adjusting for sex effects, suggesting the intervention outcomes were not substantially confounded by the potential sex differences.

Results also revealed significant and positive relationships between nutrition-related behaviors and self-efficacy among our third grade participants. Although the control group and all participants as a whole demonstrated significant positive relationships between all three constructs, self-efficacy was a stronger predictor in this equation for all groups. This finding aligns with the SCT, which indicates that self-efficacy is integral to determining behavior due to its direct effect on behavior and its indirect effect by influencing other constructs. The SCT indicates that although knowledge forms a foundation for change, constructs such as self-efficacy are necessary to overcome barriers to behavior change (Bandura, 2004). Results are supported by

existing research that demonstrates that self-efficacy is predictive of healthy eating behaviors and partially predictive of physical activity (Dishman et al., 2004; Hall et al., 2015).

This study has limitations. Race and ethnicity data were not collected due to the age of the participants and the level of difficulty in self-identification; however, because the control and intervention schools had comparable rates of students who were receiving free and reduced price school meals, it is likely that these two groups also had similar race/ethnicity distributions. The age of participants and the limited amount of time allowed to collect data in the classroom limited the potential number of variables measured. However, by keeping the measurement tool brief for a young population, this study was not only able to maximize focus and obtain accurate answers, but also to reduce the burden for third grade participants and teachers, who allowed administration of surveys during their classes. Although the items on the survey had been taken from validated instruments with a similar age group, additional objective assessments may help provide more accurate evaluation of behaviors and reduce self-report/response bias, particularly among children. The reliability of knowledge items (α=.42) was relatively lower than that of behavior (α=.61) and self-efficacy items (α=.68), and may have influenced both the knowledge results and the results of the relationships between variables. Sample size (n=191) was relatively small which limited generalizability, warranting further evaluation of this program in studies with larger sample sizes.

Finally, due to absence of data collection at the beginning of intervention implementation, this study was not able to assess the relevant variables at baseline and this post-test only design may have only detected already existing differences between

schools rather than differences due to intervention. However, the similar locations, and comparable percentages of students receiving free or reduced school meals between the two groups (74.5% vs. 65.9%) helped to limit differences. Despite the fact that more students in the intervention group were from low income families, this group nevertheless demonstrated significantly higher scores in some of the knowledge and behavior variables and summary scores of knowledge and behavior relative to the control group (Table 1). Therefore, the current results were more likely attributable to the effectiveness of intervention and less likely to be confounded by participants' existing nutrition knowledge, behavior and self-efficacy at baseline. However, the cross-sectional nature of this study prevented the unequivocal determination of the temporal relationship for the observed associations between knowledge, behavior, and self-efficacy. Thus, causality could not be assessed and effects of the intervention could not be determined longitudinally. Future studies are necessary to collect data at baseline and at multiple time points during and after the intervention to confirm the current findings.

Conclusion

SEKP appeared to be an effective K-2 nutrition intervention for improving behaviors, such as vegetable intake and breakfast consumption, and some nutrition knowledge among elementary school students. Though modest, these differences between intervention and control schools are promising due to the minimal commitment required from teachers. This interactive nutrition and physical activity-related curriculum is realistic and practical for classroom teachers due to its duration, which fits within the limited time teachers are provided for nutrition education. Future research should be conducted to elucidate the underlying etiology for the sex differences demonstrated in

this study to better tailor curriculum that meets the learning needs of both males and females. Results related to self-efficacy suggest that self-efficacy is integral to nutrition interventions, so best practices for increasing nutrition-related self-efficacy should be investigated.

Implications for Health Behavior or Policy

To improve nutrition behaviors, nutrition education programs should consider using theory-based, interactive, hands-on nutrition curriculum, such as SEKP. As this study demonstrated, students receiving SEKP had higher scores on breakfast consumption, vegetable consumption, and knowledge of food groups and complete meals when compared to a control group. Although teachers have limited time for delivery of supplementary programs due to core subject requirements and preparation for standardized testing, interactive activities can easily supplement regular health units. Nutrition professionals should dedicate time to training teachers and introducing them to activity-based learning that seamlessly integrates into the classroom. Such training has the potential to motivate teachers, improve teachers' self-efficacy to deliver nutrition education, increase nutrition education commitment, and improve program implementation. Although results in this study were modest, there were some important differences between control and intervention schools that demonstrate even a 10-hour yearly curriculum can make an impact, so it is important that nutrition professionals commit efforts to recruiting classroom teachers into using interactive programs. Activities such as these can be adapted for use in any number of other environments, such as after-school programs, community interventions, or family interventions, so further

research should be conducted on the effectiveness of interactive nutrition education outside of the classroom.

Nutrition professionals should consider integrating a variety of teaching methods when delivering nutrition education, as a diverse program may better address sex-associated learning differences. Since knowledge is integral in forming the foundation for behavior, educating both sexes adequately is important for lasting behavior change. Self-efficacy is a strong predictor of behavior, so more efforts should be made in nutrition education to improve self-efficacy for nutrition-related behaviors.

Finally, although National Health Education Standards exist, they are broad. They imply the need to teach nutrition, yet no sub-objective directly states the word "nutrition" at any point. Policy with health education should focus on improving standards to directly address nutrition, both in terms of objectives and required educational hours. With a 10-hour curriculum showing promise, it is important that policy is present to establish expectations and hold teachers accountable for delivering nutrition education. Nutrition professionals should push for more specific standards so that teachers have guidance and direction for delivering nutrition education in their classroom.

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Table 1. Knowledge, Behavior and Self-Efficacy Scores of Intervention and Control Participants

Variable	Intervention (n=79) Mean±SD	Control (n=112) Mean±SD	p value[a]
Knowledge			
"Sometimes" Foods	0.77±0.42	0.74±0.44	0.626
Physical Activity	0.97±0.16	0.95±0.23	0.340
Breakfast	0.82±0.38	0.77±0.42	0.361
Variety	0.53±0.50	0.57±0.50	0.588
Food Groups	0.66±0.48	0.44±0.50	0.002
Complete Meal	0.71±0.46	0.49±0.50	0.003
One-item Healthy Snack	0.67±0.47	0.60±0.49	0.309
Two-item Healthy Snacks	0.94±0.25	0.96±0.19	0.378
Health Benefits (minerals)	0.54±0.50	0.62±0.49	0.324
Health Benefits (vitamins)	0.51±0.50	0.44±0.50	0.380
Summary Knowledge[b]	7.13±1.69	6.57±1.76	0.030
Behavior			
Breakfast	2.77±0.45	2.61±0.53	0.025
Fruit	2.24±0.43	2.25±0.51	0.893
Vegetables	2.27±0.60	2.09±0.60	0.042
Dairy	2.49±0.60	2.48±0.59	0.894
Soda pop	2.30±0.56	2.16±0.58	0.090
Whole grains	2.19±0.62	2.14±0.54	0.577
All food groups	2.30±0.54	2.19±0.61	0.175
Physical activity	2.76±0.43	2.80±0.42	0.481
Healthy snacks	2.38±0.58	2.24±0.59	0.109
Summary Behavior[b]	21.68±2.41	20.96±2.45	0.046
Self-efficacy			
Physical Activity	2.68±0.57	2.74±0.48	0.450
Meal Planning	2.52±0.57	2.54±0.58	0.801
Choosing Healthy Meal	2.33±0.67	2.32±0.73	0.894
Social Pressure	2.48±0.64	2.46±0.63	0.783
Choosing Healthy Snack	2.65±0.51	2.64±0.58	0.973
Choosing not to be Sedentary	2.43±0.71	2.47±0.70	0.679
Eat Breakfast	2.81±0.48	2.67±0.51	0.063
Summary Self-Efficacy[b]	17.90±2.60	17.75±2.48	0.689

[a]P values calculated by t-test

[b]Summary Knowledge=Summary scores of all knowledge items; Summary Behavior=Summary scores of all behavior items; Summary Self-efficacy=Summary scores of all self-efficacy items

Table 2. Knowledge, Behavior, and Self-Efficacy Scores by Gender

				Males			Females		
	All Males (n=94) Mean±SD	All Females (n=96) Mean±SD	p[a]	Intervention (n=36) Mean±SD	Control (n=58) Mean±SD	p[b]	Intervention (n=42) Mean±SD	Control (n=54) Mean±SD	p[b]
Knowledge									
"Sometimes" Foods	0.74±0.44	0.76±0.43	0.803	0.78±0.42	0.72±0.45	0.567	0.76±0.43	0.76±0.43	0.976
Physical Activity	0.94±0.25	0.98±0.14	0.142	0.97±0.17	0.91±0.28	0.265	0.98±0.15	0.98±0.14	0.859
Breakfast	0.69±0.46	0.89±0.32	0.001	0.72±0.45	0.67±0.47	0.616	0.90±0.30	0.87±0.34	0.604
Variety	0.52±0.50	0.58±0.50	0.392	0.47±0.51	0.55±0.50	0.459	0.57±0.50	0.59±0.50	0.837
Food Groups	0.47±0.50	0.58±0.50	0.113	0.58±0.50	0.40±0.49	0.079	0.71±0.46	0.48±0.50	0.022
Complete Meals	0.56±0.50	0.59±0.49	0.678	0.67±0.48	0.50±0.50	0.116	0.74±0.45	0.48±0.50	0.011
One-item Healthy Snacks	0.64±0.48	0.61±0.49	0.737	0.72±0.45	0.59±0.50	0.186	0.62±0.49	0.61±0.49	0.938
Two-item Healthy Snacks	0.93±0.26	0.98±0.14	0.083	0.92±0.28	0.93±0.26	0.799	0.95±0.22	1.00±.000	0.107
Health Benefits (Mineral)	0.55±0.50	0.61±0.49	0.393	0.50±0.51	0.59±0.50	0.419	0.57±0.50	0.65±0.48	0.449
Health Benefits (Vitamin)	0.45±0.50	0.48±0.50	0.609	0.53±0.51	0.40±0.49	0.218	0.48±0.51	0.49±0.51	0.891
Summary Knowledge[c]	6.49±1.80	7.07±1.63	0.020	6.86±1.69	6.26±1.84	0.115	7.29±1.64	6.91±1.62	0.263
Behavior									
Breakfast	2.63±0.55	2.73±0.45	0.163	2.72±0.51	2.57±0.57	0.189	2.83±0.38	2.65±0.48	0.043
Fruit	2.18±0.46	2.30±0.48	0.079	2.14±0.35	2.21±0.52	0.492	2.31±0.47	2.30±0.50	0.895
Vegetables	2.10±0.63	2.22±0.57	0.162	2.09±0.61	2.10±0.64	0.896	2.40±0.54	2.07±0.54	0.004
Dairy	2.52±0.58	2.46±0.60	0.463	2.61±0.55	2.47±0.60	0.240	2.40±0.63	2.50±0.58	0.441
Soda Pop	2.15±0.59	2.28±0.56	0.112	2.25±0.55	2.09±0.60	0.189	2.33±0.57	2.24±0.55	0.421
Whole Grains	2.06±0.55	2.26±0.59	0.018	2.06±0.53	2.07±0.56	0.908	2.31±0.68	2.22±0.50	0.471
All Food Groups	2.18±0.60	2.28±0.57	0.235	2.25±0.55	2.14±0.63	0.385	2.33±0.53	2.24±0.58	0.421
Physical Activity	2.78±0.42	2.79±0.43	0.808	2.78±0.42	2.78±0.42	0.983	2.74±0.45	2.83±.042	0.288
Healthy Snacks	2.23±0.61	2.38±0.55	0.096	2.42±0.60	2.12±0.60	0.022	2.38±0.54	2.37±0.56	0.926
Summary Behavior[c]	20.81±2.65	21.70±2.19	0.012	21.25±2.64	20.53±2.64	0.205	22.05±2.19	21.43±2.17	0.168
Self-efficacy									
Physical Activity	2.71±0.52	2.72±0.52	0.937	2.67±0.63	2.74±0.44	0.502	2.69±0.52	2.74±0.52	0.639
Meal Planning	2.47±0.64	2.58±0.52	0.192	2.44±0.65	2.49±0.63	0.732	2.57±0.50	2.59±0.53	0.843
Healthy Meal Choice	2.21±0.75	2.42±0.65	0.041	2.17±0.74	2.24±0.76	0.639	2.45±0.59	2.40±0.69	0.676
Social Pressure	2.39±0.66	2.53±0.60	0.133	2.33±0.72	2.43±0.62	0.488	2.60±0.54	2.48±0.64	0.357
Healthy Snack Choice	2.62±0.57	2.67±0.54	0.537	2.58±0.55	2.64±0.58	0.654	2.69±0.47	2.65±0.59	0.703
Non-Sedentary Choice	2.44±0.74	2.47±0.66	0.750	2.33±0.76	2.50±0.73	0.292	2.50±0.67	2.44±0.66	0.687
Eat Breakfast	2.67±0.56	2.79±0.43	0.106	2.75±0.55	2.63±0.56	0.296	2.88±0.40	2.72±0.45	0.075
Summary Self-Efficacy[c]	17.44±2.63	18.16±2.37	0.049	17.28±2.88	17.53±2.50	0.648	18.38±2.26	17.98±2.46	0.416

[a]P values for differences between all males and all females by-t test

[b]P values for differences between males intervention group and male control group, or for differences between female intervention group and female control group by t-test, P<0.05

[c]Summary Knowledge=Summary scores of all knowledge items; Summary behavior=Summary scores of all behavior items; Summary self-efficacy=Summary scores of all self-efficacy items

Table 3. Relationships Between Constructs of Knowledge, Behavior and Self-Efficacy[a]

		All Participants (n=191		Intervention (n=79)		Control (n=112)		Males (n=94)		Females (n=96)	
Construct Equation	Predictor in the equation	β coefficient for the predictor[b]	p[b]	β coefficient for the predictor[b]	p[b]	β coefficient for the predictor[b]	p[b]	β coefficient for the predictor[b]	p[b]	β coefficient for the predictor[b]	p[b]
B=K	K	0.29	<0.0001	0.19	0.100	0.33	<0.0001	0.34	0.001	0.17	0.095
B=SE	SE	0.59	<0.0001	0.55	0.000	0.61	<0.0001	0.59	<0.0001	0.56	<0.0001
SE=K	K	0.26	<0.0001	0.20	0.071	0.30	0.001	0.32	0.001	0.13	0.205
B=K+SE	K	0.15	0.017	0.08	0.435	0.16	0.042	0.16	0.065	0.10	0.246
B=K+SE	SE	0.55	<0.0001	0.54	<0.0001	0.57	<0.0001	0.54	<0.0001	0.55	<0.0001

Note: B = behavior; K = knowledge, SE = self-efficacy

[a]Summary scores of each construct (i.e. summary scores of all behavior items, summary scores of all knowledge items, summary scores of all self-efficacy items) were used to compute the association

[b]Values were estimated using regression analysis

CHAPTER VI: STUDY IV

Teachers' Experience of Nutrition Education: A Phenomenological Exploration

Abstract

Nutrition education delivered by classroom teachers has become a popular intervention design to improve healthy eating and combat childhood obesity. However, few qualitative studies have explored nutrition education among teachers, which is vital to understanding and addressing their perspectives. The purpose of this study was to explore how elementary teachers describe their experience with nutrition education. A qualitative transcendental phenomenological approach was used. Semi-structured interviews, observations, and document analysis were conducted with 10 elementary school teachers who delivered interactive nutrition education in their classrooms. Inductive coding was used to determine invariant constituents of the experience, reduce constituents to categories, and cluster categories into five core themes of the experience. Themes and descriptions were used to generate an overall essence of the experience. Reliability and validity were accomplished through intercoder agreement, audio recording, triangulation, bracketing, and member checking. Results identified five core themes: (a) meaningful roles, (b) importance, (c) mutual perceived influences, (d) supplementary education and (e) motivation, and barriers. Teachers believed that nutrition was important for their students. They were motivated to play multiple nutrition-related roles, integrate a variety of extra activities, and make material meaningful through classroom adaptations. They experienced a positive perceived triadic relationship between themselves, the curriculum they used, and their students. However, teachers were conflicted by prioritization for core subjects, time, home environment, and resources. Future studies should examine how perception, motivation, and classroom adaptation of curriculum influences student outcomes.

Introduction

As the prevalence of childhood obesity has increased in the United States, so have nutrition education interventions. One method of delivering nutrition education gaining popularity is through the classroom teacher rather than an outside nutrition expert.

Teachers are important role models in students' lives as familiar adults that spend a significant amount of time with children and thus have the potential to positively influence expected outcomes of nutrition interventions. In fact, research comparing a nutrition education intervention delivered by classroom teachers versus guest nutritionists demonstrated that teachers were more effective at improving students' healthy eating behaviors (Panunzio, Antoniciello, Pisano, & Dalton, 2007).

Multiple nutrition and/or physical activity interventions delivered by classroom teachers have shown promise. Outcomes from interventions include: Increased fruit and vegetable intake, behavioral intentions for healthy eating, physical activity, nutrition knowledge, and efficacy expectations regarding health eating, as well as decreased sedentary activity and consumption of sweets (Fahlman, Dake, McCaughtry, & Martin, 2008; Abood, Black, & Coster, 2008; Subba Rao, Raghunatha Rao, Venkaiah, Dube, Rameshwar Sarma, 2006; Dunton, Lagloire, & Robertson, 2009). However, not all studies have demonstrated improvements with teacher-delivered intervention. Some studies show no improvement in fruit and vegetable consumption, attitude, body mass index (BMI), waist circumference, or subscapular skinfold thickness (Abood, Black, & Coster, 2008; Brandstetter et al., 2012; Dunton, Lagloire, & Robertson, 2009). Although these variables may be affected by any number of non-classroom related confounders, the teacher delivering the material may impact these variables, and qualitative research with

teachers can elucidate in-depth perspectives on nutrition education that are vital to understanding their experience and informing future quantitative studies.

A variety of qualitative research exists on teachers and health, however this research is limited in scope and does not always focus solely on teachers. Some qualitative nutrition research with classroom teachers explores specific factors affecting teaching such as barriers, facilitators, or policy, leaving a gap in knowledge of the overall experience of nutrition education (Jørgensen et al., 2014; McCaughtry, Martin, Fahlman, & Shen, 2010). Other research explores nutrition-related perspectives of a variety of school staff, making classroom teachers' voices less prominent and in-depth (Patino-Fernandez, Hernandez, Villa, & Delamater, 2012; Jourdan, McNamara, Simar, Geary, & Pommier, 2009; Odum, McKyer, Tisone, & Outley, 2013; Power, Bindler, Goetz, & Daratha, 2010). Several studies solely explored teachers' perspectives, however these studies were conducted in Head Start or preschool classrooms that are different from elementary school environments (Lumeng, Kaplan-Sanoff, Shuman, & Kannan, 2008; Carraway-Stage et al., 2014). One study explored the role of elementary classroom teachers in nutrition and physical education within low income schools, however is strongly quantitative in presentation, warranting further exploration in this area (Prelip et al., 2006).

Therefore, the purpose of this study was to explore how teachers describe their experience with nutrition education within the context of a phenomenology. Research questions included: What does it mean to be a classroom teacher of nutrition education? What is the process of teaching nutrition? How do teachers perceive school-based nutrition education? What perceived influence do teachers have over their students?

What opinions do teachers hold of the curriculum they use? What is the overall essence of nutrition education for teachers?

Methods

Overview and Design

A qualitative transcendental phenomenological approach was used in this study. This approach by Moustakas (1994), adapted from Husserl, focuses on the participants' given descriptions to generate an essence of the lived experience, as opposed to hermeneutical phenomenology which is strongly interpretive (Moustakas, 1994; Gibson, 1931; Mohanty, 1985). A post-positivism paradigm formed the foundation of this study (Phillips & Burbules, 2000).

Sampling and Participants

This exploration was approved by the Internal Review Boards of the University of Nebraska-Lincoln and the participating school district (Appendix A-2). Purposive criterion sampling was used to identify teachers who have experienced the phenomenon of delivering classroom-based nutrition education. This method of sampling helps create a homogenous sample that have experienced the phenomenon (Creswell, 2012). Teachers were selected from one district based on their use of Growing Healthy Kids, one specific interactive curriculum, which helped to maintain homogeneity of the sample (Albrecht, Vierregger, Hall, Sehi, & Koszewski, 2014; Vierregger et al., in press). Teachers were selected from kindergarten, first, or second grade classrooms to focus the experience within the boundaries of young elementary students. Finally, teachers were required to have at least one year of experience with the curricula. Participants were contacted via

email with a cover letter and consent form explaining their rights as participants. Written consent was obtained and each participant was assigned a pseudonym (Appendix B-7).

A sample of 10 teachers participated in this study. Participants predominantly taught kindergarten (50%) or first grade (40%). There was a similar number of teachers from low income (Title I; 60%) and high income schools (non-Title I; 40%). All Title I teachers used the Fresh Fruit and Vegetable Program in their classrooms (United States Department of Agriculture, 2014). Teachers' experience with the curriculum ranged from two years to twelve years.

Growing Healthy Kids Curriculum

Although evaluation and analysis of curriculum are not within the scope of this dissertation, the type of curriculum used inherently influenced the nutrition education experiences of the teachers. Growing Healthy Kids, created by Extension Educators, is a 10-hour interactive nutrition and physical activity kit delivered each year beginning in kindergarten (Vierregger et al., in press). Lessons were designed to teach nutrition and physical activity in a fun and interactive format with games, hands-on and group activities, and experiments. Teachers were trained at the beginning of the program by Extension educators to familiarize them with the curriculum.

Data Collection

The first author bracketed biases by setting personal opinions and biases aside before beginning data collection to assure accurate data. Semi-structured interviews were conducted with teachers privately in their regular classroom. All interviews were audiotaped for accuracy. The interview protocol included 10 questions concerning the following topics: role in nutrition education, beliefs about teaching nutrition, view toward

nutrition in comparison to core subjects, influence on students, experiences with curriculum, and barriers (Appendix D-1). Throughout the interview process, probes and follow-up questions were added as needed to encourage elaboration and clarify responses. Specific questions were added as the interview process progressed in response to developing themes. Immediately after each interview, verbatim transcripts were generated.

Observations were conducted with teachers during their regular nutrition education time. Teachers were observed on their use of the nutrition education materials, incorporation of their own teaching strategies, attitude and demeanor while teaching, strategies to promote constructs, and arrangement of classroom. Traditional detailed field notes were recorded by the first author and transferred to an observational matrix following the observation (Appendix D-2).

Teachers were asked to complete a reflection on each of the five lessons to understand their feelings on each lesson and the perceived influence on student learning. The following prompt was given, “Please write a reflection about how you felt about this specific set of lessons after you completed it” (Appendix D-3).

Data collection ended upon saturation of the data, when no further themes or new information emerged to add to the understanding of the phenomenon (Bowling, 2002; Strauss & Corbin, 1990; Francis et al., 2010).

Data Analysis

Moustakas’ (1994) structured method of inductive data analysis was used in this study. After each individual transcript was read twice to immerse the researcher in the data, all transcripts were read again and memos were recorded to further immerse the

researcher and highlight key concepts. Next, horizonalization was performed by giving equal value and importance to each statement and coding it with a descriptive label. All statements that were not a horizon of the experience were reduced or eliminated. Initial coding resulted in 164 categories of invariant constituents of the experience. These categories were clustered and reduced into five core themes of the experience. Final identification of these themes was performed by re-reading the complete transcripts to verify that the theme and accompanying invariant constituents were explicitly expressed and compatible with the participants' words. These themes were used to construct individual and overall textural, structural, and textural-structural descriptions, culminating into an overall essence of the experience.

Reliability and validity

Reliability was accomplished through detailed field notes, an audio recorder for accuracy, and intercoder agreement from two outside coders. The two additional coders analyzed data independently, then met with the dissertation author to discuss codes. There were no significant discrepancies, and any small differences were discussed and resolved to create one set of themes.

Validation was accomplished through data source triangulation to corroborate evidence, bracketing to clarify bias, and member checking. Member checking, identified as the most critical validation technique, was conducted with participants to determine the credibility of the findings and interpretations (Lincoln & Guba, 1985). Final themes, as well as a sample of the invariant constituents of those themes, were emailed to all teacher participants for review. Teachers were asked to examine these themes and reflect

on the accuracy. Teachers who responded reported that the provided account accurately reflected their perspectives and experiences.

Results

Five themes emerged from the teachers' experience of nutrition education in this study, including: (a) meaningful roles, (b) importance, (c) mutual perceived influences, (d) supplementary education and motivation, and (e) barriers.

Meaningful Roles

Teachers experienced nutrition education through a variety of roles. The most commonly reported roles were educator, role model, and coach. Other roles included advocate, supporter, engager, guide, school "wellness champ", and enlightener. Most roles were within the classroom, however, a couple of teachers expanded their roles school-wide through coordinating school wellness challenges, assisting with a variety of after-school wellness activities, and recruiting other teachers into wellness efforts.

Teachers expressed that their roles were meaningful for students' lives, particularly with serving as models for students:

> "They [students] really look to their teacher to model after kind of what they are doing. So it really sets the stage of, if I talk about what healthy choices I'm making, how these things impact me, they're gonna be more apt to try and want to do those themselves. Because they really want to put themselves to be like their teacher or that role." -Paula

Most teachers perceived that these roles aligned with the roles they believed they should be playing in nutrition education. Some teachers believed that these roles were *necessities* for their students. However, a few teachers expressed that they would like to

do more if they had the resources and time, including increasing nutrition discussion in the classroom, exposing students to new foods, spending more time with the Fresh Fruit and Vegetable Program, and educating themselves more. Heather states, "I think I could talk more about it and even educate myself more on some of the correct terms and how to talk to them [students]." Other teachers expressed that more efforts needed to be made with nutrition education in a broader sense rather than just their individual role:

> "Outside of the world we hear the big push of health and obesity and all these things and how they're important. I don't think we're doing enough to educate the kids about what that means. We are doing more on the adult piece, not the kid piece." –Paula

Importance

All teachers believed that nutrition education was important for their students. When comparing nutrition to other school subjects, Carrie states, "I'll be honest with you…I think it's just as important or more important." She stated that it carried over to the rest of the students' school day by helping them to concentrate, learn, and achieve success in other academic subjects.

Many teachers expressed importance in terms of the future. Nutrition education was viewed as essential at a young age to form the foundation of healthy lifestyle choices later in life. Teachers expressed a responsibility to educate children and help shape their nutrition and movement choices.

> "It's something that's really important for their well-being and it's something that's a life skill so if you start practicing good nutrition and eating healthy at an early age, those habits can carry through for the rest of your life." –Nora

All teachers believed that it was an important topic to teach in the classroom setting, and many expressed that it was a necessity. Teachers believed that home environments varied, so not all students would learn about nutrition at home. Others believed that even if students were learning about nutrition at home, school was still important in providing a formal learning environment. Heather believed that it was an area in which parents and teachers could deliver reinforcing messages for children; "It's some way we can work together."

Although teachers expressed that nutrition education was important, the amount of time spent on formal nutrition education was reported to be minimal. Teachers did express they would like to dedicate more time to teaching nutrition, however, they did not believe it necessitated the same amount of time as other subjects. Becky states, "I mean honestly, I can't see myself spending 60 minutes a day on nutrition."

Mutual Perceived Influences

Teachers experienced nutrition education through an interaction of important influences between themselves, their students, and the provided curriculum that was integral in forming their perceptions of nutrition education. Figure 1 demonstrates the reported interaction between teachers, students, and curriculum.

Many teachers developed enjoyment for nutrition education in part due to their students' excitement and positive attitude toward the topic. Sue states, "I think because they're super excited, I'm super excited…it kind of is like a domino effect." Teachers demonstrated this positive attitude toward nutrition education when delivering nutrition lessons through their body language, expressions, animation, and voice.

In turn, teachers perceived themselves as very influential figures for this young age group. Melissa states, “They believe everything their teacher says and they look up to their teacher as this role model...I think that is pretty influential for them.” Most believed that the various roles they played positively impacted their students. Only one teacher believed that she was not influential for students, “I know at this age, a lot of kiddos do look up to me, but at the same time, it’s not as in like a big life picture… I think it’s something that kind of fades away after time” (Heather).

Teachers all followed the same interactive, expert-created curriculum kit, specific for their grade level, which they believed had unique qualities that engaged and improved student learning compared to other curriculum. They perceived that the following strategies improved learning for their students: Hands-on activities, interactive models, visuals and videos, variety of materials, experiments, reinforcing activities, independent and group learning opportunities, and provided communications for parents. Sue explains, “It engages them more…I think it helps them understand it more because they can see it instead of just like read about it.” The curriculum directly influenced the teachers, several reporting that its simplicity and ease of use increased their confidence and delivery of the material for students. Most felt very comfortable delivering the material, demonstrated while teaching. Paula explains, “The resources and materials are there and it’s done in a way that allows me to feel confident about something that I don’t know a whole lot about teaching.”

Although teachers followed the same expert-created curriculum kit for their grade level, they influenced the lessons by adding in a variety of strategies or adapting the curriculum to enhance their influence on students. The decision to adapt the curriculum

was partly of their own choosing and partly due to students' positive response to the curriculum. For example, when students expressed enjoyment toward a particular group lesson, teachers would adapt that lesson for independent learning opportunities, demonstrating the students' indirect effect on the curriculum. Observed or expressed strategies included: Personalizing the lessons to make material meaningful; repurposing group lessons for independent discovery learning; facilitating group learning to promote peer influence; providing opportunities for mastery experiences; role modeling; using verbal persuasion; incorporating additional learning strategies into the provided lesson; modifying lesson as needed to adapt to students' needs; and showing connections between materials.

Teachers believed that this combination of interactions positively influenced students to improve nutrition and/or physical activity-related knowledge, confidence, and behavior. The most commonly perceived improvements in behavior included more frequent handwashing, consumption of a variety of foods, consumption of nutritious meals and snacks, and willingness to try fruits and vegetables. Integral to perceived influence was the value that teachers placed upon this influence. Teachers strongly believed that even small behavior changes were important in young children. Carrie described one particular student who had simply become more willing to try fruits and vegetables throughout the year, reflecting, "So even that small of a change of a behavior I think is huge, especially at this age. Because if we're seeing that small of a change now, what could it be in like two years or something?"

Supplementary Education and Motivation

All teachers reported integrating some type of supplementary education or activity in relation to nutrition and/or physical activity. Some of these opportunities included: Integrating nutrition education into core subjects, teaching and encouraging with the Fresh Fruit and Vegetable Program, providing classroom tastings of new foods, incorporating movement into the school day (Brain Breaks, Inside Recess, Just Dance, Zumba, GoNoodle, YouTube, Deskercises, and Brain Pop), communicating with parents about nutrition, and encouraging children to participate in wellness challenges.

Teachers reported making these additional efforts based on a variety of motivators. They generally expressed a feeling of responsibility to help children build a foundation of healthy lifestyles at a young age. There was a sense that kids just *need* movement:

> "I guess the movement piece comes from just, they're five years old and they are required to sit so much throughout the day. So I want them to be, you know, be a five year old and have that chance to move." –Melissa.

Environmental motivators included the food/physical activity environment and childhood obesity. Classroom-based motivators included maintaining focus and attention, increasing the overall sense of feeling better, reducing behavior issues, aiding in learning, and forming connections. Internal motivators included a sense of responsibility and care for students. The school environment helped maintain motivation, generally providing support for wellness efforts and making the experience positive for teachers.

Barriers

Teachers experienced nutrition education through various barriers, the strongest of which was time. Teachers experienced time as a structure that restricted their ability to complete the provided nutrition curriculum. Carrie expressed, "I just wish we had more time to do it." The topic was rushed due to tight schedules and core subject requirements. Some teachers experienced time as a barrier in terms of the amount of time they had the curriculum in their possession. Teachers received their interactive curriculum for three weeks, and with snow days, holidays, and other event conflicts that arose, teachers believed that time slipped away during those three weeks. They believed that they could "juggle" the lessons with other subjects if they had the curriculum for a longer amount of time. Other teachers experienced time as a barrier in terms of the amount of time that the district allowed for nutrition education. Some teachers believed that three weeks with the kit was enough time, as they expressed that their district technically only provides two weeks to teach nutrition. Regardless, teachers attempted to tackle the issue of time by fitting in as many lessons as possible. Becky expressed, "we kind of fudge out some time of that third week to pull in more days," demonstrating her value of the topic.

Along with time, prioritization of core subjects limited nutrition education. All teachers voiced that core subjects, such as math and literacy, were "top priority" compared to nutrition because these subjects involve standardized state testing and relate to later life employment. Paula shares, "We've said it's [nutrition is] important, we need to be teaching these things, but when push comes to shove, they're gonna have you do the math over the nutrition."

Resources and budget were barriers that influenced the nutrition education experience. Some teachers expressed a dependency on the curriculum they were provided. Teachers reported that without the kit, if they wanted any activities for their students, they would have to take their already limited time to find these activities on their own. Additionally, teachers would have to pay out-of-pocket for any supplementary materials. The curriculum provided a convenience that teachers did not have previously.

The home environment was another barrier. Although teachers expressed that they influenced students, they also believed that they had no control over the home environment and that poor habits at home could undo the efforts that they expended for their students. Sue expressed, "I feel like I can encourage them here, but ultimately I feel like it's the parents' choice to buy what they buy at the store." However, this structure instilled a responsibility to make additional efforts to compensate for homes that may not have the resources or may have barriers to healthy choices. Teachers expressed that they wished parents would be more involved in student wellness, but didn't know how to get them more involved. Some teachers were hesitant about how to communicate with parents concerning wellness and had a difficult time gauging the fine line between encouraging a healthy lifestyle and overstepping their role. Karen expresses, "I'm a little uncomfortable…I don't know if I'm crossing the line, talking to the mom or not." Teachers did try making efforts to reduce this barrier by creating their own newsletters or utilizing newsletters provided with the curriculum to send home to parents.

Overall Essence

Overall, for teachers, nutrition education was experienced as an opportunity for teachers to play a variety of roles and make efforts beyond curriculum requirements to

positively influence their students' health, motivated by the responsibility and care they felt for their students. Teachers perceived their experience through a triadic relationship between themselves, their students, and the curriculum. They believed that this relationship had positive outcomes for both them and their students. However, it was not an experience without conflict, both internally and externally. Teachers expressed feelings of value and importance toward nutrition education, while conversely expressing prioritization toward core subjects and clarifying that nutrition did not necessitate an equivalent amount of education. Time, resources, and uncontrollable home environments restricted efforts, and teachers struggled to overcome these barriers. Despite a competing internal dialogue and external barriers, teachers voluntarily expended efforts throughout the school year to maximize an enjoyable nutrition and movement experience for their students and themselves.

Discussion

This study explored nutrition education in the context of a phenomenology, providing an in-depth, holistic understanding of the experience and perspectives of classroom teachers. Exploration with teachers revealed complex feelings toward nutrition education that were not always consistent. However, teachers expressed and demonstrated enjoyment and commitment to nutrition education. The five themes that emerged through this research included meaningful roles, importance, mutual perceived influences, supplementary education and motivation, and barriers. Other qualitative research has not yet demonstrated such complex perspectives on classroom teachers' experience.

The first theme that emerged from this research was teachers' role in nutrition education. Teachers perceived that they played many roles in nutrition education, which is supported by previous research that teachers perceive themselves as educators, role models, advocates, and motivators (Prelip, et al., 2006). Our study reveals additional essential roles inside and outside the classroom, including recruiting other school staff into wellness efforts. With teachers making numerous efforts, these roles may have important implications for students. Because this area of research has not been well studied, further research should be conducted to examine the impact of these various roles on students. Moreover, future studies should examine ways to recruit and motivate teachers to play more nutrition-related roles in students' lives.

The large number of roles that teachers played in this study was, in part, related to the theme of importance that they placed upon nutrition education. Teachers struggled with balancing feelings of importance toward nutrition, their prioritization of core subjects, and the question of whether nutrition needed an equal amount of dedication. These conflicting feelings demonstrated in this study have not been demonstrated previously, which illustrates a promising area in which nutrition professionals can work to reduce confliction and strengthen already existing preferences toward nutrition education.

The perceived triadic relationship between teachers, curriculum, and students emerged as another significant theme (Figure 1). Teachers perceived their roles in combination with the interactive nutrition curriculum positively influenced students. Positive student outcomes have been demonstrated in several quantitative studies using interactive curriculum (Raby Powers, Struempler, Guarino, & Parmer, 2005; Katz et al.,

2011; Kelder et al., 2005; Hall, Chai, & Albrecht (under review)). Less present in the literature is the perception that teachers hold about student outcomes. Outcomes were not objectively measured in the present study (Albrecht et al., 2014), however perception alone is important as a potential key factor in nutrition education commitment and delivery. It has been widely noted by theorists, such as Irwin Rosenstock, Martin Fishbein, and Albert Bandura, that perception affects behavior. Several models of behavior change, such as the Health Belief Model, Theory of Planned Behavior, and Social Cognitive Theory all include some form of perceptional beliefs that influence behavior (Glanz, Rimer, & Viswanath, 2008; McKenzie, Neiger, & Thackery, 2013). These theories support the idea that teachers' positive perceptions have the potential to improve nutrition education delivery, therefore efforts should be made to cultivate these perceptions.

Next, teachers were influenced by both their students and the curriculum they used. Students' own sense of enjoyment increased the teachers' sense of enjoyment, emphasizing the need to create materials for classrooms that engage and excite students. Confidence, on the other hand, improved due to the curriculum provided. Teachers generally receive training on new nutrition education materials with the goal of increasing program fidelity and confidence, as was the case with the curriculum provided in this study (Keihner et al., 2011; Fahlman, Dake, McCaughtry, & Martin, 2008). Surprisingly though, teachers did not express confidence in relation to being trained. Rather, teachers expressed confidence in terms of the curriculum's organization, ease-of-use, and simplicity. Teachers are generally under a tight, time-constraining schedule, so designing materials to be more simplistic and user-friendly with familiar educational

terms may help to improve confidence without requiring additional training sessions (Hall, Vierregger, Koszewski, Anderson-Knott, & Albrecht, 2013).

Last in this triadic relationship was teachers' and students' influence on the curriculum. Teachers made efforts to adapt the provided curriculum to their classroom, personalizing it for their students, and adding additional learning strategies. Previous findings have supported that adaptation normally occurs and aids implementation success (Durlak & DuPree, 2008; Miller-Day et al., 2013). Allowing adaptation can increase teacher willingness to deliver nutrition education by providing them with the flexibility necessary for the classroom environment (Jørgensen et al., 2014). Outcomes such as improved attitudes toward fruits and vegetables have been demonstrated with this freedom (Prelip et al., 2011). Although fidelity of implementation is important for evaluation and predicted outcomes, adaptation has the potential to improve the educational experience by making material more meaningful for students, targeting students not performing at grade level, and incorporating strategies for different learning styles. One possible limitation of adaptation is that teachers will include unreliable and inaccurate nutrition information, so future studies should examine the balance of fidelity and adaptation with student outcomes.

Supplementary education and motivation was another theme that emerged. Teachers included a variety of additional activities, most often with movement breaks, that have demonstrated a variety of benefits for students without detracting from academics (Erwin, Abel, Beighle, & Beets, 2009; Erwin, Beighle, Morgan, & Noland, 2011; Katz et al., 2010). Grade school staff have noted that lack of physical activity makes it difficult for students to focus (Schetzina et al., 2009), however, some believe

that providing these breaks makes it difficult to get students back on task (McMullen, Kulinna, & Cothran, 2014), unlike the teachers in this study.

Motivation for including supplementary education is a fairly new finding. Although Head Start teachers have also expressed being motivated by the idea that children inherently need movement (Gehris, Gooze, & Whitaker, 2014), little has been studied on elementary teacher motivation. A key aspect to recruiting teachers to nutrition education efforts and improving their delivery of materials is motivation. This concept is cited by a number of behavior change theories such as the Information-Motivation-Behavioral Skills Model and Theory of Planned Behavior (DiClemente, Salazar, & Crosby, 2011). Nutrition professionals should, therefore, increase efforts to motivate teachers to incorporate more nutrition education in their classrooms. Nutrition professionals could work one-on-one with teachers to identify internal motivators, or address larger groups of teachers in motivational workshops with the subject matter.

Teachers participating in this study identified barriers that are consistent with previous research. Time, resources, and core subjects have consistently been identified as a barrier to delivering nutrition education (Jones & Zidenberg-Cherr, 2015; Smith & Kovacs, 2011; Pederson, 2007; Jørgensen et al., 2014; Clarke, Fletcher, Lancashire, Pallan, & Adab, 2013; Carraway-Stage et al., 2014; Schetzina et al., 2009; Carraway-Stage, 2014; McCaughtry et al., 2012; Jones & Zidenberg-Cherr, 2015). Teachers in this study were most concerned with not having the resources for hands-on activities, as they believed that students learned best with this method. Although a variety of free resources exist for schools, particularly low-income schools, most of these are not hands-on activities. Thus, further efforts may need to be allocated toward creating such resources.

Previous literature has addressed teachers' perceptions that parents may also be a barrier that contributes to a child's unhealthy choices (Power, Bindler, Goetz, & Daratha, 2010; Clark et al., 2013). Some teachers believed that parents already know about nutrition, and that it is not their place to intervene (Burrows & McCormack, 2012). Even a wider range of school staff believed that programs should involve a parental and school connection to avoid conflicting with the home environment (Bucher Della Torre, Akre, Suris, 2010). Similarly, this study found that some teachers were worried that they may be overstepping by communicating with parents. However, such feelings are not widely studied. Communication is vital to a successful program, so nutrition professionals should work to address teachers' concerns and facilitate relationships between parents and teachers to make teachers feel more comfortable about talking openly about students' nutrition.

There were some limitations to this study. Although data were collected around the time that each teacher normally taught their main nutrition unit, some recollections addressed were experiences from earlier in the school year or from the previous school year, and may not have been accurate. The range in number of years that teachers had experience with nutrition education may have made the group less homogenous, however the early saturation of themes supports that the group had similar experiences of nutrition education. Voluntary participation excluded perceptions of teachers who did not wish to participate and may have had different views to share. The lack of focus groups as a data source may have limited the depth of information. However, three data sources were used to triangulate the data.

Conclusion

This study presents a detailed phenomenological account of the essence of the nutrition education experience for elementary school teachers, which had not yet been previously researched. Teachers hold generally positive, but complex feelings about nutrition education. Themes revealed areas that nutrition professionals can focus on to improve teacher commitment to nutrition education, such as addressing barriers, providing simple and easy-to-use programs, cultivating positive perspectives, and building motivation. Teachers' adaptations to the provided curriculum and their perceived influence on students' outcomes were both promising concepts that have the potential to influence teacher commitment and student outcomes. Due to the inherent lack of generalizability of qualitative studies, future quantitative research should investigate the effectiveness of adaptability and perception for both teachers and students.

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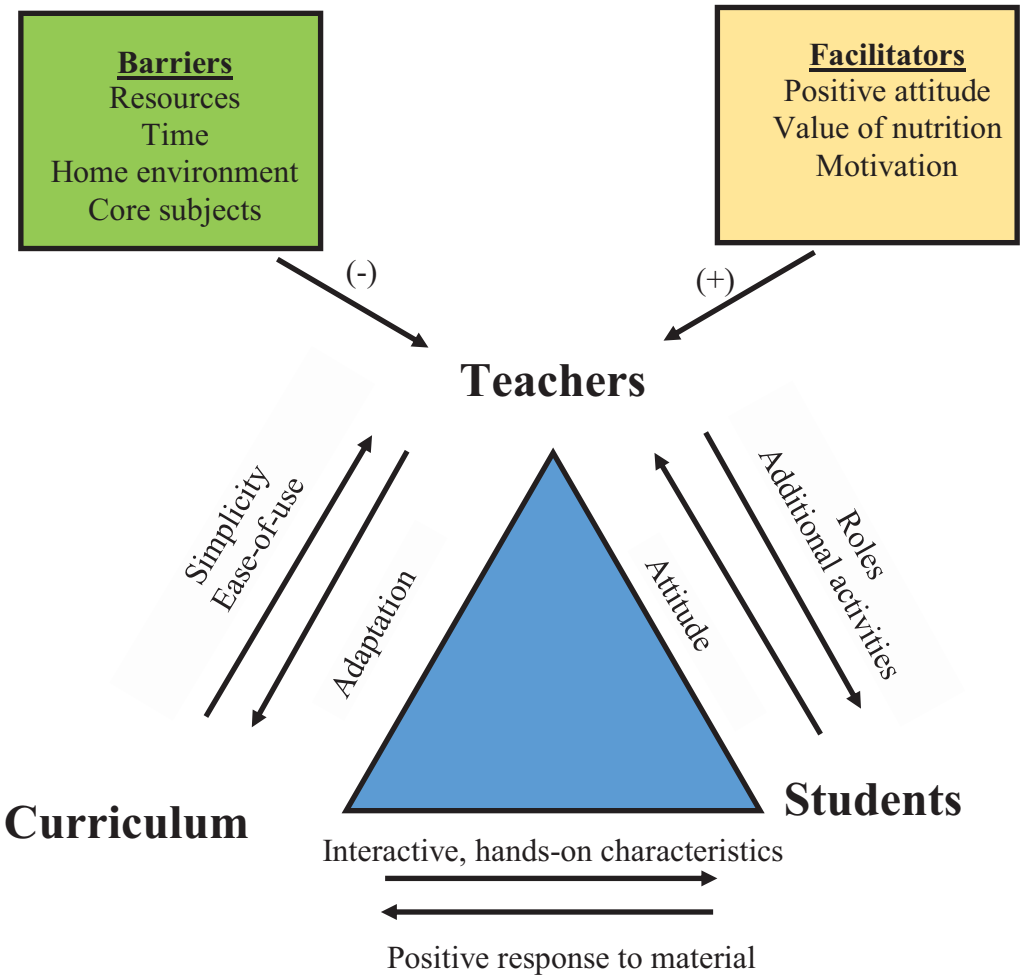
Figure 1: Representation of Teacher's Nutrition Education Perceptions and Experience



Chapter VII: General Discussion

Classroom-based nutrition education is a promising area of community nutrition that has the potential to improve healthy eating and physical activity habits, which may eventually lead to a decrease in childhood obesity. Nutrition education literature is composed of a myriad of interventions, however, basic foundational information was previously lacking. A scarcity of measurement tools covering broad topics for youth can create basic measurement validity issues in any study. Additionally, a lack of information about integral components of school-based programming, such as teacher perspectives and type of school that students attend, may hinder program success. Finally, standards for a successful intervention are not clear, so continued evaluation of unique programs is necessary to determine what type of programs are most successful.

This dissertation included four studies relating to classroom-based nutrition education to address these school-based nutrition education issues. Study I addressed the lack of measurement tools for the older elementary population by developing a valid and reliable survey instrument for collecting behavior, knowledge, and self-efficacy data on elementary students. This instrument was not only used in Study II, but could be adapted for nutrition education programs in similar populations to assess baseline characteristics and/or evaluate a program. Study II addressed the lack of research about behavior, knowledge, and self-efficacy between children from low and high income households, specifically through examination of students from Title I and non-Title I schools. This study provided information concerning nutrition-related disparities and recommendations to guide nutrition education developers so that they may better address the particular type of school with which they work. Study III addressed the lack of long term evaluation of a

novel nutrition education program for low income students. This evaluation justified its use and provided nutrition professionals that are developing nutrition education programs an example of a unique approach to nutrition education that produces positive outcomes. This study provided recommendations that professionals can use in their own programs. Study IV addressed the lack of teachers' perceptions of nutrition education by exploring teachers' beliefs through a qualitative phenomenology. This study provided insights into the teacher experience and recommendations for working with teachers to improve nutrition education delivery. All four studies connected to the broader application of providing recommendations that nutrition professionals can use to modify or develop nutrition education programs, with the goal of producing successful outcomes for children.

Notable Findings and Recommendations

Several notable findings, leading to recommendations for practice, emerged from the four studies in this dissertation. All studies demonstrated results concerning self-efficacy, and most studies were consistent in these findings. Study I determined that students with higher self-efficacy were more likely to report healthful eating, particularly in terms of fruit, dairy, and breakfast intake. Both Study II and Study III supported this self-efficacy finding with results that self-efficacy was the strongest predictor of behavior. In Study II, self-efficacy was a stronger predictor of behavior than knowledge for all participants analyzed as a group and the non-Title I group. Moreover, only self-efficacy was a predictor for the Title I group. In Study III, behavior was correlated with self-efficacy in all groups, but also correlated with knowledge in males and the control group. Self-efficacy was a stronger significant predictor of behavior than knowledge in

all groups. Additionally, self-efficacy was the only significant predictor of behavior for the male, female, and intervention groups.

These three studies support the conclusion that self-efficacy should receive more attention in nutrition education programs to facilitate behavior change. Some examples of self-efficacy development specifically used in Study III's intervention that nutrition educators could adapt for their programs include mastery experience, verbal persuasion, modeling, peer models, and teacher feedback. What is not clear from these studies is why behavior was predicted by only self-efficacy in fifth grade Title I students, 3rd grade intervention students, and 3rd grade females and males. It is premature to suggest recommendations for knowledge development for these different groups based on these three studies, so further research should examine why knowledge was not a significant behavior predictor for these particular groups.

Similarly, self-efficacy was important for teachers delivering nutrition education. Teachers in Study IV identified the important characteristics of the nutrition education material they received that increased their self-efficacy for teaching nutrition, including simplicity, organization, and ease-of-use. Self-efficacy for teachers is equally important to previously discussed self-efficacy for students since self-efficacy can have a domino effect of influencing content delivery, which may influence student development of behavior predictors, which may influence student outcomes. Nutrition education programs should consider involving teachers in the development process and providing them with straightforward and simple instructional materials, common teaching terms, and clear instructions to help teachers increase self-efficacy and improve delivery of a topic for which they are not well informed.

Aside from these results that were common to all four studies, each study also provided notable results that did not overlap between studies, providing a list of areas for improvement for current and future programs. Although these results were unique to each study, all results relate to implications for improving nutrition education programming.

Study I demonstrated low intake of fruits and vegetables in fifth grade students, with most students reporting intake of each either once per day or not at all. Although this low intake has been a common finding nationally in previous studies, this study demonstrates that low intake is still a pressing issue for nutrition programs to highlight and improve. Nutrition programs should focus more attention on improving fruit and vegetable intake, which may involve reducing a complex program to focus more specifically on fruits and vegetables or simply providing additional lessons or activities about fruits and vegetables. Some tactics may include taste tests, school gardens, hands-on fruit and vegetable activities, and enrollment in programs such as the Fresh Fruit and Vegetable Program (when schools qualify).

Study II demonstrated nutrition disparities between students from Title I and non-Title I schools for both nutrition-related knowledge and behavior items. Specific areas that were particularly concerning were lower intakes of fruits, vegetables, whole grains, lean protein, and lower physical activity. Despite supplementary educational materials and additional resources, such as the Fresh Fruit and Vegetable Program, lower income students still did not score as well as their higher income counterparts. This finding suggests that Title I schools are in more need of nutrition education, so nutrition educators should make efforts toward providing more programming and resources to these schools. Another novel finding from this study was higher self-efficacy in Title I

students for choosing healthy snacks and preparing healthy meals, which was not expected due to the poorer scores on most other variables. Due to a lack of causal information, recommendations on programming would be premature, however research should be conducted to determine the source of this high self-efficacy so that nutrition educators may have direction on methods to encourage this self-efficacy in similar student populations.

Study III demonstrated higher breakfast and vegetable intakes for intervention schools, justifying SEKP with specific healthy eating outcomes. This finding suggests that SEKP may be effective when adapted to other areas, so nutrition educators should consider the unique components from this program when creating their own programs, such as science experiments and interactive and hands-on materials. Study III also showed differences between females and males. Females demonstrated a better response to the intervention, implying that different modes of education may be more effective for females and males. Nutrition educators should therefore incorporate a variety of educational materials and teaching strategies so that both females and males can learn effectively.

Study IV demonstrated five themes that teachers experienced in nutrition education, including meaningful roles, importance of nutrition, a triadic relationship, supplementary material and motivation, and barriers. This study suggested a variety of recommendations for working with teachers to improve nutrition education delivery and outcomes, including involving teachers in the development process, balancing adaptation with fidelity, facilitating relationships between teachers and parents, providing solutions

to school-specific barriers, and educating teachers on the benefits of nutrition education to improve perceptions.

Conclusion

Overall, this dissertation produced a valid and reliable measurement tool for youth, demonstrated self-efficacy's prediction of behavior over knowledge, revealed nutrition disparities between students from Title I and non-Title I schools, evaluated and justified an interactive nutrition education program, and provided insights into teachers' perspectives on nutrition education.

It would be beneficial to conduct future studies on nutrition-related self-efficacy in a variety of youth groups. Although self-efficacy was the strongest predictor for behavior among all sampled groups, knowledge was an inconsistent predictor, with some groups showing an association (males, third grade control, and fifth grade non-Title I), some showing a predictive association when included in an equation (third grade control and fifth grade non-Title I), and some groups demonstrating no relationship or predictive factor (females, third grade intervention, and fifth grade Title I). This discrepancy should be further investigated to determine causal explanations so that nutrition educators can best address their populations. Nutrition disparities between students from Title I and non-Title I schools should also be further investigated. Income is an integral factor to nutrition behaviors, yet less research exists for children than adults. Nutrition educators need to understand disparities so they can design programs that best fit the particular type of schools with which they work. SEKP should be further evaluated in a larger sample with long-term, pre/post design to determine if results are consistent with the positive findings in Study III. Finally, teachers' perspectives should be further investigated using

a quantitative design to determine if the findings from this study are generalizable to a large sample of teachers. Information generated by future studies would be vital to nutrition educators who wish to improve current programs and develop effective future programs that best meet the needs of their specific population.

APPENDICES

Appendix A-1

Internal Review Board Approval Letter for

Study I and Study I

December 10, 2013

Elisha Hall
Department of Nutrition and Health Sciences

Julie Albrecht
Department of Nutrition and Health Sciences
119E LEV, UNL, 68583-0806

IRB Number: 20131213929 EP
Project ID: 13929
Project Title: Evaluation of a social cognitive-based curriculum among 5th grade students

Dear Elisha:

This letter is to officially notify you of the approval of your project by the Institutional Review Board (IRB) for the Protection of Human Subjects. It is the Board's opinion that you have provided adequate safeguards for the rights and welfare of the participants in this study based on the information provided. Your proposal is in compliance with this institution's Federal Wide Assurance 00002258 and the DHHS Regulations for the Protection of Human Subjects (45 CFR 46). Your project has been approved as Expedited Category 7.

Date of EP Review: 11/27/2013

You are authorized to implement this study as of the Date of Final Approval: 12/10/2013. This approval is Valid Until: 12/09/2014.

1. The stamped and approved parent notification has been uploaded to NUgrant (file with -Approved.pdf in the file name). Please use this document to distribute to parents. If you need to make changes to the document, please submit the revised document to the IRB for review and approval prior to using it.

We wish to remind you that the principal investigator is responsible for reporting to this Board any of the following events within 48 hours of the event:

* Any serious event (including on-site and off-site adverse events, injuries, side effects, deaths, or other problems) which in the opinion of the local investigator was unanticipated, involved risk to subjects or others, and was possibly related to the research procedures;

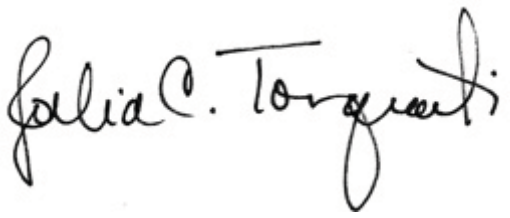
* Any serious accidental or unintentional change to the IRB-approved protocol that involves risk or has the potential to recur;

* Any publication in the literature, safety monitoring report, interim result or other finding that indicates an unexpected change to the risk/benefit ratio of the research;
* Any breach in confidentiality or compromise in data privacy related to the subject or others; or
* Any complaint of a subject that indicates an unanticipated risk or that cannot be resolved by the research staff.

For projects which continue beyond one year from the starting date, the IRB will request continuing review and update of the research project. Your study will be due for continuing review as indicated above. The investigator must also advise the Board when this study is finished or discontinued by completing the enclosed Protocol Final Report form and returning it to the Institutional Review Board.

If you have any questions, please contact the IRB office at 472-6965.

Sincerely,



Julia Torquati, Ph.D.
Chair for the IRB

Appendix A-2

Internal Review Board Approval Letter for

Study III and Study IV

November 25, 2014

Elisha Hall
Department of Nutrition and Health Sciences

Julie Albrecht
Department of Nutrition and Health Sciences
119E LEV, UNL, 68583-0806

IRB Number: 20141114378
Project ID: 14378
Project Title: Evaluation of Growing Healthy Kids

Dear Elisha:

This letter is to officially notify you of the approval of your project by the Institutional Review Board (IRB) for the Protection of Human Subjects. It is the Board's opinion that you have provided adequate safeguards for the rights and welfare of the participants in this study based on the information provided. Your proposal is in compliance with this institution's Federal Wide Assurance 00002258 and the DHHS Regulations for the Protection of Human Subjects (45 CFR 46). Your project has been reviewed under Expedited Category 6.

You are authorized to implement this study as of the Date of Final Approval: 11/25/2014. This approval is Valid Until: 11/24/2015.

1. Your stamped and approved informed consent documents have been uploaded to NUgrant (files with Approved.pdf in the file name). Please use these documents to distribute to participants. If you need to make changes to the informed consent documents, please submit the revised documents to the IRB for review and approval prior to using it.

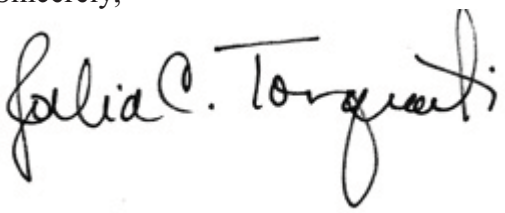
We wish to remind you that the principal investigator is responsible for reporting to this Board any of the following events within 48 hours of the event:
* Any serious event (including on-site and off-site adverse events, injuries, side effects, deaths, or other problems) which in the opinion of the local investigator was unanticipated, involved risk to subjects or others, and was possibly related to the research procedures;
* Any serious accidental or unintentional change to the IRB-approved protocol that involves risk or has the potential to recur;

* Any publication in the literature, safety monitoring report, interim result or other finding that indicates an unexpected change to the risk/benefit ratio of the research;
* Any breach in confidentiality or compromise in data privacy related to the subject or others; or
* Any complaint of a subject that indicates an unanticipated risk or that cannot be resolved by the research staff.

For projects which continue beyond one year from the starting date, the IRB will request continuing review and update of the research project. Your study will be due for continuing review as indicated above. The investigator must also advise the Board when this study is finished or discontinued by completing the enclosed Protocol Final Report form and returning it to the Institutional Review Board.

If you have any questions, please contact the IRB office at 472-6965.

Sincerely,



Julia Torquati, Ph.D.
Chair for the IRB

Appendix B-1

Student Verbal Assent Script

Study I and Study II

Student Verbal Assent Script:

OPENING:

Hi. My name is [ ] and I am from the University of Nebraska-Lincoln. We are doing a study and have developed a survey for this study. I am here today to ask each of you to fill out a short survey to assess some factors about nutrition and physical activity. This is the only time you will be asked to fill out this survey. It will take about 30 minutes for you to fill out.

The reason we are doing this study is so we can develop a more effective in-class health and nutrition program. Your participation in this survey is voluntary and you do not have to participate if you do not want to. If you do want to participate, your answers to the survey will be kept confidential and no one except the researchers will see them. There will be no way for anyone to know which responses came from you or someone else. This survey will not be graded and will not affect your classroom grades.

Would you be interested in participating? [Allow time for student response]

CLOSING:

Do you have any questions you would like answered now?

You may contact the researcher Elisha Hall at elisha@huskers.unl.edu. If you prefer to speak with someone else, call the UNL Research Compliance Services Office at 402-472-6965.

Thank you for being willing to take this survey.

Appendix B-2

Parent Notification Letter

Study I

University of Nebraska Lincoln

COLLEGE OF EDUCATION AND HUMAN SCIENCES
Department of Nutrition & Health Sciences

TO: **PARENT/GUARDIAN**
FROM: University of Nebraska-Lincoln Extension
SUBJECT: **PARENT NOTIFICATION** for the Pilot of the "Healthy Habits" Survey on Nutritio n and Physical Activity

You are receiving this letter because your child is a 5th grade student that has been selected to complete a survey about nutrition and physical activity. The objective of this study is to test the reliability this survey in a 5th grade student population in Lincoln, Nebraska. Eventually, this survey will go towards the evaluation and improvement of nutrition and physical activity education offered through Extension.

These surveys are anonymous. All students in your child's 5th grade class will complete this survey during their regular class time, which will take approximately 30 minutes. There are no known risks involved with participating in this research. The information learned from the student surveys will serve as a feedback mechanism for the researchers, who are interested in developing a valid and reliable survey instrument to use in the 5th grade population. Findings from the research may be published in scholarly journals or presented at national meetings, but all data will be kept confidential and no student, parent, or location will be mentioned by name in a report of the results.

Student participation is encouraged and appreciated, but is completely voluntary. The data collected is extremely useful in developing a valid and reliable evaluation tool for nutrition education and is beneficial in ensuring the sustainability and growth of Extension's nutrition education. However, participation is voluntary and there are no consequences if a student does not participate. You may refuse your child's participation or withdraw at any time and participation does not affect your child's grades, or you or your child's relationship with your child's school, the University, or the researchers in any way. If for some reason you do not wish for your child to participate, please complete and return the form on the reverse of this letter, and your child's survey will be omitted from the research activities.

If you have any questions about the program or the research, please contact the primary investigator, Elisha Hall at 402-472-6368 or elisha@huskers.unl.edu. Or you may contact the adviser on this project, Julie Albrecht at 402-472-8884 or jalbrecht1@unl.edu. Either of us will be happy to assist you.

Growing Healthy Kids Parent Notification Form

I have read the information about the "Healthy Habits" survey on nutrition and physical activity for students being conducted by the University of Nebraska-Lincoln. Please check the box below **only if you do not**

110 Ruth Leverton Hall / P.O. Box 830806 / Lincoln, NE 68583-0806 / (402) 472-3716 / FAX (402) 472-1587

want your son/daughter to take part in the research.

	My child does **not** have my permission to participate.

Name of student _____ Grade _____

Signature of parent/guardian _____ Date_____

Please only have your son/daughter return this form to his/her teacher within the next seven days ONLY if you DO NOT wish them to participate.

Thank you so much for your assistance with this important project.

Investigator Information:

Elisha Hall, Nutrition & Health Sciences Dept., UNL, Elisha@huskers.unl.edu or 402-472-6368
Dr. Julie Albrecht, Nutrition & Health Sciences Dept., UNL, jalbrecht1@unl.edu or 402-472-8884

If you have questions or concerns about your rights as a study participant that have not been answered by the investigators, or to report any concerns about the project, please contact the University of Nebraska-Lincoln Institutional Review Board at 402-472-6965.

TEACHERS, please return this form to Elisha Hall, Growing Healthy Kids Program Coordinators.

Appendix B-3

Parent Notification Letter

Study II

University of Nebraska Lincoln

COLLEGE OF EDUCATION AND HUMAN SCIENCES
Department of Nutrition & Health Sciences

TO: **PARENT/GUARDIAN**
FROM: University of Nebraska-Lincoln Extension
SUBJECT: **PARENT NOTIFICATION** for the "Healthy Habits" Survey on Nutrition and Physical Activity

You are receiving this letter because your child is a 5th grade student that has been selected to complete a survey about nutrition and physical activity. The objective of this study is to determine the nutrition- and physical activity-related behaviors, knowledge, and self-efficacy of 5th grade students in Lincoln Public Schools. The results of this survey will be used to evaluate and improve nutrition and physical activity education kits offered through Extension.

These surveys are anonymous. All students in your child's 5th grade class will complete this survey during their regular class time, which will take approximately 30 minutes. There are no known risks involved with participating in this research. The information learned from the student surveys will serve to improve nutrition and physical activity education kits offered to your school district. Findings from the research may be published in scholarly journals or presented at national meetings, but all data will be kept confidential and no student, parent, or location will be mentioned by name in a report of the results.

Student participation is encouraged and appreciated, but is completely voluntary. The data collected is extremely useful determining the effectiveness of our current nutrition and physical activity education kits and is beneficial in ensuring the sustainability and growth of Extension's nutrition education. However, participation is voluntary and there are no consequences if a student does not participate. You may refuse your child's participation or withdraw at any time and participation does not affect your child's grades, or you or your child's relationship with your child's school, the University, or the researchers in any way. If for some reason you do **NOT** wish for your child to participate, please complete and return the form on the reverse of this letter, and your child's survey will be omitted from the research activities.

If you have any questions about the program or the research, please contact the primary investigator, Elisha Hall at 402-472-6368 or elisha@huskers.unl.edu. Or you may contact the adviser on this project, Julie Albrecht at 402-472-8884 or jalbrecht1@unl.edu. Either of us will be happy to assist you.

Growing Healthy Kids Parent Notification Form

I have read the information about the "Healthy Habits" survey on nutrition and physical activity for students being conducted by the University of Nebraska-Lincoln. Please check the box below **only if you do not** want your son/daughter to take part in the research.

	My child does **not** have my permission to participate.

Name of student _____ Grade _____

Signature of parent/guardian _____ Date_____

Please only have your son/daughter return this form to his/her teacher within the next seven days ONLY if you DO NOT wish them to participate.

Thank you so much for your assistance with this important project.

Investigator Information:

Elisha Hall, Nutrition & Health Sciences Dept., UNL, Elisha@huskers.unl.edu or 402-472-6368
Dr. Julie Albrecht, Nutrition & Health Sciences Dept., UNL, jalbrecht1@unl.edu or 402-472-8884

If you have questions or concerns about your rights as a study participant that have not been answered by the investigators, or to report any concerns about the project, please contact the University of Nebraska-Lincoln Institutional Review Board at 402-472-6965.

TEACHERS, please return this form to Elisha Hall, Growing Healthy Kids Program Coordinators.

Appendix B-4

Student Verbal Assent Script

Study III

Student Verbal Assent Script:

OPENING:

Hi. My name is [ ] and I am from the University of Nebraska-Lincoln. We are doing a study and have made a survey for this study. I am here today to ask each of you to fill out a short survey about nutrition and physical activity. This is the only time you will be asked to fill out this survey. It will take about 30 minutes for you to fill out.

The reason we are doing this study is so we can create better nutrition and physical activity lessons. Your participation in this survey is voluntary and you do not have to participate if you do not want to. If you do want to participate, your answers to the survey will be kept confidential and no one except the researchers will see them. There will be no way for anyone to know which responses came from you or someone else. This survey will not be graded and will not affect your classroom grades.

Would you be interested in participating? [Allow time for student response]

If you decide you do not want to participate after all once you receive the survey, simply leave it on your desk and do not complete it. I will come around at the end to pick up all surveys whether you choose to complete the survey or not.

CLOSING:

Do you have any questions you would like answered now?

Thank you for being willing to take this survey.

Appendix B-5

Parent Notification Letter-Intervention Schools

Study III

IRB#: 20141114378
Date Approved: 11/25/2014
Valid Until: 11/24/2015

University of Nebraska Lincoln

COLLEGE OF EDUCATION AND HUMAN SCIENCES
Department of Nutrition & Health Sciences

TO: **PARENT/GUARDIAN**
FROM: University of Nebraska-Lincoln Extension
SUBJECT: **PARENT NOTIFICATION** for the "Healthy Habits" Survey on Nutrition and Physical Activity

You are receiving this letter because your child is a 3rd grade student that has been selected to complete a survey about nutrition and physical activity. Classrooms were randomly selected to participate in this study. The objective of this study is to determine the nutrition- and physical activity-related behaviors, knowledge, and self-efficacy of 3rd grade students in Nebraska. The results of this survey will be used to evaluate and improve nutrition and physical activity education kits offered through Extension.

These surveys are anonymous. All students in your child's 3rd grade class will be asked to complete this survey during their regular class time, which will take approximately 30 minutes. There are no known risks involved with participating in this research. The information learned from the student surveys will serve to improve nutrition and physical activity education kits. Findings from the research may be published in scholarly journals or presented at national meetings, but all data will be kept confidential and no student, parent, or location will be mentioned by name in a report of the results.

Student participation is encouraged and appreciated, but is completely voluntary. The data collected is extremely useful in determining the effectiveness of our current nutrition and physical activity education kits and is beneficial in ensuring the sustainability and growth of Extension's nutrition education. However, participation is voluntary and there are no consequences if a student does not participate. You may refuse your child's participation or withdraw at any time and participation does not affect your child's grades, or you or your child's relationship with your child's school, the University, or the researchers in any way. If for some reason you do **NOT** wish for your child to participate, please complete and return the form on the reverse of this letter, and your child will not be asked to complete the survey.

If you have any questions about the program or the research, or would like a copy of the survey, please contact the primary investigator, Elisha Hall at 402-472-6368 or elisha@huskers.unl.edu. Or you may contact the adviser on this project, Julie Albrecht at 402-472-8884 or jalbrecht1@unl.edu. Either of us will be happy to assist you.

Growing Healthy Kids Parent Notification Form

I have read the information about the "Healthy Habits" survey on nutrition and physical activity for students being conducted by the University of Nebraska-Lincoln. Please check the box below **only if you do not** want your son/daughter to take part in the research.

	My child does **not** have my permission to participate.

Name of student _____ Grade _____

Signature of parent/guardian _____ Date_____

Please only have your son/daughter return this form to his/her teacher within the next seven days ONLY if you DO NOT wish them to participate.

Thank you so much for your assistance with this important project.

Investigator Information:

Elisha Hall, Nutrition & Health Sciences Dept., UNL, Elisha@huskers.unl.edu or 402-472-6368
Dr. Julie Albrecht, Nutrition & Health Sciences Dept., UNL, jalbrecht1@unl.edu or 402-472-8884

If you have questions or concerns about your rights as a study participant that have not been answered by the investigators, or to report any concerns about the project, please contact the University of Nebraska-Lincoln Institutional Review Board at 402-472-6965.

TEACHERS, please return this form to Elisha Hall, Growing Healthy Kids Program Coordinators.

Appendix B-6

Parent Notification Letter-Control Schools

Study III

IRB# 20141114378
Date Approved: 01/28/2015
Valid Until: 11/24/2015

University of Nebraska Lincoln

COLLEGE OF EDUCATION AND HUMAN SCIENCES
Department of Nutrition & Health Sciences

TO: **PARENT/GUARDIAN**
FROM: University of Nebraska-Lincoln Extension
SUBJECT: **PARENT NOTIFICATION** for the "Healthy Habits" Survey on Nutrition and Physical Activity

You are receiving this letter because your child is a 3rd grade student that has been selected to complete a survey about nutrition and physical activity. The objective of this study is to determine the nutrition- and physical activity-related behaviors, knowledge, and self-efficacy of 3rd grade students in Nebraska. The results of this survey will be used to evaluate and improve nutrition and physical activity education kits offered through Extension.

These surveys are anonymous. All students in your child's 3rd grade class will be asked to complete this survey during their regular class time, which will take approximately 30 minutes. There are no known risks involved with participating in this research. The information learned from the student surveys will serve to improve nutrition and physical activity education kits. Findings from the research may be published in scholarly journals or presented at national meetings, but all data will be kept confidential and no student, parent, or location will be mentioned by name in a report of the results.

Student participation is encouraged and appreciated, but is completely voluntary. The data collected is extremely useful in determining the effectiveness of our current nutrition and physical activity education kits and is beneficial in ensuring the sustainability and growth of Extension's nutrition education. However, participation is voluntary and there are no consequences if a student does not participate. You may refuse your child's participation or withdraw at any time and participation does not affect your child's grades, or you or your child's relationship with your child's school, the University, or the researchers in any way. If for some reason you do **NOT** wish for your child to participate, please complete and return the form on the reverse of this letter, and your child will not be asked to complete the survey.

If you have any questions about the program or the research, or would like a copy of the survey, please contact the primary investigator, Elisha Hall at 402-472-6368 or elisha@huskers.unl.edu. Or you may contact the adviser on this project, Julie Albrecht at 402-472-8884 or jalbrecht1@unl.edu. Either of us will be happy to assist you.

Growing Healthy Kids Parent Notification Form

110 Ruth Leverton Hall / P.O. Box 830806 / Lincoln, NE 68583-0806 / (402) 472-3716 / FAX (402) 472-1587

I have read the information about the "Healthy Habits" survey on nutrition and physical activity for students being conducted by the University of Nebraska-Lincoln. Please check the box below **only if you do not** want your son/daughter to take part in the research

	My child does **not** have my permission to participate.

Name of student _____ Grade _____

Signature of parent/guardian _____ Date_____

Please only have your son/daughter return this form to his/her teacher within the next seven days ONLY if you DO NOT wish them to participate.

Thank you so much for your assistance with this important project.

Investigator Information:

Elisha Hall, Nutrition & Health Sciences Dept., UNL, Elisha@huskers.unl.edu or 402-472-6368
Dr. Julie Albrecht, Nutrition & Health Sciences Dept., UNL, jalbrecht1@unl.edu or 402-472-8884

If you have questions or concerns about your rights as a study participant that have not been answered by the investigators, or to report any concerns about the project, please contact the University of Nebraska-Lincoln Institutional Review Board at 402-472-6965.

TEACHERS, please return this form to Elisha Hall, Growing Healthy Kids Program Coordinators.

Appendix B-7

Teacher Consent Form

Study IV

University of Nebraska Lincoln

COLLEGE OF EDUCATION AND HUMAN SCIENCES
Department of Nutrition & Health Sciences

Dear Teacher,

Your school is currently receiving nutrition education kits provided by the University of Nebraska-Lincoln Extension Nutrition Education Program (NEP) to supplement the Lincoln Public Schools Health Education curriculum. I am a doctoral student working with this program as part of a research project. I am contacting you to invite you to participate in a study about this program.

Purpose: This research project will aim to explore K-2 teachers' perspectives on their general role in nutrition and nutrition education, as well as their perspectives on these education kits.

Procedures: You will be asked to participate in the following:
1. One one-hour interview, which will be audio recorded. This interview would take place privately in your regular classroom after the school day has ended. I would provide you with the main questions I would ask approximately one week before your interview so that you may look them over, if you would like.
2. One to two observation sessions while you are teaching the nutrition kits (students will NOT be observed).
3. One written reflection of your thoughts on *each* of the five lessons (five reflections, no length requirement)

Benefits: The data collected will help us to better understand your perspectives as a teacher so that we can create the most appropriate education tools possible for the classroom to help you as an instructor, and your students.

Risks and/or Discomforts: There are no known risks or discomforts associated with this research.

Confidentiality: No names or identifying information will be collected from you. A pseudonym will be used to link the three pieces of data collected. All audio recordings will be stored on a locked computer that is password protected. Only the investigator will have access to the computer. All other data will be stored in a locked cabinet in the investigator's office and will only be seen by the investigator during the study and for three years after the study is complete. The information obtained in this study may be published in scientific journals or presented at scientific meetings but the data will be reported as aggregated data.

Compensation: For your participation in the study, you will receive a $50 gift card after the completion of all three procedures. There will be a maximum number of participants for our study, so participants will be selected in the order consent forms are returned to us.

Opportunity to Ask Questions: You may ask any questions concerning this research and have those questions answered before agreeing to participate in or during the study. Or you may contact the investigator(s) at the phone numbers below. Please contact the University of Nebraska-Lincoln Institutional Review Board at (402) 472-6965 to voice concerns about the research or if you have any questions about your rights as a research participant.

Freedom to Withdraw: Participation in this study is voluntary. You can refuse to participate or withdraw at any time without harming your relationship with the researchers or the University of Nebraska-Lincoln, or in any other way receive a penalty or loss of benefits to which you are otherwise entitled.

Consent, Right to Receive a Copy: You are voluntarily making a decision whether or not to participate in this research study. Your signature certifies that you have decided to participate having read and understood the information presented. You will be given a copy of this consent form to keep.

Thank you.

Elisha Hall, MS, RD, LMNT
Doctoral Student in Nutrition and Health Sciences
(402) 472-6368

Julie Albrecht, PhD
Principal Investigator Office
(402) 472-8884

Name of Teacher: _____ ***School:*** _____

Signature of Teacher: _____ ***Date:*** _____

Appendix C-1

Healthy Habits Survey

University of Nebraska-Lincoln Extension

Healthy Habits Survey

We need your input in order to provide you and your classmates with the best nutrition and physical activity education we can. Your feedback will tell us how helpful our education is for you so we can make changes as needed to provide you with the best education possible.

Directions: For the following questions, place an "x" in the ONE box that best represents your answer. There are no right or wrong answers.

1. Yesterday, how many times did you eat/drink dairy, such as milk, yogurt, or cheese?
- ☐None
- ☐1 time
- ☐2 times
- ☐3 or more times

2. Yesterday, how many times did you eat fresh, frozen, dried or canned fruit? (Do not count fruit juice)
- ☐None
- ☐1 time
- ☐2 times
- ☐3 or more times

3. Yesterday, how many times did you eat fresh, frozen, or canned vegetables? (Do not count French fries or potato chips)
- ☐None
- ☐1 time
- ☐2 times
- ☐3 or more times

4. Yesterday, how many times did you eat French fries or chips? Chips are potato chips, tortilla chips, corn chips, or other snack chips.
- ☐None
- ☐1 time
- ☐2 times
- ☐3 or more times

5. Yesterday, how many times did you eat whole grains, such as whole grain bread, whole grain tortillas (not corn or white flour tortillas), whole grain pasta, or whole grain crackers?
- ☐None
- ☐1 time
- ☐2 times
- ☐3 or more times

6. Yesterday, how many times did you eat lean protein, such as beef, chicken, pork, fish, beans, peanut butter, eggs, nuts, or seeds? (Do not include fried meat)
- ☐None
- ☐1 time
- ☐2 times
- ☐3 or more times

7. Yesterday, how many times did you drink any punch, sports drinks, or other fruit-flavored drinks? (Do not count 100% juice or diet drinks)

- ☐None
- ☐1-2 times
- ☐3-4 times
- ☐5 or more time

8. Yesterday, how many times did you drink any regular (not diet) sodas or soft drinks?

- ☐None
- ☐1-2 times
- ☐3-4 times
- ☐5 or more time

9. Yesterday, how many times did you eat doughnuts, cookies, brownies, cakes, or candy?

- ☐None
- ☐1-2 times
- ☐3-4 times
- ☐5 or more times

10. How often do you eat breakfast?

- ☐7 days per week
- ☐5-6 days per week
- ☐3-4 days per week
- ☐1-2 days per week
- ☐0 days per week

11. How often are you physically active for at least 60 minutes per day or more? (This includes activities such as exercise, sports, running, walking, dancing, etc.)

- ☐7 days per week
- ☐5-6 days per week
- ☐3-4 days per week
- ☐1-2 days per week
- ☐0 days per week

12. How often do you help plan family meals at home?

- ☐7 days per week
- ☐5-6 days per week
- ☐3-4 days per week
- ☐1-2 days per week
- ☐0 days per week

Directions: For the following questions, place an "x" in the box that represents the ONE answer that you think is correct.

13. It is lunch time and Marty has the following items in her lunch box: an apple, a carton of chocolate milk, yogurt, and grilled chicken. How many **different** food groups are in Marty's lunch box?

- ☐1
- ☐2
- ☐3
- ☐4

14. Fruits and vegetables are good sources of vitamins. True or false?

- ☐True
- ☐False

15. How many minutes of physical activity do you think you should get each day to be healthy?

- ☐At least 15 minutes each day
- ☐At least 30 minutes each day
- ☐At least 60 minutes each day
- ☐At least 90 minutes each day

16. Why is physical activity good for kids?

- ☐Helps keep you from getting sick
- ☐Helps you pay attention in school
- ☐Builds healthy bones and muscles to keep you strong
- ☐Gives you energy
- ☐All of the above

17. Which food does **NOT** belong in the grain group?

- ☐Waffle
- ☐Noodles
- ☐Peanuts
- ☐Oatmeal

18. Which food does **NOT** belong in the vegetable group?

- ☐Broccoli
- ☐Carrot
- ☐Cabbage
- ☐Pear

19. Which food does **NOT** belong in the fruit group?

- ☐Strawberries
- ☐Corn
- ☐Pineapple
- ☐Watermelon

20. Which food does **NOT** belong in the protein group?
- ☐Turkey
- ☐Chicken
- ☐Potato
- ☐Ham

21. Which food does **NOT** belong in the dairy group?
- ☐Cheese
- ☐Cracker
- ☐Pudding
- ☐Yogurt

22. How many total cups of fruit and vegetables combined should you eat each day?
- ☐Less than 2 cups
- ☐At least 2 cups
- ☐At least 3 cups
- ☐At least 4 cups

23. How many cups should you have from the dairy group each day?
- ☐1 cup
- ☐3 cups
- ☐4 cups
- ☐5 cups

24. An example of a whole grain is:
- ☐Oatmeal
- ☐Tortilla Chips
- ☐Animal crackers
- ☐White bread

Directions: For the following questions, place an "x" in ALL boxes that represent ALL answers you think are correct.

25. Which of the following would be a healthy choice for a snack? Check ALL that apply.
- ☐Fruit and yogurt
- ☐Sports drink and cheese puffs
- ☐Whole grain crackers and cheese
- ☐Celery and peanut butter
- ☐Fruit juice and potato chips

26. Why is breakfast important? Check ALL that apply.
- ☐Helps you learn
- ☐Gives you energy
- ☐Makes you weaker
- ☐Helps keep you from getting sick
- ☐Helps you think and concentrate

Directions: For the following questions, place an "x" in the box that represents how sure or not sure you are that you can complete each action.

27. How sure are you that you can be physically active every day?
- ☐Very sure
- ☐Somewhat sure
- ☐Not sure at all

28. How sure are you that you can identify a healthy meal?
- ☐Very sure
- ☐Somewhat sure
- ☐Not sure at all

29. How sure are you that you can choose a healthy meal at home?
- ☐Very sure
- ☐Somewhat sure
- ☐Not sure at all

30. How sure are you that you can choose a healthy meal at school?
- ☐Very sure
- ☐Somewhat sure
- ☐Not sure at all

31. How sure are you that you can choose a meal with all five food groups?
- ☐Very sure
- ☐Somewhat sure
- ☐Not sure at all

32. How sure are you that you can choose a healthy meal when your friends do not?
- ☐Very sure
- ☐Somewhat sure
- ☐Not sure at all

33. How sure are you that you can ***plan*** a meal with at least three different food groups in it? (Remember, food groups include protein, vegetables, fruits, grains, and dairy)
- ☐Very sure
- ☐Somewhat sure
- ☐Not sure at all

34. How sure are you that you can choose a healthy snack?

- ☐Very sure
- ☐Somewhat sure
- ☐Not sure at all

35. How sure are you that you can choose to be physically active instead of playing a video game, watching TV, playing on the computer, or spending time on a mobile device?

- ☐Very sure
- ☐Somewhat sure
- ☐Not sure at all

36. How sure are you that you can eat breakfast every morning?

- ☐Very sure
- ☐Somewhat sure
- ☐Not sure at all

37. If you are not VERY SURE that you can eat breakfast every morning, why are you not very sure you can eat breakfast every morning? Check ALL that apply.

- ☐No time to eat breakfast
- ☐Trying to lose weight
- ☐I am not hungry at breakfast time
- ☐I do not like the food that is available to eat
- ☐Another reason
- ☐This question does not apply to me; I am VERY SURE that I can eat breakfast every morning

Directions: For the following questions, place an "x" in the box that best represents you.

38. Are you a male or a female?

- ☐Male
- ☐Female

39. How would you describe yourself?

- ☐American Indian or Alaska Native
- ☐Asian
- ☐Black or African American
- ☐Native Hawaiian or Other Pacific Islanders
- ☐White/Caucasian
- ☐Two or more races
- ☐Other, not listed
- ☐I don't know

40. Are you Hispanic or Latino?
- ☐Yes
- ☐No
- ☐I don’t know

We would like to thank you for completing our survey. What you think is very important to us and will help us improve nutrition lessons and activities for future students.

Thank you!

Appendix C-2

SEKP Survey

University of Nebraska-Lincoln Extension

School Enrichment Kit Program Survey

Directions: Put an "X" in the box that best describes what you do

1. I eat breakfast every day.
   - ☐Never
   - ☐Sometimes
   - ☐Always

2. I eat fruit every day.
   - ☐Never
   - ☐Sometimes
   - ☐Always

3. I eat vegetables every day.
   - ☐Never
   - ☐Sometimes
   - ☐Always

4. I drink milk or eat cheese or yogurt every day.
   - ☐Never
   - ☐Sometimes
   - ☐Always

5. I drink soda pop every day.
   - ☐Never
   - ☐Sometimes
   - ☐Always

6. I eat whole grain foods (like whole grain bread, whole grain pasta, brown rice, whole wheat tortillas, and popcorn) every day.
   - ☐Never
   - ☐Sometimes
   - ☐Always

7. I eat foods from all the food groups every day.
   - ☐Never
   - ☐Sometimes
   - ☐Always

8. I am physically active (I run, play sports, dance, ride a bike, or exercise) every day.
   - ☐Never
   - ☐Sometimes
   - ☐Always

9. I choose healthy snacks when I have the choice.
- ☐Never
- ☐Sometimes
- ☐Always

Directions: Place an "x" in the box for the ONE answer that you think is correct. Only choose ONE answer.

10. Which food has more fat?
- ☐Pretzels
- ☐Potato Chips

11. Being physically active means:
- ☐Getting really involved in video games
- ☐I have a lot of homework to do
- ☐Moving my body

12. Eating breakfast helps me learn better.
- ☐True
- ☐False

13. Which would be the best way to get the fruits we should have in a day?
- ☐Orange juice at breakfast, canned peaches at lunch, and a banana for a snack
- ☐Apple juice at breakfast, applesauce at lunch, and an apple for a snack
- ☐Orange juice at breakfast and an orange smoothie for a snack

14. Marty brings an apple, yogurt, carton of chocolate milk, and grilled chicken for lunch. How many different food groups are in this meal?
- ☐1
- ☐2
- ☐3
- ☐4

15. Marty brings an apple, yogurt, carton of chocolate milk, and grilled chicken for lunch. What food groups will Marty still need to eat today?
- ☐Grains and protein
- ☐Vegetables and protein
- ☐Grains and vegetables

16. Which snack is a **healthier** snack choice?
- ☐Pretzels
- ☐Fruit roll-up

17. Which snack is a **healthier** snack choice?
- ☐Potato chips and milk
- ☐Whole grain crackers and 100% fruit juice

18. Which food is better for your health?
    - ☐Whole wheat bread
    - ☐White bread

19. Dairy gives us calcium to help:
    - ☐Keep our skin and eyes healthy
    - ☐Build strong bones and teeth
    - ☐Build muscles

20. Fruits and vegetables give us vitamins to help:
    - ☐Keep our skin and eyes healthy
    - ☐Build strong bones and teeth
    - ☐Build muscles

Directions: Place an "x" in the box for how sure or not sure you are that you can complete each action.

21. How sure are you that you can be physically active every day?
    - ☐Very sure
    - ☐Somewhat sure
    - ☐Not sure at all

22. How sure are you that you can plan a healthy meal?
    - ☐Very sure
    - ☐Somewhat sure
    - ☐Not sure at all

23. How sure are you that you can choose a meal with all five food groups?
    - ☐Very sure
    - ☐Somewhat sure
    - ☐Not sure at all

24. How sure are you that you can choose a healthy meal when your friends do not?
    - ☐Very sure
    - ☐Somewhat sure
    - ☐Not sure at all

25. How sure are you that you can choose a healthy snack?
    - ☐Very sure
    - ☐Somewhat sure
    - ☐Not sure at all

26. How sure are you that you can choose to be physically active instead of playing a video game, watching TV, or playing on the computer?

- ☐Very sure
- ☐Somewhat sure
- ☐Not sure at all

27. How sure are you that you can eat breakfast every morning?

- ☐Very sure
- ☐Somewhat sure
- ☐Not sure at all

Directions: For the following questions, place an "x" in the box that best represents you.

28. Are you a male or a female?

- ☐Male
- ☐Female

We would like to thank you for completing our survey. What you think is very important to us and will help us improve nutrition lessons and activities for future students.

Thank you!

Appendix D-1

Semi-Structured Interview Protocol

Semi-Structure Interview Guide

Date:	
Time Beginning & End:	
Location:	
Participant Pseudonym:	

Introduction:

Thank you for taking the time to talk to me today. For my dissertation project, I am working with the Growing Health Kids program from UNL Extension that you use at your school. Today I am going to ask you some questions related to nutrition education so that I can better understand your individual perspective of your role as a nutrition educator. There are no right answers, and I appreciate any thoughts you have on the questions I am going to ask. I will be audio recording this conversation, as well as recording some handwritten notes. If at any point you would like to take a break or are uncomfortable with any question, just let me know. You can also withdraw from the study at any time. Do I have your permission to begin recording?

Questions:

About your experience in nutrition and nutrition education

1. How would you describe your current role in nutrition education?
    a. How does this compare to the role you think you should play?
2. Tell me how you feel about teaching students about nutrition as part of the school curriculum?
    a. Probes: How would you describe your…comfort, confidence, enjoyment, appropriateness (how would you describe the appropriateness of teaching in class vs another environment)?
3. How do you view the subject of nutrition compared to other subjects you teach, such as math, English, etc.?
4. How influential do you believe YOU, specifically, are in changing student's nutrition knowledge, confidence, and behavior? In what ways (teaching the material, modeling, etc)?

About your experience with GHK

5. Tell me about your experiences teaching Growing Healthy Kids curriculum.
6. What is different about Growing Healthy Kids compared to other nutrition curriculum or materials you may have used?
7. Tell me about what went well with the Growing Healthy Kids curriculum.
8. Tell me about what barriers you faced in completing the Growing Healthy Kids curriculum.
9. Tell me about the influences you think GHK has had on student's nutrition knowledge.
    a. Behavior?

b. Confidence?

10. What suggestions do you have to improve Growing Healthy Kids curriculum?

If time…tell me about anything you may do nutrition-related in your classroom outside of the GHK? What motivates you to do this extra bit?

Probes

- Tell me more about that…
- Can you give me an example?
- I want to understand what you mean, can you tell me again?
- Why do you think that is?

Conclusion: Thank you for taking the time to provide me with your perspectives and feedback.

Appendix D-2

Observation Matrix

Date: Location: Lesson:	Time: Pseudonym of Participant: Grade:
Descriptive Notes	Reflective Notes
Curriculum:	Reflection:
Behavior, Attitude, and Confidence in Teaching:	Reflection:
Promotion of Behavior:	Reflection:
Promotion of Self-Efficacy:	Reflection:
Tools to Improved Learning (Promotion of Knowledge):	Reflection:
Environment:	Reflection:

Appendix D-3

Document Analysis Prompt

Lesson Reflection

1. Please circle the lesson number for this lesson reflection:

1 2 3 4 5

2. Please write a reflection about how you felt about this specific set of lessons after you completed it. No length requirement. (Write whatever comes to mind. You are not limited to any topics.)