RELATIONSHIP OF A NUTRITION INTERVENTION CLASS FOR MIDDLE SCHOOL STUDENTS ON NUTRITION KNOWLEDGE AND ATTITUDES

by

Kathy Hood

Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

Doctor of Education

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ABSTRACT

Kathy Hood. RELATIONSHIP OF A NUTRITION INTERVENTION CLASS FOR MIDDLE SCHOOL STUDENTS ON NUTRITION KNOWLEDGE AND ATTITUDES. (under the direction of Dr. Tracey B. Pritchard) School of Education, Liberty University, July 27, 2012

A pre-test post-test nonequivalent group design was utilized to investigate the role nutrition education has on a student's choice to eat healthy foods. The Nutrition Essentials: Teaching Tools for Healthy Choices nutrition module was used to teach clinically based nutrition. The research used rural Georgia seventh and eighth grade students' to evaluate the effects of nutrition education on the students' nutrition knowledge and attitudes using the SPAN student questionnaire. MANOVA was used to determine if changes occurred between the control and experimental groups. Results of the study showed that the short term study did not improve student nutrition knowledge or attitudes.

DEDICATION

This dissertation is dedicated to

My father, Marvin Hood who has always encouraged me to pursue my dreams and then stands prayerfully behind me offering love and support as I work towards their attainment.

My sister, Linda Tamblyn, who offered encouragement, would stay up late to read my paper, and helped me take care of our mother while I worked to complete this dissertation.

In memory of my loving mother, Ouida Lindsey Hood; the Lord called her home before I could finish my degree. I selfishly wish she could be here to celebrate this occasion with us on earth, but she is much happier in heaven celebrating with our Lord and Savior.

ACKNOWLEDGEMENTS

I thank God for directing me to pursue this degree. We often do not know the path that He has chosen for us but His path is always the right one to take. A person should not pursue a higher degree for the prestige or financial gains but to learn how to serve others at a higher level, how to be a better witness for our Lord and Savior, and how to be the best person that we can be for the glory of God.

Many thanks to Dr. Tracey B. Pritchard, my committee chair, she patiently keep ensuring me that I would obtain my degree. I gratefully appreciate the encouragement and guidance she provided. She was always positive about the final outcome when I was discouraged. My path was full of rocky roads and steep cliffs and I believe that we both had many learning experiences through this dissertation process.

Dr. Janice Maddox, my colleague and friend held me accountable. She provided many words of encouragement and close attention to the details. Just as in her profession, nothing is good enough except the best and you never, ever call it quits. Many thanks for walking with me through this endeavor.

Dr. Martin E. Ringstaff continued to be part of my committee even after accepting a new superintendent position. I am grateful for his interest and feedback during a time of many personal transitions. His physical attendance at my defense was greatly appreciated.

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LIST OF ABBREVIATIONS

Adequate Yearly Progress (AYP)

Body Mass Index (BMI)

Centers for Disease Control and Prevention (CDC)

Compact Disk (CD)

Exercise Your Options (EYO)

Healthier US School Challenge (HUSSC)

Institutional Review Board (IRB)

National Food Service Management Institute (NSFMI)

National School Breakfast Program (SBP)

National School Lunch Program (NSLP)

Nutrition Essentials: Teaching Tools for Healthy Choices (Nutrition Essentials)

School Physical Activity and Nutrition Project (SPAN)

Social Cognitive Theory (SCT)

United States Department of Agriculture (USDA)

World Health Organization (WHO)

CHAPTER ONE: INTRODUCTION

This study was conducted to examine how providing clinically based nutrition education to students might result in changes to a student's knowledge and attitude of nutrition. Federal and state governments are attempting to mandate what children eat during the school day to reduce the dramatic increase in obesity (Fried & Simon, 2007). Educating students in how to select healthful foods gives them accurate nutrition knowledge thus enabling them the freedom to choose what foods they want to eat while maintaining a healthy diet (O'Dea & Wilson, 2006). The impact of food insecurity and nutritional status of students on the cognitive skills, behavior and attendance of students should be of interest to educators desiring to give children every opportunity for academic success (Alaimo, Olson, & Frongillo, 2001; Jyoti, Frongillo, & Jones, 2005).

Nutrition education in schools has been threaded into multiple areas of curriculum to meet the mandated hours of nutrition education without taking away from subjects that are tested for annual yearly progress. Thus, nutrition may be taught by teachers who have expertise in their subject area, but limited training in nutrition education. To be successful role models and nutrition educators for the students, teachers may need continuing education classes to improve their personal knowledge of nutrition (Kubik, Lytle, Hannan, Story, & Perry, 2002).

Background

The role of school nutrition has gained increasing public awareness in recent years due to the dramatic rise in student obesity, the use of A´ la carte sales as a potential

revenue source for the school, and the relationship of cognitive skills to the nutrition status of a student (Fried & Simon, 2007). Much of the research focuses on the increasing number of students who have poor eating habits which may be evidenced by skipping meals, a reduction in their cognitive abilities in class, as well as increased student absenteeism, and discipline referrals (Alaimo, Olson, & Frongillo, 2001).

Potential nutritional risk for students increases along with the incidence of obesity due to students globally eating unhealthy foods (Foster, et al., 2008; Hsieh, 2004). Society has become increasingly alarmed at the rate which the nation's children are becoming obese; this topic has come to the forefront of concerns of the nation's leaders, and medical groups. Melody Barns (2010) reported to President Obama in the White House task force report Solving the Problem of Childhood Obesity Within a Generation that:

> One out of every three children is now overweight or obese, a condition that places them at greater risk of developing diabetes, heart disease, and cancer over the course of their lives. This is not the future we want for our children, and it is a burden our health care system cannot bear. Nearly $150 billion per year is now being spent to treat obesity-related medical conditions (p. 1).

Recommendations of the task force report, along with much of current research focused on what and when children eat, but has not focused on utilizing nutrition education to teach students to make personal decisions to eat healthy meals at school and away from school.

Many of the changes that are currently being implemented as part of the school nutrition reauthorization act titled Healthy, Hunger-Free Kids Act of 2010 focus on

offering only healthy foods in the school setting and recommend indirect student education emphasis through staff education and expanded research (S. Res.3307, 2010). Educating students directly by implementing school based programs that present scientific based nutrition information, support healthy eating that may help prevent childhood obesity, improve academic performance, increase longevity, and reduce future healthcare costs (Florence, Asbridge, & Veugelers, 2008).

School nutrition meals have been designed to model positive nutrition habits by meeting calorie, protein, calcium, vitamin A and C, iron, and fat guidelines recommended by the current Dietary Guidelines for Americans. Participation rates of students for the school breakfast and lunch programs should be of interest to educators searching for methods to improve the learning process (Richard B. Russell School Lunch Act, 2009). Lunch meals offered through the School Nutrition program are healthier choices than A´ la cart selections, fast food, or some convenience foods prepared in a home setting (Richard B. Russell School Lunch Act, 2009). Students, especially girls, often skip breakfast believing that skipping the breakfast meal will help them lose weight. Other students skip school breakfast due to peer pressure that associates eating breakfast in the cafeteria with being poor (Reddan, Wahlstrom, & Reicks, 2002).

Nutrition education may help increase student nutrition knowledge and develop accurate nutrition attitudes thus promoting change in the behavior of students to reduce the consumption of low-nutrient high-calorie foods students bring from home or that is purchased from available A' la carte items (Briefel, Crepinsek, Cabili, Wilson, & Gleason, 2009; O'Toole, Anderson, Miller, & Guthrie, 2007). The nutrition knowledge and attitudes of the students may impact their personal decision to eat healthy foods.

Prior to eating healthy foods students must believe that they have the knowledge to select a healthy diet. Students who eat nutritious school meals are exhibiting the choice to eat healthy food (O'Dea & Wilson, 2006).

Educators have been aware that students need to eat healthy food and that hungry students often do not perform well in class (Alaimo et al., 2001; Fried & Simon, 2007; Mahoney, Kanarek, & Samuel, 2005; Murphy et al., 1998). However, time allotments for subjects such as physical education and nutrition have suffered since the passing of the No Child Left Behind Act put social and professional pressure on educators if a school does not meet adequate yearly progress (AYP) requirements (Powell, Higgins, Aram, & Freed, 2009). School administrators and teachers do not want their school to be listed as a low achieving school (Powell, et al., 2009). Subjects such as social studies, physical education, and nutrition that have less impact on high stakes testing may receive a reduced emphasis within the school day to allow additional classroom hours for subjects that will be tested to meet AYP (Jacob, 2005). Recess has been reduced significantly in K-6 grades and science reduced seven minutes per day in some schools to allow additional classroom time for tested subjects (Powell et al., 2009).

Peer pressure and inaccurate nutrition knowledge may be leading students to make poor food choices and to skip meals (Murphy, 2007). In attempts to maintain student participation and increase revenues in school nutrition programs, some schools allow healthy and less healthy food choices to be available during lunch periods (Condon, Crepinsek, & Fox, 2009). Vendors such as Pizza Hut, Taco Bell, and Subway are allowed to be located in school lunchrooms thus competing with the more nutritionally adequate School Lunch program meals (Astbury, et al., 2008). Conflicts between the

nutrition information presented to students in the classroom and competitive foods that are sold in the school may result in confusion as to what nutrition information is valid (O'Toole, et al., 2007). Students often choose the less healthy choices because of this confusion (Condon, et al., 2009). Building a strong nutritional self-efficacy through the use of scientifically based nutritional education is vital to students having the ability to make good nutrition choices (O'Dea & Wilson, 2006).

Investigating the use of current clinically based nutrition education to change the food choice decisions of students may result in students selecting to eat meals that are of higher nutritional value. Students that start eating healthier foods at an early age are likely to make eating healthy a lifestyle change for the future (Story, Kaphingst, & French, 2006).

The long-term impact of students adopting healthy eating habits may be fewer health issues such as hypertension, obesity, and diabetes. According to the 2010 Dietary Guidelines for Americans, eating whole grain products, fresh fruits and vegetables, drinking low fat milk, and increasing fiber in the diet are some of the major changes that should be made in the American diet (U.S. Department of Health and Human Services, 2010). These foods are part of the school breakfast and lunch programs but they are often not eaten by students who choose less healthy foods from home or to skip the meal and purchase fast food at the end of the school day.

Obesity is increasing worldwide as countries experience advertising that promotes quick and easy energy dense fast food that meets the needs of a society, and where women are expanding into the workforce (Fu, Cheng, Tu, & Pan, 2007). Countries around the world are undergoing a nutritional transition as they have more food available,

including high-saturated fat snacks and sweetened carbonated beverages (Shah, et al., 2010). Media exposure has influenced the attitudes and preferences of society regarding the foods they select (Fu, et al., 2007). Traditional food preparation is being replaced with fast food or grabbing a quick snack and commercial advertising promotes eating foods that are low in micronutrients and minerals (Shah, et al., 2010).

Numerous nutritional interventions have been developed based on various theoretical models (Astbury, et al., 2008; Sharma, 2006). Most nutrition interventions address lifestyle changes in both nutrition and physical activity, there are others that focus on specific areas of behavior modification (Sharma, 2006). There is a general concensus that providing nutrition education in the classroom is the most efficient location for nutritional intervention to occur (Astbury, et al, 2008; Sharma, 2006). One of the most significant problems with the implementation of any nutrition intervention is the lack of nutrition training for the teacher (Astbury, et al., 2008; Kubik, et al., 2002).

Problem Statement

Obesity and the unhealthy eating habits of students are recognized as national issues. Attempts to help students improve their nutritional status are focusing on eliminating unhealthy food choices in schools and providing direct and indirect nutrition education (Fried & Simon, 2007; S. Res.3307, 2010). Schools have the opportunity to participate in the national effort to reduce obesity by improving student nutrition knowledge and nutrition attitudes by directly teaching students clinically based nutrition education.

Purpose Statement

The purpose of this pre-test post-test nonequivalent group study was to test the social cognitive theory that compare nutrition knowledge and nutrition attitudes of 7th and 8th grade male and female students who received government designed scientific nutrition information using the Nutrition Essentials: Teaching Tools for Healthy Choices nutrition module compared to the current classroom textbook education. Nutrition Essentials was designed to be an easy-to-use format that provides learning skills that enable the student to gain nutrition knowledge based on scientific nutrition information which support the development of healthy lifelong habits. Control students received nutrition education using the current classroom textbooks for health classes that were out of date and not scheduled for replacement due to budget restrictions.

Significance of the Study

This study addressed if providing scientifically based nutritional knowledge using the Nutrition Essentials: Teaching Tools for Healthy Choices (Nutrition Essentials) education module in the school scheduled health class resulted in the deliberate and purposeful ability of students to correctly respond to nutrition questions evaluating nutrition knowledge and attitudes (United States Department of Agriculture Food and Nutrition Service, 2007). Students who develop healthy lifestyles at an early age generally benefit from improved health later in life thus enabling them to be a greater contribution to society (Florence, et al., 2008). The nutritional quality of what a student eats may impact the academic success of the student (Alaimo, et al., 2001). When educators consider methods to improve student achievement, they often do not consider the relationship of healthful eating to achieving a successful education program.

Research Questions

1. Is there a significant difference between the pre-treatment and post-treatment mean scores of nutrition knowledge by seventh and eighth grade students who participate in the Nutrition Essentials: Teaching Tools for Healthy Choices education module as compared to a control group?
2. Is there a significant difference between the pre-treatment and post-treatment mean scores of nutrition attitudes by seventh and eighth grade students who participate in the Nutrition Essentials: Teaching Tools for Healthy Choices education module as compared to a control group?

Statement of Hypotheses

Hypothesis 1

H_01_1 There is no significant difference between the pre-treatment and post-treatment mean scores of nutrition knowledge by seventh and eighth grade students who participate in the Nutrition Essentials: Teaching Tools for Healthy Choices education module as compared to a control group.

Hypothesis 2

H_02_1 There is no significant difference between the pre-treatment and post-treatment mean scores of nutrition attitudes by seventh and eighth grade students who participate in the Nutrition Essentials: Teaching Tools for Healthy Choices education module as compared to a control group.

Definitions

Body Mass Index (BMI)-A tool used to determine an individual's body weight status. BMI is a weight-for height index that uses the function of weight and height to

determine a value of weight adjusted for height. BMI is a measure of weight in kilograms (kg) relative to height in meters (m) squared. Quetelet index is another name for BMI (Kuczmarski & Flegal, 2000; U.S. Department of Health and Human Services, 2010)

Child Nutrition Programs-The child nutrition programs were initially begun after World War II as a national security measure to ensure that the country had healthy men to protect the nation, and to provide an outlet for agricultural products grown by American farmers. The program has expanded to include the school breakfast and afterschool snack program (Martin & Oakley, 2008; Richard B. Russell School Lunch Act, 2009).

Food Insufficiency or food insecurity-Food Insufficiency or food insecurity is when a household is not sure that food will be available and may resort to securing food in an illegal or inappropriate means, such as searching garbage cans, in order to obtain food (Anderson, 1990).

Free and Reduced Meal Application-The free and reduced meal application is a federal form that parents or guardians submit to the local school nutrition authority on an annual basis. The application is processed and the free or reduced meal benefits of the students in a household are determined based on the household income (U.S. Department of Agriculture Child Nutrition Programs Food and Nutrition Service, 2011).

Hidden Hunger- Defined by the Food and Agriculture Organization (FAO) of the United Nations as micronutrient malnutrition (Food and Agriculture Organzation of the United Nations, 2011).

Hippocampus-Hippocampus is the part of the brain that is responsible for long-term memory and spatial memory (Pravosudov, 2005).

National School Lunch Program (NSLP)-Program authorized by the Richard B. Russell Act and directed by the Department of Agriculture to provide student lunches that meet one-third of the daily required nutrients (Richard B. Russell School Lunch Act, 2009).

School Meals Initiative-Audit conducted in all school nutrition programs to ensure that the meals meet the nutrition goals outlined by the USDA (Richard B. Russell School Lunch Act, 2009).

School Nutrition Breakfast-School Nutrition Breakfast provides one-fourth of the daily requirements of calories, protein, iron, vitamin A and C (Richard B. Russell School Lunch Act, 2009).

Team Nutrition- Developed as an initiative of the United States Department of Agriculture Food and Nutrition Service, Team Nutrition, provides training and technical assistance for nutrition education for children and their caregivers, foodservice, and school and community support for healthy eating and physical activity (Richard B. Russell School Lunch Act, 2009).

Undernutrition-Undernutrition is the lack of available nutrients in relation to body tissue needs. Inadequate growth in children is one of the signs of undernutrition (Anderson, 1990).

CHAPTER TWO: LITERATURE REVIEW

School systems strive to provide students the most conducive learning environment possible. Any barrier to learning must be identified and removed if possible. A review of the literature was conducted on how nutrition education intervention may by improving student nutrition knowledge and attitudes impact current and future student health and possible academic achievement by improving student nutrition knowledge and attitudes.

Introduction

Teaching children about food and the impact that food has on the body has current and long-range importance (Barton, Koch, Contento, & Hagiwara, 2005). Nutritional concerns for students impacting education at the present time include how nutrition relates to cognitive abilities, hidden hunger, and the dramatic rise in obesity (Alaimo et al., 2001; Briefel et al., 2002). Currently overlooked by some educators is the importance of nutrition on the academic success of all students (Florence et al., 2008; Jyoti et al., 2005). Fu et al. (2007), in their research of Taiwanese elementary school children, stated that the current reduction in academic success may be a result of the unhealthful eating patterns of the children. Providing nutrition education can teach students the reasons their body requires quality, nutrient dense food to provide the energy that they need to think clearly in school (Fu et al., 2007).

A large gap tends to exist between the nutrition knowledge of a student and their eating behavior (Shah et al., 2010; Zapata, Bryant, McDermott, & Hefelfinger, 2008). Eating habits of students are usually set by adolescence. Older children are often less

receptive to nutrition information (Shah et al., 2010). In a study conducted to assess the nutrition knowledge and behaviors of students, they were unable to state the recommended number of fruits and vegetables (Zapata et al., 2008). The consumption of fruits and vegetables is often used to evaluate the adequacy of a child's diet since fruits and vegetables are nutrient dense foods containing rich sources of phytochemicals. When students consume larger amounts of fruits and vegetables they have diets lower in calories and fat (Florence et al., 2008). The increase in fruits and vegetables results in a diet higher in nutrients; thus, the students' diet provides more than 50% of the recommended daily allowances of selected nutrients. Diets that fail to provide 50% of the recommended daily allowances of selected nutrients are classified as being of low nutrient intake (Kleinman, et al., 2002).

Students who choose to eat healthier meals may increase their academic success due to improved cognitive abilities resulting from their improved nutritional status. Eating breakfast has been shown to improve attention in class and the ability to think clearly during academic testing (Gewa et al., 2009; Murphy, 2007). Florence et al. (2008) found that students that ate fruits and vegetables while consuming diets lower in calories and fat were more likely to pass literacy assessments thus increasing their potential for being successful later in life (Florence et al., 2008; Fu et al., 2007). Students' who eat healthier diets also are less susceptible to illness; therefore, resulting in improved school attendance (Murphy, et al., 1998).

Hidden hunger is defined by the Food and Agriculture Organization (FAO) of the United Nations as micronutrient malnutrition (Food and Agriculture Organzation of the United Nations, 2011). FAO (2011) estimates that two billion people worldwide do not

receive sufficient vitamin A, iodine and micronutrients. Flour is fortified with folic acid, iron, and other vitamins and minerals for a large part of the world's population (National Center for Chronic Disease Prevention and Health Promotion, 2010). Unfortunately, fortified flours do not contain the micronutrients and phytochemicals that are associated with the reduced risk of developing chronic diseases which are available in whole grain flours (Liu, 2007). Teaching students' the value of eating a healthful diet may improve the health of the children while in school and in the future (Liu, 2007).

Research has shown that obesity and poor nutrition may correlate to poor academic performance (Fried & Simon, 2007). Studies have found that overweight children tend to be among the low achievers in school and later in adulthood (Burniat, Cole, Lissau, & Poskitt, 2002; Lobstein, Baur, Uauy, & IASO, 2004). Psychological and social issues can result in children who are overweight or obese (Lobstein et al., 2004; Richardson, Hastorf, Goodman, & Dornbusch, 1961). Children who are overweight or obese often experience more discrimination than non-overweight children or children with other handicaps (DeVault, Kennedy, Hermann, & Mwavita, 2009; Lobstein, et al., 2004; Richardson et al., 1961).

The epidemic of obesity could be reduced if student's would eat according to the dietary guidelines (Zapata et al., 2008). Nutrition education based on the dietary guidelines could be implemented if eating behaviors associated with consuming low-nutrient foods could be determined (Briefel et al., 2009b). Children, especially urban children, do not see food as coming from nature to meet their nutritional needs. More often, children's food choices are based on taste and appearance. They are rarely able to understand that as food processing increases the alteration of a food's nutritional quality

also increases (Barton et al., 2005). O'dea and Wilson (2006) reported that there is no association between a student's nutrition knowledge and their risk of becoming overweight, but that they do benefit from developing their awareness of the many factors that influence eating habits.

Since the 1900s it was believed that having a good breakfast would improve a student's ability to learn (Spargo, 1906). Spargo (1906) was concerned that children were at risk nutritionally due to not having sufficient food to eat. Currently, educators are facing the opposite concern due to the dramatic increase in the obesity rates of children (Lobstein et al., 2004).

Theoretical Framework

The social cognitive theory (SCT) is an appropriate theoretical framework for investigations involving edible intake (Bere & Klepp, 2005). The Health Belief Model, social learning theory developed by Albert Bandura was later relabeled by Bandura as the SCT (Rosenstock, Strecher, & Becker, 1988). Bandura theorized that there is a difference in outcome expectancy and an efficacy expectation (Bandura, 1977). Individuals who have outcome expectancy may believe that a specific action will result in a certain outcome but they may doubt that they have the ability to perform the required activities (Bandura, 1977). Efficacy expectation in individuals is the conviction that a person can successfully perform the behavior that is required to obtain a desired outcome (Bandura, 1977).

Relevant cognition or relevant affect are the two components that comprise attitude in an individual (van den Berg, Manstead, van der Pligt, & Wigboldus, 2006). Beliefs of an individual are exhibited in relevant cognition and are based on their

thoughts about an object or subject (van den Berg, Manstead, et al., 2006). The relevant affect component of an attitude is based on the individuals feelings about on object or subject (van den Berg, Manstead, et al., 2006).

Bandura stated that the SCT is at the core of how individuals translate knowledge into effective health practices (Bandura, 2004). Unless individuals have the knowledge and believe that they can make changes they will have little incentive to attempt to achieve changes (Bandura, 2004; O'Dea & Wilson, 2006). The belief of an individual to change is recognized as the attitude they have regarding a subject (van den Berg, et al., 2006). Knowledge of health risks and benefits is a precondition for change in an individuals habits to occur. If individuals do not have the knowledge of how lifestyle habits impact their health they have little reason to invest in the effort to make positive health changes that result in denying themselves the habits that they enjoy (Bandura, 2004; O'Dea & Wilson, 2006). Beliefs about the consequences of a behavior determine the attitude of an individual toward that behavior (Sutton, et al., 2003).

Children's cognitive, academic and psychosocial development is complex and is effected by numerous ecological factors. Past nutrition, health, social risk, and family food insecurity can result in poor cognitive and academic outcomes (Alaimo et al., 2001). Recognizing that students must be nutritionally healthy to learn is foundational to the education process. Addressing the dynamic interactions within the student's personal environment, and behavioral factors that influence eating must be taken into consideration when teaching the student how to eat healthy (Reddan et al., 2002). If children are expected to eat healthier then they must first learn accurate nutrition knowledge and how to monitor their health behavior (Bandura, 2004).

Pravosudov (2005) conducted a study on the effect of nutritional deprivation during the post-hatching phase on the hippocampus of scrub jays. What he concluded was that the nutritionally deprived hippocampus spatial memory function was never able to overcome the initial nutritional deprivation. Spatial memory holds information regarding an individual's environment such as where one has been and how to return to locations that one has been to in the past.

The research by Pravosudov (2005) is supported by a study that examined the relationship of nutrition to the cognitive abilities of Kenyan children. The cultural lifestyle of the children resulted in the utilization of more calories than the children had available to consume. Diet quality was negatively impacted by a lack of fat in the diet to boost the calorie level and a lack of animal protein. Classroom observations of the student's revealed a reduced attention span and a lower cognitive skill level (Sigman, Neumann, Jansen, & Bwibo, 1989).

Research conducted by Yu et al. (2010) suggests that diets high in lard changes the fatty acids in the brain and damages the memory and learning ability of mice. Spatial memory is usually included in studies of nutrition and cognitive skills. Many studies do not list the term spatial memory but they do address the effects of memory on the cognitive skill which involves the use of spatial memory. Fasting, such as skipping breakfast or an extended period of time between meals, could impact cognitive levels due to the ratio of brain weight to the liver size in conjunction to the child's metabolic rate in middle school age children. These children may not physically have the muscle mass to provide the glucogenic amino acids necessary for hepatic gluconeogenesis that would provide additional energy in an adult (Pollitt, Leibel, & Greenfield, 1981).

Life expectancy of obese children was investigated in a longitudinal study that followed 4,857 American Indian children for 23.9 years (Franks et al., 2010). The results indicated that there was an increased rate of premature death from endogenous causes for individuals who were obese, had diabetes or glucose intolerance, or hypertension in childhood (Franks et al., 2010; Lobstein et al., 2004).

Adolescence has been identified as the most significant time in a child's life to consume calcium at a level sufficient to reduce the risk of osteoporosis and bone fractures later in life (Zapata et al., 2008). Nutritional interventions in the school setting may alter the entire student body toward healthier eating habits, thus improving the impact of the interventions in later grades and adult life (Hoelscher, Evans, Parcel, & Kelder, 2002; Kelder, Perry, Klepp, & Lytle, 1994; Luepker et al., 1996). Nutrition education that utilizes multiple channels of communication, and that is based on theories of behavior is reported to be most successful (Levine et al., 2002). Zapata et al. (2008) reported that students learn nutrition from a variety of influences; 62.2% from their parents, 56.7% from schools, 42.7% from television and 13.7% from other sources (Zapata et al., 2008).

Hidden Hunger

Household food managers, often mothers, will substitute quality of food for quantity of food to prevent their children from feeling hungry. The less expensive food lacks the nutrients that the child requires and may result in nutrient and micronutrient deficiencies (Cook & Frank, 2008). In 2007, 15.8% of American households were determined food insecure based on the US Department of Agriculture monitoring (as cited in Nord, 2009). Households with one or more children determined as food insecure represented 8.3% of American households and 0.8% of households were classified as

being in severe food-insecure conditions (Nord, 2009). In the severe food-insecure households, group meals were irregular and food intake was considered inadequate (Nord, 2009). The current trend of society to not eat whole grain products makes children susceptible to the risk of developing chronic diseases such as cardiovascular disease, type 2 diabetes, and some cancers due to a lack of phytochemicals (Liu, 2007).

Food insufficiency or insecurity occurs in the United States. However, it is much more prevalent in other countries. Food insecurity has been defined as "the inability to acquire or consume an adequate quality or sufficient quantity of food in socially acceptable ways, or the uncertainty that one will be able to do so" (Hamilton, et al., 1997, p. iii). When students have food insufficiency or are malnourished they demonstrate lower cognitive skills (Gewa, et al., 2009; Jyoti et al., 2005; Sigman et al., 1989). One reason that the children who fail to eat breakfast in the United States may not demonstrate a significant decrease in cognitive effect is that they are not as malnourished or exposed to food insufficiency as students in other countries (Taras, 2005). Teenagers who experience food insufficiency are twice as likely to have been suspended from school, and to have difficulty getting along with fellow students (Alaimo et al., 2001).

Transient hunger occurs when an individual skips a meal due to not having food or the financial means to secure food. These individuals are not at risk for starvation; but, they may experience malnutrition (McIntyre, Walsh, & Connor, 2001). The Food Research and Action center indicate that in school age children, transient hunger which exhibits symptoms such as difficulty concentrating, fatigue, irritability, dizziness, frequent colds, and infections is more prevalent in the United States (as cited in McIntyre et al., 2001).

When cognitive skills were evaluated based on four categories of nutrition related insufficiency: limited food availability, iron deficiency, zinc deficiency, and micronutrient supplementation; there was a correlation between cognitive skills and deficiencies (Halterman, Kaczorowski, Aligne, Auinger, & Szilagyi, 2001; Schoenthaler, Bier, Young, Nichols, & Jansenns, 2000). Iodine deficiencies were found to have significant effects on the cognitive skill along with zinc and iron (Zimmermann, Connolly, Bozo, Rohner, & Grimci, 2006). Students with iron deficiency were found to score below average on math tests twice as often as non-anemic students (Halterman et al., 2001). Providing vitamin and mineral supplements to students from six to twelve years old resulted in IQ gains of 15 or more points and a 2.5 point net gain in nonverbal intelligence (Schoenthaler et al., 2000). Zimmermann et al. (2006) reported that even moderate iodine deficiency can impact cognitive skills and motor function in children. Under-nutrition which occurs due to food insufficiency or the inability of the body to absorb nutrients is much more difficult to identify than severe malnutrition (Sigman et al., 1989). Food alone does not eliminate developmental problems, but is a contributing risk factor (Alaimo et al., 2001).

Kenyan children with mild under-nutrition were extensively studied to determine the effect of their nutritional state on cognitive skills. These children exhibited anthropometric values indicating that their nutrition had been deficient for some time. The children ages 7 to 8 were small for their age and underweight. Results of the study indicated that food intake was associated with cognitive abilities (Sigman et al., 1989). Similar results were reported in a study of micronutrient status of Indian school children

which found that long-term under-nutrition resulted in lower cognitive performance (Eilander, et al., 2010).

The socioeconomic status of a family impacts the level of food security and may result in increased depression levels of mothers (Lupien, King, Meaney, & McEwen, 2000). Stress has been linked to increased levels of the cortisol hormone which can result in cognitive deficit, increased depression levels and mental health illnesses (Lupien, McEwen, Gunnar, & Heim, 2009). A study of cortisol levels of children in lower socioeconomic families found that cortisol levels of the children were elevated as early as six years old (Lupien, et al., 2000).

Obesity

Globally countries are experiencing a rise in obesity rates. Although, the increases are at different speeds and in different patterns leading to concern being expressed by society for the current and future health of students (Lobstein et al., 2004). Economically developed countries have a higher prevalence of overweight children, but even the poorer countries are experiencing a rise in obesity (Lobstein et al., 2004). Overweight and obesity are usually based on the anthropometry, waist circumference, and body mass index (BMI) of the individual. Predicting health risk and comparing between populations are the primary purposes for defining overweight and obesity (Lobstein et al., 2004).

The BMI is widely used to determine the thresholds for overweight and obesity. Depending on the BMI cutoff values used to determine overweight and obesity can dramatically affect the percent of overweight and obese individuals identified. According to Kuczmarski and Flegal, (2000) if the BMI for overweight is determined to be $\geq$27.8 for

men and ≥27.3 for women then the percentage of overweight adults over the age of 20 is 33.3% for men and 36.4% for women. If the BMI for overweight is determined to be ≥25.0 then the percentage of overweight adults over the age of 20 rises to 59.4% for men and 50.7% for women (Kuczmarski & Flegal, 2000). Currently, the 2010 Dietary Guidelines for Americans states that individuals with a BMI for 25.0 to 29.9 kh/m are considered overweight and BMI levels above 30.0 kg/m are considered obese (as cited in U.S. Department of Health and Human Services, 2010).

A 13-year longitudinal study conducted by Nader, et al., (2006) found that the number of times a child entered the 85th BMI percentile the more likely that the child would be overweight by age twelve. If a child enters the 75th BMI percentile at any time before the age of 12 the child would probably become obese. Even if a child exceeds the 50th BMI percentile there is an increased risk that by age 12 the child will be obese. From 1976 to 2008 obesity levels increased in adolescents aged 12 to 19 from 14.0% to 18.1% (Ogden et al., 2006). In the same time period, it was reported that obesity levels increased to 19.6% of children aged six to eleven, and 10.4% of preschool children age two to five (Ogden et al., 2006). The research of Ogden et al. (2006) found that the prevalence of children being overweight had tripled from 1980 to 2002. Children tend to be more likely to develop overweight or obesity during the adolescent years (Dietz, 1994; Lobstein et al., 2004). Approximately 30% of obese women were obese adolescents, but only 10% of obese adult males were obese as adolescents (Dietz, 1994).

The Health Behavior in School-Aged Children Study evaluated the rate of overweight and obesity in children of 34 counties. The results of the research indicated that 77% of the countries examined had at least 10% of the youth being classified as

overweight and in 20% of the countries at least three percent of the youth were obese (Janssen et al., 2005). When comparing overweight and obesity rates among different countries and populations, factors such as sexual maturation, secular trends in growth, and development, and measurement errors must be taken into consideration (Lobstein et al., 2004).

Health Issues Caused by Obesity

Concern has been expressed by the medical profession and by government leaders that the rate of obesity of children will result in an increase in future healthcare cost and a decreased life expectancy (Lobstein et al., 2004). Health issues such as hypertension, dyslipidemia, hyperinsulimemia, osteoarthritis, and asthma are seen more frequently in overweight students (DeVault et al., 2009). One strong predictor of adult renal failure is the occurrence of Type-Two diabetes in children (Franks et al., 2010).

Children in the highest quartile of BMI were twice as likely to die from endogenous causes as children in the lowest BMI quartile (Franks, et al., 2010). Overweight and obese children have an increased risk of developing non-alcoholic fatty liver disease (NAFLD) which can lead to fibrosis, cirrhosis and end-stage liver disease (Lobstein, et al., 2004; Neuschwander-Tetri & Caldwell, 2003).

Nutrition Interventions

Healthy People 2020 has established goals that include reducing the risk of chronic disease for individuals and to achieve and maintain healthy body weights (as cited in US Department of Health and Human Services, 2010). The target for improvement suggested in the report is a 10% reduction in the obesity rate of children by the year 2020 (as cited in US Department of Health and Human Services, 2010). Many

of the current interventions have resulted in small beneficial changes on specific behaviors, but not a significant effect on BMI levels of children. Strategies to promote healthy behaviors seem to be less effective than those attempting to reduce unhealthy behaviors (Kamath et al., 2008). Successful interventions tend to occur more when focused on children prior to grade six (Kelder et al., 1994; Kreisel, 2003).

Schools experience difficulty in determining the percent of students that are overweight or obese on their campus. One method used to obtain the obesity rate of a school is to determine each child's height and weight anonyomously while incorporating teaching students numeracy and data handling. Researchers investigating the obesity rate of seven primary schools in Birmingham, United Kingdom determined that 20% of their students were overweight and seven percent were obese (Routh, Rao, & Denley, 2005).

Nutrition education to aid students in identifying hunger could be a means of reducing obesity. Research has identified that obese children have a tendency to eat faster than non-obese children. The speed at which obese children eat leads to them to be unable to identify the food satiety cues that are present in non-obese children (Webber, Hill, Saxton, Van Jaarsveld, & Wardle, 2009).

Teachers must often obtain and develop their own nutrition curriculum materials which may not address issues such as recognizing food satiety cues. Research has reported that teachers use Team Nutrition curriculums 19% of the time, Dairy Council materials 27%, American Cancer Society materials 40%, and American Heart Association materials 62% of the time (Murimi, Sample, Guthrie, & Landry, 2007).

Nutrition intervention collaboration within the school ethos produces more effective results in lowering BMI of students (Foster et al., 2008). Collaboration between

multiple disciplines can be obtained through the use of school gardens (Ratcliffe, Merrigan, Rogers, & Goldberg, 2011). Health educators can partner with math and science as they promote learning through the garden experience (Ratcliffe et al., 2011). In a two-year longitudinal study of schools that implemented multidisciplinary and community stakeholder nutrition intervention there was a 50% reduction in overweight and obesity (Foster et al., 2008). The study provided 50 hours of food and nutrition education per student. Control schools that were part of the research, but received no nutrition intervention experienced a 15% increase in children who were overweight during the two-year period (Foster et al., 2008).

Numerous nutrition intervention programs are currently available for use by schools. DeVault et al. (2009) reported that providing nutritional intervention to students positively changed the attitudes about food choice intentions related to selecting more healthful choices. Significant improvement in pre to post-test was seen after ten hours of nutritional intervention in a study of middle school children (Fahlman, Dake, McCaughtry, & Martin, 2008). However, other studies found that the correlation between knowledge and behavioral changes that occurred after ten to fifteen hours of intervention was weak (Powers, Struempler, Guarino, & Parmer, 2005). Nutrition intervention that provides 50 hours of instruction that includes a focus on behavioral change resulted in a significant reduction of obesity rates of children in the intervention schools (Foster, et al., 2008; Hoelscher et al., 2002).

The Coordinated Approach to Child Health (CATCH) program is geared to grades three through six and utilizes a behavioral-epidemiological and health belief theoretical model (University of California, no date). Cookshop Program was developed

for elementary school children using a social cognitive theory model (Liquori, Koch, Contento, & Castle, 1998). Another nutrition intervention program for elementary school children is the Nutrition in the Garden program based on socio-ecological and experimental learning theories (Astbury et al., 2008). Middle school students are the focus of the Planet Health nutrition intervention model based on behavioral choice and social cognitive theories (Astbury et al., 2008). The program, Teens Eating for Energy and Nutrition at School (TEENS), was developed for middle and high school students based on the social cognitive theory (Astbury et al., 2008). Interactive classroom lessons reinforced by activities are used by Team Nutrition interventions to focus on changing eating behaviors (Levine et al., 2002).

Research is also being conducted to determine if nutrition intervention programs that utilize computer technology for student instruction will be more successful than tradtional classroom instruction (Hensleigh, Eddy, Wang, Dennison, & Changey, 2004). Although, Hensleigh et al. (2004) found that student nutrition knowledge increased with the use of techology, research by Kreisel (2003) found no significant difference between tradtional classroom nutrition intervention and intervention using technology. One reason that technology nutrition intervention may be more successful than traditional classroom settings is due to the increased activity level of student activity during the classroom intervention process thus increasing their motivation to learn (Brug, Steenhuis, van Assema, Glanz, & De Vries, 1999; Hensleigh et al., 2004).

The nutrition messages that are sent to students through the school system have positive or negative impacts on the success of nutrition interventions (Hoelscher, et al., 2002). Vending and A' la cart sales of high fat foods with poor nutritional quality can

counteract the positive nutrition intervention messages and result in students eating higher fat and high-calorie snacks (Briefel, Crepinsek, Cabili, Wilson, & Gleason, 2009a; Fried & Simon, 2007; Hoelscher, et al., 2002; Newmark-Sztainer, French, Hannan, Story, & Fulkerson, 2005). Students also learn from the role modeling of their teachers. Kubik et al. (2002) found that middle school teachers often used unhealthy foods as rewards in the classroom. The teachers would eat snack food purchased from the vending machines and drink sodas, thus modeling unhealthy eating (Kubik et al., 2002). A study conducted by Wang et al. (2006) found that serving healthy foods in the school cafeteria had the most significant impact on what students ate in school.

Modifying the school environment and developing a whole school approach to obesity prevention is helpful when nutrition and physical education are part of the curriculum (Sutherland, Gill, & Binns, 2004). According to Wang et al. (2006) the goal of the school should be to change the knowledge, attitudes, and beliefs of students and school staff regarding healthy lifestyles, thus changing the students' social environment in school and fostering social support of healthy eating. Parents, teachers, and health care providers indicated support for restricting foods in schools; however, the study indicated that parents should be the main source for determining what students should be allowed to eat (Sutherland et al., 2004). Brief health related messages announced over the intercom two or more times a week can have a dramatic impact on the nutritional choices of students (Wang et al., 2006). Healthy People 2020 recommends that schools be required to offer fruits or vegetables, or other nutritious foods whenever foods are offered outside of school meals (US Department of Health and Human Services, 2010).

Culture

Ethnic, socioeconomic and cultural influences have a significant impact on the nutritional choices of students (Lobstein et al., 2004). In developing countries children from the higher socioeconomic levels tend to be the obese children of the country because they have the financial ability to purchase food. Industrialized countries that have abundant food will have more overweight children in the lower socioeconomic levels because their families purchase the less expensive foods that are often high in calories and fat. Higher socioeconomic levels of industrialized countries have the financial ability to purchase the healthier and often the more expensive foods (Lobstein et al., 2004).

African American and white girls both increase their consumption of fast food as they increase in age as adolescents; however, African American girls consume a greater quantity of fast food than their white counterparts (Schmidt et al., 2005). An inverse relationship was found between socieoeconomic level, race, and obesity. Obesity levels decreased with an increase in socioeconomic status of white females, but obesity increased with the same increase in socioeconomic status in African-American females (Gordon-Larsen, Adair, & Popkin, 2003).

Globally there is a trend in how culture impacts the obesity levels of society. Students with low socioeconomic status are more likely to have a high BMI (O'Dea & Wilson, 2006). Factors reported that contribute to the high BMI in low socioeconomic students have been the relationship of the poor nutritional quality of the breakfast, increased dietary self-efficacy contributing to a risk of overweight, and consumption of a greater variety of foods (O'Dea & Wilson, 2006).

Mahoney et al. (2005) determined that a high fiber breakfast meal of oatmeal improved the cognitive memory of students. They determined that the high fiber of the oatmeal maintained a more even glucose level. Although, the cognitive skills are not equally affected by glucose levels it does seem that glucose levels have more importance when the mental tasks are demanding as opposed to easy tasks (Bellisle, 2004).

Results of one study to determine the effect of glucose levels on mental arithmetic tasks found that students who ate breakfast had an advantage over students who did not eat breakfast (Dykman & Rivik, 2002). In this study students had their blood glucose levels checked after overnight fasting. Before eating breakfast the students were tested on addition or subtraction of one to two digit integers. One group of the students was provided a breakfast meal comparable to a School Breakfast Program meal. Blood glucose levels were checked again and both groups were presented additional arithmetic problems. Although, both groups had similar response times in the fasting state, the group that was provided breakfast had response time almost twice as fast as the fasting group. Accuracy of answers was the same for both groups (Dykman & Rivik, 2002). These results were supported by a study conducted in Israel where students were found to have a smaller breakfast than in the United States (Vaisman, Voet, & Vakil, 1996). Providing a mid-morning snack of juice was suggested to bring glucose levels back up to support cognitive thinking (Vaisman et al., 1996).

Regardless of the socioeconomic status of students, they will be at a higher risk of having a decreased ability to learn if they have inadequate nutrition (Peterson, 2000). Assumptions cannot be made that increasing the socioeconomic status of families will reduce obesity. As referenced above, the prevalence of overweight decreased in white

females as their socio-economic status increases. However, in African American females the prevalence of overweight increases as their socio-economic status increases (Gordon-Larsen et al., 2003). Understanding the aetiology of why children select certain foods is often included in obesity research as the search for causes of childhood obesity continues (Bere & Klepp, 2005). Environmental, contextual, biological and socio-cultural factors must all be considered when investigating the causes for obesity (Gordon-Larsen et al., 2003). Nutrition curriculums often do not include assistance to recognize cultural diversity that impacts food choices and habits (Hoelscher et al., 2002).

Parental nutrition role modeling has a stronger impact than teacher influences in the nutritional choices of adolescents (Barton et al., 2005; Newmark-Sztainer et al., 2005; O'dea & Wilson, 2006; Wang et al., 2006). Following their parents' behavior, children base their knowledge of foods and nutrition on their previous experiences, with what they see on television and other individuals that have influence in their life, such as teachers (Barton et al., 2005; Kelder et al., 1994; Newmark-Sztainer et al., 2005). Nutrition intervention that includes educating the parents has been shown to improve the eating habits of children by increasing the number of fruits and vegetables consumed in the family setting (Epstein et al., 2001). Children often consume the largest proportion of their calories at home from low-nutrient foods. Educating both students and parents is important in reducing obesity (Briefel et al., 2009b).

By the time of adolescents, the nutritional habits of a student have been indoctrinated to the point they are likely to continue through adulthood (Kelder et al., 1994). Parental modeling continues to be a slight but significant influence on fruit and vegetable consumption. As children reach middle school the parental control has less

effect on fruit and vegetable selections (Briefel et al., 2009b; Young, Fors, & Hayes, 2004). Due to children's nutritional habits being set early in life, Kelder et al. (1994) suggests that nutritional interventions should begin prior to the sixth grade. More efforts are needed to disseminate nutrition education to students (Hoelscher et al., 2002).

Environmental Factors

Current environmental factors impact the activity levels of individuals. Once walking to school or to work was considered normal, but now transportation has evolved to the utilization of motorized transport. Hazards such as increased traffic and safety issues have reduced the number of students that walk to school (Lobstein et al., 2004). Playing outside for recess, after school or on holidays has been dramatically reduced due to safety concerns (Lobstein et al., 2004; Wang, et al., 2006) . Community crime rates have an impact on obesity levels as citizens reduce their outside activity levels (Gordon-Larsen et al., 2003).

Fast foods and snacks that students use to replace meals such as consuming a bag of chips before school for breakfast may be changing the fatty acid composition of their brain and reducing or damaging their memory functions (Yu et al., 2010). Since students make the ultimate decision as to what they will eat, providing nutrition education is needed to help the students learn how to make appropriate food choices (Condon et al., 2009; Hsieh, 2004). One area that school administrators recognize as a potential barrier to students receiving nutritious meals is the personal decision of students to not participate in school meal programs and their decision to not eat healthy foods (Hsieh, 2004; Mahoney et al., 2005; Waggoner, 2001).

Food purchasing has become more frequent with a wider variety of energy dense foods available to most of society (Lobstein et al., 2004). Children have the purchasing power and the food availability to purchase healthy foods but they lack the natural ability to choose nutritious foods without nutrition education (Shah et al., 2010). The frequency of eating has increased as have the size of the portions being offered. Soft drinks have replaced water as the preferred beverage, and eating outside the home has increased (Lobstein et al., 2004; Young & Nestle, 2002). Portion sizes that were once considered normal have increased through the years to be much larger than USDA standard portion sizes (Young & Nestle, 2002). Cookie sizes have increased 700%, cooked pasta has increased 480%, muffin sizes have increased 333% and steaks have increased 224% (Young & Nestle, 2002).

Adolescents often view purchasing foods that have been processed by technology as providing an air of sophistication to the food without realizing that the additional processing is making the food less healthy (Barton et al., 2005). Adolescents who eat fast food tend to consume an average of 187 more calories per day than students who eat more wholesome foods (Schmidt, et al., 2005).

Periods of economic prosperity or recession within a country can also affect how quickly the obesity rates rise or fall (Wang, Monteiro, & Popkin, 2002). One example cited was during the Russian economic recession of the 1990s when the obesity rate of the country fell 6.6% (Wang et al., 2002).

Television/Advertising

Transitions in lifestyles are occurring at a rapid pace driven by aggressive advertising, low cost and easy availability of high saturated fat snacks, refined

carbohydrates, and sweetened carbonated drinks (Shah et al., 2010). People have become more sedentary due to television being available around the clock and less physical recreational activities (Lobstein et al., 2004). In a study of adolescent children 42% were reported to watch television four or more hours a day and 29% were reported to watch television five or more hours per day. Only 26% of the students were reported to exercise 20 minutes five days a week (Wang, et al., 2006). Results from a cross-sectional study of 162,305 youth representing 34 countries and a longitudinal study of 106 offspring of the surviving subjects of The Framinham Children's Study both reported that increased time watching television was associated with an increased occurrence of becoming overweight (as cited in Proctor et al., 2003). Similar results linking the hours of television watching to obesity rates were reported in a study comparing recent obesity estimates to results from the international study on Health Behaviour in School-Aged Children Study conducted in collaboration with the World Health Organization (Janssen, et al., 2005). BMI levels of girls were consistently statistically significant with an increase in hours of television viewing; boys had weaker and often not significant results (Hancox & Poulton, 2006). Overweight and obesity rates increased as the amount of time watching television increased (Janssen et al., 2005; Proctor et al., 2003).

The relationship of television watching to obesity rates is very complex. Poor dietary habits and reduced exercise may contribute to the increased obesity of television watchers. However, the possibility that television produces a hypometabolic effect may further exacerbate the obesity issue (Proctor et al., 2003). Advertisements on television usually present foods that are high in sugar, fat, and sodium (Powell, Szczpka, Chaloupka, & Braunschweig, 2007). Advertisers present non-healthy foods 89.4% of the

time in programs for 12 to 17 year olds (Powell et al., 2007). Educators perceive the importance of teaching students to recognize advertising techniques 46% of the time but only 26% of those teachers actually taught students about advertising falicies (Murimi et al., 2007). Nutrition interventions need to address the importance of reducing television time for children (Proctor et al., 2003).

Government Mandated Foods in Schools

The Richard B. Russell National School Lunch Act is mandated to design meals based on recommendations from the National Academies' Institute of Medicine (Richard B. Russell School Lunch Act, 2009). Historic changes in the school meal pattern began in school year 2012 and will be finalized in school year 2023 as a result of the Hunger-Free Kids Act (S. Res.3307, 2010). According to the USDA News Release the proposed changes will provide students:

- both fruits and vegetables every day,
- increased quantities of vegetables served every day,
- increased amounts of whole grain-rich foods,
- ensure that only fat-free or low-fat milk is offered,
- base calorie requirements to the age of the child being served,
- promote the reduction of saturated fat, transfats and sodium (United States Department of Agriculture, 2012).

Breakfast fruit requirements will increase from 2.5 cups to five cups of fruit per week. Lunch meals will be required to offer two and one-half cups of fruit and five cups of vegetables per week an increase from 3.75 cups of either fruits or vegetables per week (Federal Register, 2012). Vegetables served each week must include a 0.5 cup serving

from both dark green and three-fourths cup of the red/orange component groups (Federal Register, 2012). Dark green vegetables include dark green leafy vegetables and broccoli. The approved dark green leafy vegetables include spinach, romaine lettuce, collard greens, kale, and turnip greens. Acorn, butternut, and Hubbard squash, carrots, pumpkin, and sweet potatoes are some of the approved red/orange vegetables (Healthier US School Challenge, 2011).

In school year 2013, half of the grain component of the school meal must be whole grain for lunch meals. The following year breakfast grains must be half whole grain. Then in school year 2015 all grain components in breakfast and lunch meals must be whole grain (Federal Register, 2012). Sodium levels of foods will be gradually reduced for all grades beginning in 2014 to meet the final requirements of 640 mg for K-5 grades, 710 mg for grades 6-8, and 740 mg for grades 9-12 in 2023 (Federal Register, 2012).

The Healthy, Hunger-Free Kids Act of 2010 requires that the USDA establish nutritional standards for all foods served in schools at any time during the school day (S. Res.3307, 2010). Reducing A la´ carte foods or offering healthy choices is supported by health professionals and nutritionists (Briefel et al., 2009a; Sutherland et al., 2004).

In countries such as India, nutrition intervention addresses health, nutrition, decreased physical activity and healthy home cooking practices (Shah et al., 2010). In the United States, training for school nutrition is under the Food Service Management Institute (NSFMI) (Richard B. Russell School Lunch Act, 2009). Research and training materials are developed by the NSFMI to offer continuous improvement to child nutrition programs (Richard B. Russell School Lunch Act, 2009).

The Healthier US School Challenge (HUSSC) is a voluntary initiative established in 2004 to promote nutrition and physical activity. The meal criteria of HUSSC is based on including whole grain products and a variety of foods that support eating a healthful diet and developing healthful nutrition lifestyles for the future (Healthier US School Challenge, 2011).

Increased Fruits and Vegetables

Currently, less than one-fourth of students met the expert recommendations for fruit and vegetable consumption (Zapata et al., 2008). Children that consume fewer sugar-sweetened beverages and low-nutrient foods as part of the school lunch program often ate more non-healthy foods when away from school. However, the mean energy density of foods consumed in a day was lower for school lunch participants than non participants in secondary schools (Briefel et al., 2009b). Student self-efficacy was only a modest predictor of a student consuming fruits and vegetables (Young et al., 2004). Children seem to prefer other foods to eating vegetables (Gonzalez, Jones, & Frongillo, 2009). Participation in the school lunch program promotes eating fruits and vegetables, but 46% of the students fail to consume any fruit or vegetable during the day (Briefel et al., 2009b). Restricting the availability of snack foods in schools is associated with a modest increase in fruit and vegetable consumption (Gonzalez et al., 2009).

Increasing the amounts of fruits and vegetables consumed by students to aid in reducing the quantities of empty calorie foods is viewed as a major step in reducing obesity in children and is considered as indicative of a high quality diet (Florence et al., 2008). Adolescents tend to decrease their fruit and vegetable intake as they increase in age (Bere & Klepp, 2005). Schools have a unique ability to provide mass emphasis on

eating fruits and vegetables (Anderson et al., 2004). Education programs within a school setting during the life cycle when eating habits are being developed have the potential for increasing fruit consumption. A variety of fruits and vegetables can be provided by schools to offer students the opportunity to taste foods that they may not be use to eating in the home environment (Anderson et al., 2004). Increasing the amount of fruits and vegetables is dependent on having the foods available for consumption. However, availability does not ensure a high rate of intake if the students choose to eat other foods (Bere & Klepp, 2005). African-American students are more likely to report eating fruits and vegetables five or more times a day than caucasion students (Cullen, Watson, & Konarik, 2009).

Overcoming personal food preferences can be a major obstacle in increasing fruit and vegetable intake. Most students like a wide variety of fruits but have less acceptance of vegetables. Repeated exposure and tasting of a food can alter a student's dislike of a food to an acceptance of the food (Bere & Klepp, 2005). School gardens allow students to become familiar with a wide variety of vegetables and result in students being more willing to taste new foods (Ratcliffe et al., 2011). School fresh fruit and vegetable programs have seen success in increasing fruit and vegetable intake by repeated exposure to a wide variety of foods (Bere & Klepp, 2005; Cullen et al., 2009). Students exposed to school gardens demonstrate an increased preference and consumption of vegetables in the school setting. However, there is little change in vegetable consumption in the home setting. The variance between school and home consumption may be due to increased availability in the school setting (Ratcliffe, et al., 2011).

Historical Perspective of Child Nutrition

Nutrition has been considered an important part of a student's ability to be successful in school since 1906 when *The Bitter Cry of the Children* was published describing that the effects of poverty, which caused children not to be able to learn at school due to being in a weak physical and mental condition (Spargo, 1906). When one-third of the men rejected for the draft in World War II were unable to serve due to nutritional deficiencies, Congress recognized the importance of nutrition to the nations' children. The need for able men to fill the military ranks to defend the nation, and the concern that children receive adequate nutrition resulted in Congress passing the School Lunch Act through the efforts of educators, the medical community, and National School Foodservice Association who recognized the importance of nutrition to academic success (Martin & Oakley, 2008).

The school lunch was originally designed to meet one-third of the child's nutrition requirements for each day. Food habits of the community, the amount of money available for the meals, and the kitchen equipment available for food preparation were to be used as guidelines in preparing the school lunch menus (Martin & Oakley, 2008).

As additional nutrition knowledge was gained the National School Lunch Program (NSLP) spearheaded changes to improve child nutrition by updating the lunch menu design to provide students with one third of the daily calorie and protein requirements in a healthy meal that has less than 30 % fat and is low in sodium and high in fiber. Students who participate in the NSLP receive meals that are higher in vitamin

A, riboflavin, vitamin B-12, vitamin C, calcium, phosphorus, magnesium, and zinc. Lower values of saturated fat and carbohydrates are found in NSLP meals than

non-school lunch meals (Gordon et al., 1995). It is estimated that the school lunch program is available to 92% of students but only 56% participate in the program nationwide (Dunifon & Kowaleski-Jones, 2003).

School nutrition programs are designed to be financially self-sufficient so as not to be a burden to the local school system (Richard B. Russell School Lunch Act, 2009). As some programs needed additional participation to maintain adequate funding less healthy snack items, called A´ la carte foods, began to be sold along with the healthy school meals (Martin & Oakley, 2008). Neumark-Sztainer et al. (2005) found that in schools that offer A´ la carte sales most students would eat a school lunch in addition to A´ la carte items.

The School Breakfast Program began as a pilot program in 1966 in low income areas to improve the nutritional condition of poor children in the United States and was permanently authorized by Congress in 1975. The goal of the School Breakfast Program (SBP) was to prevent children from being hungry during school hours prior to the lunch meal which would reduce their learning ability (Martin & Oakley, 2008). Schools that implement the SBP must provide one-fourth of the caloric and nutrition needs of children based on their age and follow the recommendations of the current Dietary Guidelines for Americans (Condon et al., 2009; Martin & Oakley, 2008). Students who choose to eat healthier school meals may increase their academic success due to improved cognitive abilities resulting from their improved nutritional status. Eating breakfast has been shown to improve attention in class and the ability to think clearly during academic testing (Murphy, 2007). Participation in the SBP has been found to be associated with a lower BMI (Briefel et al., 2009b).

Unplanned negative responses to the SBP occurred such as students avoiding the program for various reasons such as the social stigma of being considered poor. Scheduling issues impacted school breakfast participation since students were required to arrive at school early to purchase a meal (Peterson, Davison, Wahlstrom, Himes, & Irish, 2003). In the early 1970s, an effort to increase utilization of the SBP resulted in several school districts providing universally free breakfast and/or changed breakfast serving times to be during the first period of the day (Peterson et al., 2003). Prior to implementation of the universal school breakfast program 33% of all children evaluated for nutrition were classified as being at nutritional risk. Significant improvements were found in school attendance, breakfast participation, and reduction in reported hunger six months after the implementation of the program (Kleinman, et al., 2002).

Universal Breakfast and Lunch programs were made available for schools with student populations that had high levels of poverty. These schools could provide breakfast and lunch to all students at no charge (Martin & Oakley, 2008). Schools that promote breakfast through universal breakfast programs usually see positive results in the cognitive functions of children and overall student health (Murphy, 2007). Murphy, et al. (1998) concluded that children who eat universal school breakfast are significantly more likely to increase their math grades by +0.3 of a grade. Absenteeism for children who ate breakfast was reduced by -0.1 days compared to increases in absenteeism in children who did not eat breakfast. After the implementation of the universal school breakfast, child depression inventory scores decreased by 2.3% and hyperactivity scores decreased by 8.3 points (Murphy et al., 1998).

Team Nutrition was implemented by the U.S. Department of agriculture in 1994 as part of the Healthy School Meals Initiative to change children's eating behavior through social marketing techniques (as cited in Levine et al., 2002). The goal of Team Nutrition is "to improve children's life-long eating and physical activity habits by using the principles of the Dietary Guidelines for Americans (Team Nutrition, 2011, p. 1). "MyPyramid" and the most recent program revision titled "My Plate" have been used to visually present how Americans and especially children can eat a healthy diet. Team Nutrition provides scientifically based, social cognitive learning nutrition intervention materials to schools at no cost to member schools (Team Nutrition, 2011). Utilization of local coordinators that can aid in the collaboration between teachers, cafeteria staff, and external stakeholders aids in the successful implementation of Team Nutrition materials (as cited in Levine et al., 2002). The materials focus on planning and preparing healthy meals, linking meal programs to other activities that may be occurring in the classroom and providing nutrition expertise and awareness to the school community (Team Nutrition, 2011).

Slightly more than half of all students eat school lunch (Newmark-Sztainer et al., 2005). Food selections by children during school hours are associated with the school food environment and practices on campus. Although there was not a consistent difference between younger and older children, both groups tended to eat healthier foods if they participated in school lunch programs (Briefel et al., 2009a). Schools that have a closed campus with vending and A´ la carte policies tend to offer foods lower in calories and have a higher student consumption of fruits and vegetables (Newmark-Sztainer et al., 2005).

Nutrition Education Provided In Schools

Schools offer a unique setting to provide nutrition education such as helping the student to understand the importance of eating breakfast (Condon, Crepinsek, & Fox, 2009). Mass screening for obesity can be conducted in a more efficient manner if administered in a school environment (Lobstein et al., 2004). Education can address the concerns expressed by students that eating breakfast will make them fat (Reddan et al., 2002). Lien, (2007) suggests that students need to be informed that eating breakfast will help them to have increased calmness in their life in addition to the other more published benefits such as improved scholastic abilities and reduction of fatigue.

The World Health Organization (WHO) has focused on encouraging schools to take the lead in obesity prevention (as cited in Lobstein et al., 2004). During the first two decades of life the concentrated contact time that children are in school is second only to the time that they are in the home (Sutherland et al., 2004). In addition, schools can provide nutrition education to help students understand the concept of eating healthy in conjunction with physical exercise and aid in the development of a child's self-efficacy (Anderson et al., 2004; Lobstein et al., 2004). Nutrition interventions implemented by schools need to address the cultural differences in foods, and the impact of the socioeconomic levels of the children (Reddan et al., 2002). Posters, flyers, and signs can be displayed promoting healthy nutrition (Wang, et al., 2006).

Mandated changes resulting in controlling the food that is offered to students is not completely supported by all education stakeholders. There is a strong perception that controlling the types of food eaten and the eating environment is primarily a parental

responsibility. Many educators desire to only focus on teaching curriculum that focuses the academic success required for the student to graduate (Sutherland et al., 2004).

No Additional Cost for After-School Programs

Interventions through the school can be made in a more cost effective method than interventions outside of the school setting (Hoelscher et al., 2002; Lobstein et al., 2004). Gymnasiums and other physical education facilities can be usedas a cost effective venue for after-school programs (Wang, et al., 2008). Utilizing these facilities for afterschool programs for nutrition programs that included physical activity resulted in decreasing the

body fat of students (Wang, et al., 2008)

Schools have the opportunity to model positive eating habits through school nutrition programs. School administration often determines if nutrition education within a school will be implemented successfully by the level of importance they place on nutrition to school staff (Murimi et al., 2007). The decision to offer healthy foods in school canteens can have a significant role in supporting classroom nutrition intervention programs (Sutherland et al., 2004).

Nutrition in the Classroom

Developing an awareness to the many factors that influence eating habits can be beneficial to students (O'Dea & Wilson, 2006). Utilizing a festive atmosphere to emphasize that achieving and maintaining a healthy lifestyle can be fun aids in increasing implementation of healthful eating habits by children (Shah et al., 2010). Posters, masks, cards, and cartoons can be used to help relay the nutrition information to the students (Shah et al., 2010). Depending on the type and duration of the classroom nutrition

intervention, students have been able to demonstrate nutrition knowledge retention three months after the conclusion of the class (Kreisel, 2003).

Learning experiences provided in science and other curriculums could be used to assist students inconnecting the relationship between science, food, personal health, and global sustainability, but they often fail to teach the connection as part of the curriculum (Barton et al., 2005). Consumer science and health classes can be used to focus on healthy food preparation techniques and increase food awareness incorporating the cultural and psychological influences have on food choices (O'Dea & Wilson, 2006).

Teachers exhibit the least support for providing nutritional intervention in the classroom setting. Sutherland et al. (2004) reported that the reason teachers resist nutrition intervention is not that they do not acknowledge the seriousness or of childhood obesity, but that they feel overwhelmed by the pressure to solve all of society's problems within the classroom.

One method that teachers and staff can use to encourage students to receive adequate nutrition is by educating the student on how to incorporate healthful foods in their diets (Foster et al., 2008). In a study of teachers' perceptions of important topics to be taught only 34% of the teachers reported teaching nutrition on a weekly basis. Weight management was taught by 37% of the teachers. Coordination between classroom nutrition education and cafeteria activities seems to be critical to a successful nutrition intervention program, however, only 15% of the teachers collaborated with foodservice staff to reinforce classroom instruction (Murimi et al., 2007). Teachers often denied giving candy as a reward opting for using non-candy snacks or less often by providing additional recess time (Murimi et al., 2007). Lack of financial resources inhibits

purchasing some nutritional intervention programs or printing materials for student use offered in free programs (Levine et al., 2002). Teachers often lack the time to coordinate with cafeteria staff to utilize the lunchroom as a teaching resource (Levine et al., 2002). Nutrition education provided by teachers that incorporates ethnic foods and cultures was deemed important by 33% of teachers in a study conducted by Murimi et al. (2007) but only taught by 21% of the teachers.

The knowledge that teachers possess on nutrition can be a critical link in providing students with accurate information and improving misconceptions regarding healthy foods and activities (Shah et al., 2010). Educators may lack adequate nutrition training and regard nutrition education programs as extra work and therefore may not properly implement

intervention programs (Kain, Leyton, Cerda, Vio, & Uauy, 2008; Levine et al., 2002; Murimi et al., 2007; Sutherland et al., 2004). Teachers often state that they are confident or very confident that they have adequate knowledge to teach nutrition. Twelve percent of teachers reported that they had received staff development training in nutrition within the last 12 months (Murimi et al., 2007).

Integrating Nutrition Within the Academic Curriculum

Globally, schools are faced with meeting government annual education assessment standards that often result in conflict for curriculum time to teach tested subject and time to teach nutrition. Physical education or health class times are often reduced to allow more time for tested subjects (Kain et al., 2008; Levine et al., 2002).

Health education curriculums in approximately 70% of the states in America require instruction on nutrition and dietary behavior, but teachers average only about five

hours per year on nutrition instruction (Story et al., 2006). Integrating nutrition within the academic curriculum would reduce the conflict with other academic priorities that is currently reducing nutrition education in the school setting (Levine et al., 2002). Nutrition curriculum integration would allow school based intervention to be implemented without the need for additional school financial resources (Luepker et al., 1996).

Recommendations proposed in the Healthy People 2020 report are for children to receive nutritional education during office visits with a physican. Additional suggestions within the study include increasing worksites that offer nutrition classes but providing nutrition education in the school setting is not addressed (as cited in US Department of Health and Human Services, 2010). Food is used in science curriculums to teach chemistry but may not be linked to how food impacts the body or the sustainability of nutritional health (Barton et al., 2005).

Efficacy of Nutrition

The efficacy of nutrition intervention is dependent upon the teachers having clinically based nutrition knowledge and that they model their knowledge before the students (Kubik, et al., 2002; Murimi et al., 2007; Abood, Black, & Birnbaum, 2004). Additional reinforcement of the classroom instruction is gained through coordination of nutrition intervention with foodservice directors who develop healthful school meals (Murimi et al., 2007).

Hsieh (2005) found that the perception of eating healthy is different for student's and health care professionals. Students associated eating high fat snacks as pleasant and desirable. Eating healthy snacks became important to students only if a personal health

problem forced them to eat healthy (Hsieh, 2004). The perceived availability of fruits and vegetables was found to positively influence student self-efficacy of fruit and vegetable selection (Young et al., 2004).

Providing clinically based nutrition education may help students understand the nutritional benefits to healthful eating that may improve their cognitive abilities in school, help them control their weight, and improve their future health (Reddan et al., 2002). Including self-efficacy with nutrition knowledge intervention promotes behavioral change by providing a personal sense of control (Abood et al., 2004).

Summary

Eating behaviors of today's students is of interest worldwide. The medical profession, government leaders, and society have recognized that an emphasis must be made on changing the eating habits of students. Changing cultures around the globe have altered the traditions of the past and replaced home cooked meals with convenience foods (Foster et al., 2008; Hsieh, 2004). The complex influences of parental, peer, society, media, culture socioeconomic factors, and a lack of nutrition knowledge has resulted in students eating poor quality foods (Barton et al., 2005: Kelder et al., 1994: Newmark-Sztainer et al., 2005). Currently, society is faced with a rising obesity crisis in today's youth. Alongside of the obesity crisis is the often silent nutritional issue of hidden hunger (Food and Agriculture Organzation of the United Nations, 2011). Educators are teaching students that may have nutrient and micronutrient deficiencies reducing their cognitive abilities at the same time they are overweight or obese (Cook & Frank, 2008).

Cultural changes in the world are impacting the nutrition and activity decisions of students and their families (Shah et al., 2010). Concerns for safety have reduced the

availability of areas for children to play after school (Wang et al., 2006). Society has become increasingly more mobile but less active due to using mass transportation or automobiles (Lobstein et al., 2004). Media portrays eating foods that are quick to prepare but that may not be nutritionally healthy. Food availability has increased and students have the financial ability to purchase fast foods which are often high in calories and fat but low in nutrient value (Shah et al., 2010). Decreasing the fast food consumption would help lower calories and fat in the diet (Schmidt et al., 2005). Public health reform is needed to protect children's well-being in regard to overweight and obesity (Fried & Simon, 2007).

Schools are often the focus of governmental regulations in the attempt to educate students who in turn will educate parents. In the United States the current Healthy, Hunger Free Kids Act of 2010 will implement nutritional changes in an attempt to remove unhealthy food from schools and to improve the nutritional quality of the meals while meeting the caloric needs of the children (Federal Register, 201, p. 2494). The Healthy, Hunger Free Kids Act, as with many other interventions in various countries, impacts the foods that are served to students but does not address teaching the students about healthy eating (Shah et al., 2010).

Providing nutrition education to students in schools is the ideal location since the student is already in the building for several hours of the day (Condon et al., 2009). Teaching tools such as projectors, classrooms, cafeterias, and gymnasiums can be used in the nutrition education process (Wang et al., 2008). Nutrition education can be woven into numerous curriculums such as math, science, history, health, and physical fitness (Lobstein et al., 2004).

Unfortunately, school administrations in the United States and abroad have reduced the amount of classroom time given to nutrition education due to the need to increase classroom instruction on courses that are tested for AYP (Barton et al., 2005). Teachers rarely receive continuing education that is needed to teach scientifically based nutrition to the students (Kubik et al., 2002). The teachers often obtain their knowledge from the internet or other forms of media that may not be scientifically sound (Sutherland et al., 2004). Demonstration of poor eating habits of teachers results in a poor modeling for students. Schools that allow unhealthy food items to be sold beside the healthful school nutrition foods communicate a conflicting message to students (Murimi et al., 2007).

The need to teach students how to eat healthy in a manner that encourages the student to take ownership of their health is important to society. Students who are overweight or obese in childhood have a significantly greater chance of being obese in adulthood resulting in possible increased health costs and earlier death rates (Franks et al., 2010). Providing clinically based nutritional education to students may impact not only current health and possibly their current scholastic success, but it also positively change their lifestyle habits in the future (Fried & Simon, 2007). At the present time nutrition interventions have experienced limited success in changing negative eating habits to positive eating habits (O'Dea & Wilson, 2006). Nutrition interventions are being presented to students, but the efficacy of the interventions is dependent on the behavioral modifications of the program, and role modeling of the school administration and staff (Murimi et al., 2007). Success of nutrition interventions for students is

determined by whether or not the student makes the decision to eat healthy foods in the future (Shah et al., 2010).

The research does not focus on helping students to understand the short and long-term impact of their current nutritional decisions. A student's decision to eat fast foods, skip meals or eat junk food instead of healthy food may have a negative effect on their current education outcomes and future health (Hsieh, 2004).

CHAPTER THREE: METHODOLOGY

Introduction

Students who have the opportunity to eat in a healthy way may choose to eat less healthy foods due to inadequate nutrition knowledge. Nutritional status of children has been related to their cognitive skills and many health related issues in current research but research has not been successful in determining how to improve the nutritional knowledge of children. This study investigated if using a nonequivalent group design of seventh and eighth grade students to teach clinically based nutrition would result in an increase in nutrition knowledge, and attitudes of students as indicated on the School Physical Activity and Nutrition Project student questionnaire (Hoelscher, Day, Kelder, & Ward, 2003). The Nutrition Essentials nutrition module was used to provide clinically based nutrition education (United States Department of Agriculture Food and Nutrition Service, 2007).

Design

A pre-test, post-test nonequivalent control group design was utilized due to lack of randomization of the experimental and control group. Randomization of students for research in school settings was not possible due to disruption of classroom instruction (Ary & Jacobs, 2006; Trochim, 2006). The experimental group was determined by the school roster of students assigned to take Health the second semester of the 2011-2012 school year. The participants of the study were less aware of the experiment by allowing the predetermined classes to remain intact than they would have been if the classes had been divided to establish random groups. Pre and post-test questionnaires are part of the

regular classroom assignments. Utilizing correlated pairs made each participant their own control subject; therefore, reducing the threat of differences between subjects from entering into the analysis (Howell, 2008). The pre-test acted as the correlated pair for the post-test in the current study. Participants of the control group were similar in age, gender and grade level to the test participants which increased the matching of the two groups.

Matching of the control and experimental groups is a common method of addressing the lack of true randomization in quasi-experimental research (Ary & Jacobs, 2006). According to Ary & Jacobs, (2006) when classes can not be disrupted or reorganized to accommodate research the researcher should select two similar classes. One class will be assigned as the control group and the other class will be assigned as the experimental group. The two groups of this study appeared similar; neither class was a remedial or an advanced class (Ary & Jacobs, 2006). Since matching of participants is not possible in non randomized groups the pre-test is an important feature to reduce the threat of selection bias thus adjusting for differences in the groups (Ary & Jacobs, 2006).

Internal Threats

The main threat to internal validity of nonequivalent group design is selection bias or selection threat. Selection bias is any factor that results in differences between groups (Trochim, 2006). The pre-test was an important method used to control for selection bias in this study. The pre-test allowed for the equivalence of the group on the dependent variable prior to the implementation of the independent variable (Ary & Jacobs, 2006).

Selection-history threat could have occurred if some of the students were exposed to a historical event that provided an additional nutrition intervention other than what

they were being taught in the classroom setting (Trochim, 2006). To help control the selection-history threat the researcher determined that during the testing period no nutritional interventions were being sponsored in the community by groups that target middle school children such as the county extension office or in the 21st Century Afterschool program.

The selection-maturation threat which would have been the result of one of the groups maturing faster than another could have resulted in results that were impacted by the maturation and not the nutrition intervention. Short studies may experience maturation threats that are the results of boredom or fatigue (Ary & Jacobs, 2006). The current study was of short duration which inhibited the maturation impact due to maturing of the participants. Boredom and fatigue could have been present due to the focus on nutrition during the class period. However, the fatigue level would not be expected to be higher than in any other nutrition class. The pre-test post-test design usually has limited impact of maturation because both groups are expected to mature at the same rate (Ary & Jacobs, 2006).

Selection-testing threat would have been a possibility in the current study if the classroom groups determined by school administration were assigned with a bias toward one group such as if the control group had lower or higher reading ability or aptitude ability than the experimental group (Ary & Jacobs, 2006; Trochim, 2006). The school system where the research was conduced routinely assigns students to Health classes on a random basis. Although attempts were made to limit the extraneous variables between the control and test groups such as tossing a coin to determine the control and test groups, the inability to randomly assign the groups could have impacted study results. The

control and test groups differed in constructs for the number of gender, socieoeconomic status and ethnicity within each group. The pre-test design of the current study compensated for the differences in the groups because the design allows for a check on the equivalancy of the two groups prior to implementation of the independent variable (Ary & Jacobs, 2006).

Analysis of the data could have been impacted by the selection-instrumentation threat. Students who perform well on pre-test using instruments that have a ceiling of possible correct answers have less room for improvement on the post-test than students who perform poorly on the pre-test. A false improvement gain on the post-test may be seen by the students who performed poorly on the pre-test because they had the possiblity of a higher range of improvement than the student who performed well on the pre-test but had a lower possible range of improvement on the post-test (Ary & Jacobs, 2006).

The current study could have had the possibility of the selection-instrumentation threat if students had performed well on the pre-test due to not having sufficient range of improvement to demonstrate their improvement after the nutrition intervention. However, participants did not perform well on the pre-test and therefore all participants had sufficient range avalable to demonstrate gains in nutrition knowledge and attitude on the post-test.

Analysis of the current study revealed that both the control and experimental group had a possible large range of improvement for the post-test with neither group reaching the ceiling of possible correct answers. Pre-testing could alter the post-test results if the participants had learned from the pre-test and altered their answers on the post-test feeling their answers might be more acceptable (Ary & Jacobs, 2006). Testing

effect could have occurred since the same pre-test and post-test was used (Ary & Jacobs, 2006).

Another threat to the study was the possibility of selection and regression. Since the students were assigned by school administration it was possible that one group would score higher on the pre-test than the other group due to the group population having a higher mean (Ary & Jacobs, 2006). In a classroom setting this threat can occur if a specific class is assigned students that require remedial tutoring or if the class is composed of gifted children (Trochim, 2006). The current study was conducted in a small rural school district that divided each grade in half to teach health in both the first and second semester of the school year, thus all achievement levels were represented in each class.

Mortality was also an internal threat for the study. Selection-mortality is when there is an differential nonrandom dropout between the pre-test and post-test (Trochim, 2006). The current study did experience mortality due to students not being present on the day that the pre-test or the post-test was administered by the classroom instructors. Data obtained from these students was not included in the study results.

Results of the study could have been jeopardized by interruptions in the nutrition module schedule that occurred during the study period. The Health classes were not always held as scheduled due to the class time being used for field day activities prior to spring break. Interruption of the study time line schedule occurred on three days for the female group and one day for the male group. These interruptions were due to the instructor being pulled to cover for other classes and when the students were pulled to help prepare for field day activities. The reason given by the health instructor that

students are pulled from the health class was to avoid having them lose class time for math, science, or English classes.

Health classes were held at different times of the day, but all classes were held in late morning and the afternoon. Physical education classes and the teachers planning periods were held prior to the health classes. Kain et al., (2008) reported similar issues stating that teaching nutrition was not a high priority for school administrators. The instructors of the current study were supportive, but had to work the nutrition intervention into planned and unplanned day to day changes imposed by school administration. The study time schedule was three days longer due to the unplanned class activities.

Research Questions and Hypotheses

Research Question 1

Is there a significant difference between the pre-treatment and post-treatment mean scores of nutrition knowledge by seventh and eighth grade students who participate in the Nutrition Essentials: Teaching Tools for Healthy Choices education module as compared to a control group being taught with classroom texts?

$H_0 1_1$. There is no significant difference between the pre-treatment and post-treatment mean scores of nutrition knowledge by seventh and eighth grade students who participate in the Nutrition Essentials: Teaching Tools for Healthy Choices education module as compared to a control group being taught with classroom texts?

Research Question 2

Is there a significant difference between the pre-treatment and post-treatment mean scores of nutrition attitudes by seventh and eighth grade students who participate in the

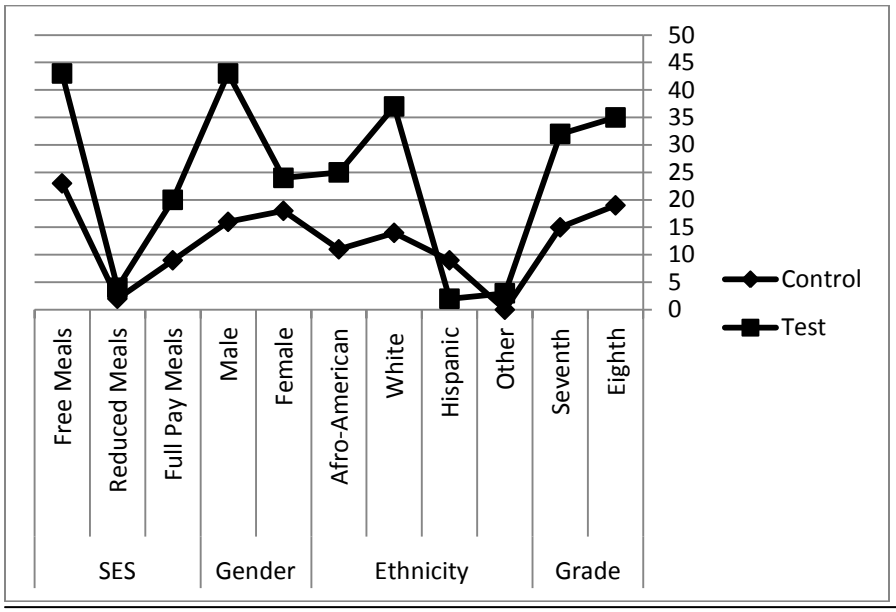
Nutrition Essentials: Teaching Tools for Healthy Choices education module as compared to a control group being taught with classroom texts?

$H_0 2_1$. There is no significant difference between the pre-treatment and post-treatment mean scores of nutrition attitudes by seventh and eighth grade students who participate in the Nutrition Essentials: Teaching Tools for Healthy Choices education module as compared to a control group being taught with classroom texts?

Participants

Seventh and eighth grade male and female students enrolled in a rural area of Georgia health class during the second semester of the school year were included in the nonrandomized control group pre-test post-test designed study. Since the school district where the study was conducted was small the convenience sampling included the entire population, 109 seventh and eighth grade students, scheduled for health in the second semester. Students who had taken health in the first semester were not included. Eight students (7.3%) did not complete either the pre or post-test; therefore, their data was not included in the study. Chart one is a profile of the demographics of the student respondents.

Chart 1
Demographics of Study Participants



The small sample size of the study could have a negative impact on the confidence level. A sample size of 139 would have been preferred to give a *p* value of 0.10 with a 5% margin of error. However, the student population did not have sufficient students for a larger group (Ary & Jacobs, 2006). Since the population of seventh and eighth grade students is fairly homogeneous a smaller size sample is acceptable (Ary & Jacobs, 2006).

The control group consisted of the one female and one male class that were selected by the toss of a coin as suggested by the Georgia Southern University Statistical Consulting Service which was used by the researcher for consultation and is suggested by Ary & Jacobs (2006) as a method of determining experimental and control groups in nonrandomized control group, pre-test post-test designs. Control group students received nutrition education based on the current curriculum approved by the school system. The

study participants were taught nutrition using the Nutrition Essentials nutrition module. No changes were made in the module during the study period.

Setting

This study was conducted at a small middle school in a rural community of Georgia. The school has 441 students enrolled, 51.70 % white, 32.20 % African-American, 13.83% Hispanic, 0.45% Asian and 1.81% are classified mixed or other. The free and reduced rate for the school is 68.2%. School lunch participation rate is currently at 80.3% and the school breakfast participation rate is 32.8%.

Control Group

Participants of the control group were presented nutrition education using the local school board approved health textbook by the physical education and Health teachers assigned by the school district to teach the respective grades. The classroom setting was similar in appearance to all classrooms in the school. Both the control and experimental group nutrition classes were taught in the same classroom but at different periods during the day. Team nutrition posters were hung in the classroom along with materials that were part of the normal classroom atmosphere. Teachers were instructed not to alter their existing classroom lesson plans. The control group nutrition module was taught for 10 days. The nutrition chapter of the health textbook focused on the following topics:

- Food for Energy focused on describing how the body changes food into energy that is then used by the body through digestion, absorption, and metabolism.

- Carbohydrates and Proteins were presented in a lesson that focused on describing the importance of carbohydrates and proteins in a healthy diet.
- Fats and Cholesterol were discussed in lesson three to inform students of their importance in a healthy diet and how to identify healthy and non-healthy fats.
- Vitamins, Minerals, and Water were presented to inform students why eating whole foods was of more value than taking dietary supplements.
- Dietary Guidelines were covered in the lesson that focused on using the dietary pyramid to determine what foods should be eaten for a healthy diet.

Experimental Group Setting

Participants of the experimental group were presented nutrition education utilizing the Nutrition Essentials nutrition module by the physical education and health teachers assigned by the school district to teach the respective grades. The classroom setting was similar in appearance to all classrooms in the school. Team nutrition posters were hung in the classroom along with materials that were part of the normal classroom atmosphere. Both the control and experimental group nutrition classes were taught in the same classroom but at different periods during the day. The nutrition module consisted of six units. The modules were taught by the health and physical education teacher over a ten day period with two additional days used for students to take the pre and post-test questionnaires.

The six sequential lesson plans of the nutrition module were provided. Worksheets, fact sheets, objectives, and standards, in addition to interactive games are

provided on compact disk (CD) format. A PowerPoint presentation was available on CD to aid the instructor in classroom presentation. The lesson titles were:

- "Get the MyPyramid Amounts of Foods—for You"

  Goals of the first lesson were to help the students identify the amounts and kinds of foods that they should eat based on their age, gender, and physical activity level. This lesson exposed the students to the MyPyramid website and the steps that need to be taken to be healthier based on a 2,000 calorie diet.

- "Choose the Foods YOU Need"

  Ingredient lists and how they are organized were presented to the students. The goal of the lesson was for the student to have the ability to use ingredient lists to identify general amounts of food components and to be able to describe the importance of making food choices over several days to obtain the required nutrients.

- "Choose Foods for Their Nutrients"

  How to read labels to determine the value of foods before they are eaten was presented in the third lesson. The goals of the lesson were for the students to be able to identify and compare amounts of nutrients, calories, and serving sizes from nutrition labels.

- "Estimate Amounts of Foods"

  This lesson instructed students on knowing how much food they should consume. Students learned how to compare portion sizes identified on nutrition labels with the portion size that they might consume. The goal of

the lesson was for the student to have the ability to estimate amounts of foods by using common objects, such as a deck of cards and a computer mouse for comparison of portion sizes.

- "Put It All Together—Food for a Day"

  In this lesson the students used a worksheet to practice choosing foods and the amounts that should be consumed based on the MyPyramid model. Then the students' critiqued their worksheets to determine how much more or less food they would need to consume to meet the MyPyramid guidelines. The goal of the lesson was to reinforce to the student that they possessed the knowledge to determine what were healthy foods and that they knew how much to eat.

- "Move It! To Keep You Health in Balance"

  The final lesson added physical exercise to instruct students on how physical activity effects the amount of food they need to consume. The goal of the lesson was for students to know the recommendation that they should be physically active at least 60 minutes most days and how to determine various levels of physical activity (United States Department of Agriculture Food and Nutrition Service, 2007, p. 2,6,10,14,18 and 22).

Nutrition education is part of the National School Lunch Program (Richard B. Russell School Lunch Act, 2009). During the study period no changes were made in the cafeteria setting that would have contributed to additional nutrition education for the study participants.

Instrumentation

Nutrition Essentials

The Nutrition Essentials: Teaching Tools for Healthy Choices was obtained through Team Nutrition. The peer reviewed nutrition module was developed based on the principles of the 2005 Dietary Guidelines for Americans and the MyPyramid Food Guidance System (United States Department of Agriculture Food and Nutrition Service, 2007). Nutrition Essentials was developed based on middle school academic level and assumes that participants will be familiar with the five major food groups and that they have some knowledge of nutrition terms such as vitamins, minerals, fats, cholesterol, and calories (United States Department of Agriculture Food and Nutrition Service, 2007).

SPAN Questionnaire

Developed as part of an interagency work group, the School Physical Activity and Nutrition questionnaire (SPAN) was designed to provide a model school-based nutrition monitoring system to assess the health and nutrition status of school-aged children (Hoelscher, et al., 2003). The federal participants of the interagency group consisted of the following: the Department of Health and Human Services, Center for Disease Control and Prevention (CDC), National Center for Chronic Disease Prevention and Health Promotion, National Center for Health Statistics, the United States Department of Agriculture (USDA), Food and Nutrition Service, the USDA Cooperative Extension Service, and the Department of Education. The CDC and USDA funded the development of the questionnaire (Hoelscher, et al., 2003).

The 2004 English version of the SPAN Project Student Assessment was used for the pre and post-nutrition test (Appendix A). The SPAN student questionnaire consists of nine constructs which were based on The National Nutrition Monitoring and Related

Research Act of 1990. The authors have made the questionnaire available for download from the website with the request that the authors be cited in the references (Appendix B) if the article is published (University of Texas School of Public Health, 2005).

Demographics, recall of food and menu choices, food selection skills, physical activity exercise, physical type of activity, weight behavior, nutrition knowledge, and nutrition attitude questions make up the nine constructs (Hoelscher, 2003). Demographic questions include the student's grade level, birth date, age, sex, and race. Question 11-35 relate to food recall; 36-41, 58-69, and 71 relate to nutrition, 42 and 72-73 relates to eating the school lunch; 43-53 and 70 relate to physical exercise, 44-57 relate to if the student would like to change their current weight and 74 relates to depression (Hoelscher, 2003). The current study focused on the nutrition knowledge construct questions 58-65 and the nutrition attitude questions 66-69. Data collected for the remaining questions in the SPAN survey has been secured for use in future studies.

The student questionnaire development included needs assessment, development of a rationale, goals and scope statement, development of questionnaire items. Review by and expert panel, focus group testing, and cognitive interview testing of questionnaire items. Reading level of the questionnaire was established using the Dale-Chall formula to be at US grade level 5.41 for the secondary school survey (Hoelscher, 2003).

The questionnaire was validated using a test-retest study design on eighth grade students in central Texas middle schools. Reproducibility and validation were done using the Spearman rank order correlation, $_{k}$ statistic, and percentage agreement. Results of the study found that nutrition knowledge items ranged from 47% to 92%, with $_{k}$ statistics ranging between 0.3 and 0.56. Nutrition attitude items ranged from 50% to 87%. Food

intake items ranged from 70% to 98%, with $_k$ statistics ranging between 0.54 and 0.93 and correlations between 0.66 and 0.97. Physical activity ranged from 66% to 89%. The researchers found the questionnaire to be similar to other questionnaires for school-aged children. Reproducibility was less reliable for nutrition knowledge and attitudes than for nutrition and physical activity behaviors (Hoelscher, 2003). The authors of the SPAN questionnaire acknowledged that $_k$ statistics are volatile statistics that are affected by the categorization approach to true date. In the case of the SPAN questionnaire the $_k$ statistics were used only when the specific question responses made the $_k$ statistics appropriate to adjust for the skewness of the data (Hoelscher, 2003).

Reproducibility scores for each of the questions on the SPAN survey are documented in the reproducibility and validity article of the SPAN survey. Comparison of the SPAN results with responses for a 24 hour food recall were provided as part of the validity evaluation. Results based on race, gender, and ethnicity for the test schools were included in reproducibility outcomes for the individual schools tested (Hoelscher, et al., 2003). Hoelscher et al., (2010) reported that the SPAN questionnaire had an acceptable internal consistency, with Cronbach's α of 0.73 and 0.76 (Hoelscher, et al., 2010).

Fluctuations are often seen in adult studies of nutrition knowledge and attitudes which may be more pronounced in school-aged children. In the SPAN survey the fluctuations may be due to the volatile constructs (Hoelscher et al., 2003). Validation and reliability results of other questionnaires investigating food consumption also reported lower reliability scores that are normally anticipated. Reliability estimates of .70 or lower are seen in over half of the 19 studies evaluated by Axelson and Brinberg (as cited in Sapp & Jensen, 1997). The KiGGS food frequency questionnaire used for adolescents

in Germany reported a mean correlation of 0.53 for the 47 items surveyed (Truthmann, Mensink, & Richter, 2011). Spearman correlation coefficients ranged from 0.22 to 0.69 revealing a fair to moderate validity ranking (Truthmann, et al., 2011). Reliability of a Belgian school-aged food-frequency questionnaire reported $_k$ statistics ranging from 0.43 to 0.70 and overall Spearman mean correlation ranges of 0.70 for 11 to 12 year olds and 0.67 for 13 to 14 year old students (Vereecken & Maes, 2003).

Limited attention spans of children reduce the accuracy of their recall responses. Investigations to the response accuracy indicate that children respond incorrectly 35% of the time. Incorrect responses could include reporting that they did not eat an item when in fact they did 33% of the time. Children also report that they did eat an item when in fact they did not 17% of the time (Baxter et al., 2003). Maintaining eye contact with the child during recall questioning may be helpful in holding the child's attention but may not significantly alter the responses provided by the child (Baxter, et al., 2003).

Procedures

After receiving local school administration permission (Appendix C), and approval from the Institutional Review Board (IRB) at Liberty University the study was conducted during a 16 day period. Exemption to consent was approved by the IRB since the nutrition module and SPAN survey were part of the regular classroom assignments (Appendix D).

The Nutrition Essentials nutrition module was obtained by the researcher from Team Nutrition. The nutrition module was taught by the school health and physical education teacher assigned to teach the class by school administration. Each instructor was provided a copy of the nutrition module. Training on how to present the Nutrition

Essentials program was provided to the instructors for 45 minutes one week prior to the implementation of data collection in the health classroom during their planning period. Training consisted of the following:

a. A proposed timeline of the research study based on items four thru eight of the description of the procedures of the study listed below. Each date had what study activities the health instructor and the student should complete.
b. Instructors were given a copy of the Nutrition Essentials Teaching Tools for Healthy Choices. Visuals that came with the Nutrition Essentials intervention program were distributed to the instructors. Each of the six lessons had a detailed lesson plan that provided the instructor with objectives, guiding questions to present to students, and nutritional information to be taught.
c. Instructors were given time to review the information and ask any questions they might have regarding the material.
d. Copies of the SPAN Student Survey Administration Protocol were given to each instructor. Questions presented by the instructors were answered after allowing time for the health instructor to read thru the protocol (Appendix E).

On day one of the study each participant in the study was given a SPAN student questionnaire to complete in the classroom on the day of the pre-test. The instructor administered the test using the SPAN survey protocol (Hoelscher et al., 2003). The protocol instructions were altered to change the name of the administering organization to the name of the test school. Page one and six of the SPAN questionnaire were altered to remove references to student height and weight as mandated by school administration (Appendix F and G). The researcher collected the pre-test from each instructor on the day that it was administered.

The instructors initiated the nutrition module using the Nutrition Essentials tool for the study participants or the classroom textbook for the control group on day two. Each module of the Nutrition Essentials tool required two to three days for completion to allow for classroom instruction and student activities to be completed. On day 16 each student was given a copy of the SPAN questionnaire for use as the post-test. After the class was completed the researcher collected the questionnaire from the instructor.

Data collection forms were developed by the researcher using Excel worksheets in a format that could be downloaded into the PASW Statistics GradPack 17.0 software program for analysis. Coding numbers were determined using a blank Excel worksheet. When both the pre and post-test were received by the reviewer, the questionnaires were sorted to match the pre and post-test for each participant and temporarily combined using a gem clip. Then the tests were shuffled and the student name was entered by unique code on the Excel identification sheet. The same code was written on the pre and post-test of the student information sheet and on the first page of each questionnaire by the researcher. The student information sheets were then removed from the questionnaire and placed in a locked file. Pre and post-tests were separated for data entry into the Excel worksheet. Questionnaires that did not have both a pre and post-test were removed from the study data collection and placed in a locked file.

The unique code number assigned to each participant was used for entering data on the Excel worksheet stripped of student names. When data from both the pre and post-test had been entered onto the Excel worksheet the data was imported into the PASW Statistics GradPack 17.0 software for data analysis.

Data Analysis

Prior to entering the data on the Excel worksheet the researcher obtained copies of the psychometrics, grade scales, syntax, and instructions for analyzing the SPAN questionnaire from the University of Texas Research Coordinator. The syntax and coding information provided by The University of Texas was used to design coding for the responses of the current study. Questionnaire items were sorted to include all questions that pertained to nutrition knowledge and attitudes based on survey subscales (University of Texas, 2011).

The student information section of the SPAN questionnaire obtains student demographic information. Questions vary between Likert type scale responses and multiple choice type answers. Questions asking students about what they ate yesterday evaluate student nutrition diet history information. The yesterday type questions are worded as Likert type questions allowing the student to select none, one time, two times, and three or more times for each question regarding what they ate yesterday (Appendix A). Responses to these questions received scores of zero if the student selects the response of none, a score of one if the student selects the one time response, a score of two if the student selects a response of two times, and a score of three if the student selects a response of three or more. Nutrition knowledge and attitude questions are in multiple choice formats (Appendix A). Each question lists five possible responses, of which, only one would be correct. Composite scores were developed to analyze the SPAN nutrition data so that each component would have a value of zero or one (University of Texas, 2011).

Indicators of nutrition knowledge were represented in questions 58 through 65. Higher scores for these questions indicated that the student had valid nutrition knowledge to make healthful choices regarding the food they consume. Nutrition attitudes were evaluated in questions 66 through 69. Higher scores for these questions indicated that the student had a healthful attitude toward eating foods that promote wellness. Correlation tests were conducted to determine if there was a correlation between the control group and experimental group for the nutrition knowledge questions.

Analysis of questions 58 to 65 were based on grading the response of the student and analyzing the correct versus incorrect responses. Questions 66 to 69 are personal preference responses thus they were analyzed using the actual answer provided by the student based on desirability of the response. Such as question 68 which state that skipping meals such as breakfast or lunch affects my ability to do well in my classes would have a desirable response of agreement by the student.

School administration did not approve for student weight and height information to be obtained. All references to obtaining this information were removed from the SPAN questionnaire resulting in revisions to demographic questions found on page one (Appendix F) and six of the questionnaire (Appendix G). In addition references to students having the option to not complete the questionnaire was removed at the request of school administration since the activity was part of the scheduled classroom assignments. No changes were made to the study questions.

Descriptive analyses were conducted to answer the question: What is the difference between the pre and post-test group scores for nutrition knowledge and nutrition attitudes? T-test analysis was conducted to control for pre-test differences (Ary & Jacobs, 2006). Utilization of the t-test addressed the selection internal threat due to the

non randomized test design. Correlation of the dependent variables was used to answer the descriptive question: What correlation exists between the dependent variables of nutrition knowledge and nutrition attitudes of students? Significance of the correlation of the variables of the variables was used to determine if analysis should be based on within or between group variance (Ary & Jacobs, 2006).

Statistical correlation was conducted to determine if the dependent variables were correlated. Data was analyzed based on between group variance since the variation is due to the interaction between samples. If the variation had been due to differences within the individual samples data would have been analyzed with within group variance (Ary & Jacobs, 2006). MANOVA analysis was conducted for the between group correlated data. The MANOVA is appropriate for this study because it is used to determine whether there are any differences between independent groups on more than one continuous dependent variable (Ary & Jacobs, 2006).

CHAPTER FOUR: RESULTS

In chapter four the statistical findings are reported. Descriptive statistics are used to describe the demographics of the study. Inferential statistics are used to answer the two research questions: (1) Is there a significant difference between the pre-treatment and post-treatment mean scores of nutrition knowledge by seventh and eighth grade students who participate in the Nutrition Essentials: Teaching Tools for Healthy Choices education module as compared to a control group?, and (2) Is there a significant difference between the pre-treatment and post-treatment mean scores of nutrition attitudes by seventh and eighth grade students who participate in the Nutrition Essentials: Teaching Tools for Healthy Choices education module as compared to a control group? The study investigated the impact that teaching the Nutrition Essentials module had on the nutritional knowledge and attitudes of seventh and eighth grade students. Implementation of the study was in March 2012.

Demographics

All of the male and female students assigned to take Health during the semester were included in the study. Eight students did not have their data included due to not taking either the pre or post-test. Of the 109 student participants, data was collected for 101 students minus the eight students (7.3%) who did not have both pre and post-test data. Study participants were divided into the control group which consisted of a sample size of 34 (34%) students, and a test group which consisted of a sample size of 67 (66%) students.

Demographics of the study group participants included 59 (58.4%) males, and 42 (41.6%) females. SES status of group participants qualified 66 (65.3%) to receive free meals, six (5.9%) students qualified to receive reduced paying meals, and 29 (28.7%) participants were full paying students. Ethnicity of the control group consisted of 36 (35.6%) African-Americans, 51 (50.5%) White, 11 (10.9%) Hispanic students, and 3 (3.0%) listed their race as other. Seventh grade students represented 47 (46.5%) of the students, and 54 (53.5%) of the students were in the eighth grade.

Table 1

Demographics of Study Participants Disaggregated by Group

Characteristic	Variable Categories	Frequency Control	Frequency Test	Percent Control	Percent Test (*n*=101)
SES	Free Meals	23	43	67.6	64.2
	Reduced Meals	2	4	5.9	6.0
	Full Pay Meals	9	20	26.5	29.8
Gender					
	Male	16	43	47.1	64.2
	Female	18	24	52.9	35.8
Ethnicity					
	African-American	11	25	32.4	37.3
	White	14	37	41.2	55.2
	Hispanic	9	2	26.4	3.0
	Other	0	3	0	4.5
Grade					
	Seventh	15	32	44.1	47.8
	Eighth	19	35	55.9	52.2
	Total	34	67		

T-test analysis was used to answer the question: "What is the difference between the pre and post-test group scores for nutrition knowledge and nutrition attitudes?" The t-test analysis was conducted to control for pre-test differences (Ary & Jacobs, 2006). A

paired samples t-test of the control group failed to reveal a statistically reliable difference between the mean nutrition knowledge pre-test scores (M = 2.88, s = 1.32) and the mean nutrition knowledge (M = 2.82, s = 1.53) post-test scores, t (33) = .268, p = .790, α = .05. The paired samples t-test of the control group failed to reveal a statistically reliable difference between the mean nutrition attitude pre-test scores (M = 12.82, s = 2.53) and the mean nutrition attitude (M = 13.09, s = 2.52) post-test scores, t (33) = .586, p = .56, α = .05. The paired samples t-test of the experimental group failed to reveal a statistically reliable difference between the mean nutrition knowledge pre-test scores (M = 3.52, s = 1.13) and the mean nutrition knowledge (M = 3.33, s = 1.66) post-test scores, t (66) = .829, p = .410, α = .05. The paired samples t-test of the experimental group failed to reveal a statistically reliable difference between the mean nutrition attitude pre-test scores (M = 12.46, s = 2.19) and the mean nutrition attitude (M = 12.66, s = 2.29) post-test scores, t (66) = .822, p = .41, α = .05.

Pearson's r was used to answer the descriptive question: What correlation exists between the dependent variables of nutrition knowledge and nutrition attitudes of students? To determine if MANOVA was the correct statistical test to answer the research questions Pearson's r was used to determine if a correlation existed between the dependent values. Results of the Pearson correlation indicated that there was a correlation between the knowledge and attitude responses. SPSS analysis of Pearson r indicated a positive correlation of .46 at the p = 0.01 level for a two-tailed test. The means and standard deviations for combined groups were M = 2.82 (SD = 1.53), M= 12.66 (SD = 2.30) respectively.

Table 2
Dependent Variable Descriptive Statistics Disaggregated for Knowledge and Attitude

Variable	Test Group N=67 M	Test Group N=67 SD	Control Group N=34 M	Control Group N=34 SD
Nutrition Knowledge	3.52	1.13	2.88	1.30
Nutrition Attitude	2.46	2.19	2.82	2.53

Since there was a correlation between the test and control groups the MANOVA test was the correct statistical test to answer the research questions (Ary & Jacobs, 2006; Elliott & Woodward, 2007).

Test results of the Between-Subjects Effects also indicated that there was no significant effect of the group results between the control and test group for nutrition knowledge of the students. Table 3 lists the *F* and *p* values of the Between-Subjects Effects.

Table 3
Test of Between-Subject Effects for MANOVA

Source	F-test	*P*-Value
Test Group	.514	.475
Control Group	.413	.325

Elliott & Woodward (2007) state that determining normality is not necessary if the group size is larger than fifty. Since the control group was 34, and the test group was 67, the assumption of normality was evaluated. Results of the Box's test, $M = 6.94$, $F=1.6$ and $p=.11$ indicate that there was homogeneity of the covariance of the group. The Levene's test results supported the the normality with values of $F = .70$, and $p = .41$ for

test group and F =.39 and p =.53 for the control group. The Box's M test is used to know the equality of covariance between the groups whereas the Levene's test is used to examine if there is an equal variance between independent variable groups (Statistics Solution, 2011). MANOVA is the method used to analyze a factorial design experiment investigating the combined effects of two or more independent variables (Ary & Jacobs, 2006).

The Kolmogorov-Smirnov test value was a p=1.0, and the Shapiro-Wilk had a p=.06 value for normality. Since both the values were not significant the data is considered normal. Both the Q-Q Plot and box plot of normality shown below indicates the normality of the group.

Chart 2
Linear Diagram of Study Participants

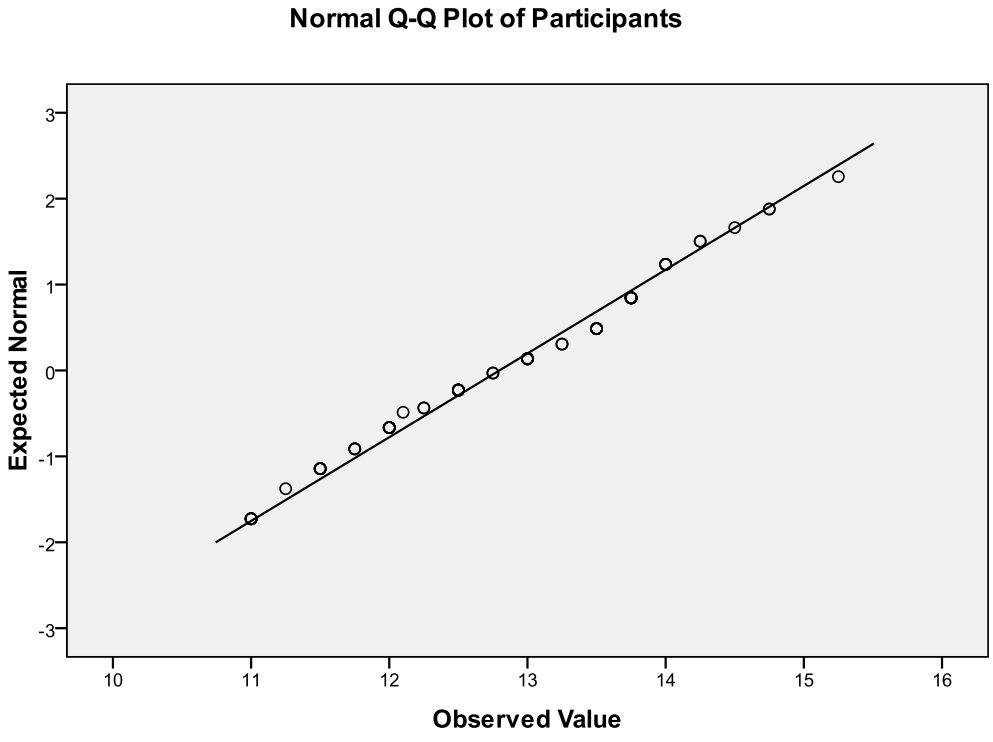
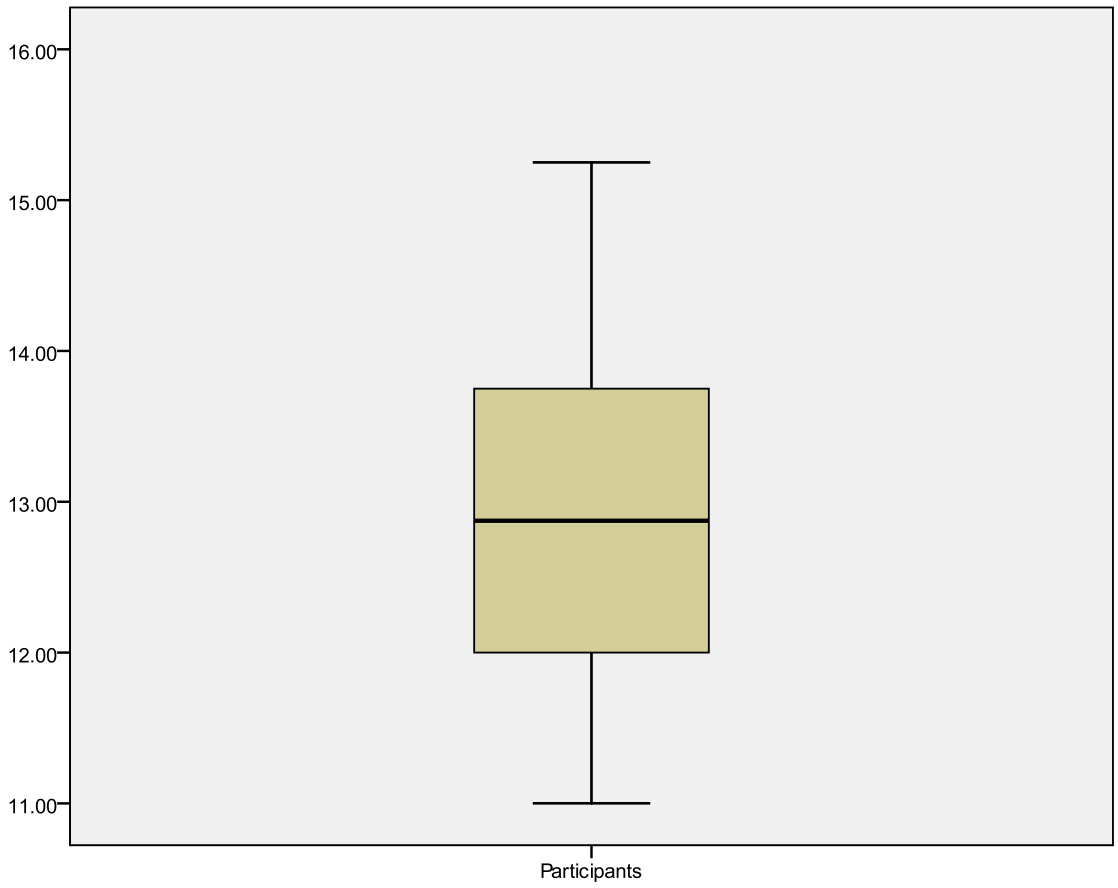


Chart 3
Box Plot Diagram of Study Participants



Results of the Multivariate test for nutrition knowledge and attitudes indicated an *F*-test value of .286 and a *p*-value of .28 for the Wilks' Lambda. Since the Wilks' Lambda tests for overall significance of the model, the results indicate that there was not a significant effect of the dependent variables on the independent variables when considered as a group (Statistics Solution, 2011).

When examining multiple dependent variables it is possible for Type 1 errors to occur. MANOVA provides good protection against alpha inflation and is more powerful than using a Bonferroni correction, but the possibility of Type 1 errors may still exist (DeCoster, 2004). Acceptance of the null hypothesis for research question one may

result in a Type 2 error. The observed power determined by the SPSS multivariant analysis was 1.0 indicating that the possibility of a Type 1 error was very low.

Statistical Analysis of Research Question One

MANOVA was used for the statistical analysis for research question one: "Is there a significant difference between the pre-treatment and post-treatment scores of nutrition knowledge by seventh and eighth grade students who participate in the Nutrition Essentials: Teaching Tools for Healthy Choices education module as compared to a control group?" Based on the statistical analysis the results of the study failed to reject the null hypothesis.

Exploration of why nutrition knowledge did not significantly change was investigated by reviewing the correct student responses to the questions that comprised the nutrition knowledge subscale. Data in Table 4 indicates the actual percentages of students who correctly responded to the nutrition knowledge questions. The results show that for the eight nutrition knowledge questions the number of students answering the questions correctly was less than one percent for both the experimental and control group.

Table 4
Nutrition Knowledge Percentages of Correct Responses for Pre and Post-Test

Questions	Group	Pre-Test	Post-Test
58. From which food group should you eat the most servings each day?	Test	.04	.07
	Control	.09	.20
59. From which food group should you eat the fewest servings each day?	Test	.67	.58
	Control	.59	.52
60. How many total servings of fruits and vegetables should you eat each day?	Test	.10	.04
	Control	.15	.03
61. What is the recommended amount of Calories from fat that you should get from the foods you eat?	Test	.13	.13
	Control	.09	.08
62. Which contains the most Calories?	Test	.61	.58
	Control	.59	.57
63. What you eat can make a difference in your chances of getting heart disease or cancer.	Test	.75	.67
	Control	.69	.65
64. People who are overweight are more likely to have a higher risk of health problems than people who are not overweight.	Test	.87	.76
	Control	.80	.71
65. People who are underweight are more likely to have a higher risk of health problems than people who are not underweight.	Test	.37	.48
	Control	.28	.43

Experimental group correct responses decreased for 62.5% (5 of 8 questions) from the pre-test to the post-test. Control group correct responses decreased 75.0% (6 of 8 questions) from the pre-test to the post-test.

Statistical Analysis of Research Question Two

MANOVA was used for the statistical analysis for research question two: Is there a significant difference between the pre-treatment and post-treatment mean scores

of nutrition attitudes by seventh and eighth grade students who participate in the Nutrition Essentials: Teaching Tools for Healthy Choices education module as compared to a control group? Based on the statistical analysis the results of the study failed to reject the null hypothesis.

Exploration of why nutrition attitudes did not significantly change was investigated by reviewing the correct responses of students to the questions that comprised the nutrition attitude subscale. Data in Table 5 indicates the actual percentages of students who correctly answered the nutrition attitude questions. The results show that for the four nutrition attitude questions that the number of students answering the questions with the desired response was less than two percent for both the experimental and control group.

Table 5
Nutrition Attitudes Percentages of Desirable Responses for Pre and Post-Test

Questions	Group	Pre-Test	Post-Test
66. There is so much information about healthy ways to eat that it's hard to know what to believe.	Test	1.60	1.60
	Control	1.71	1.60
67. The foods that I eat and drink are healthy so there is no reason for me to make changes.	Test	1.87	1.96
	Control	1.76	1.91
68. Skipping meals such as breakfast or lunch affects my ability to do well in my classes.	Test	1.54	1.63
	Control	1.57	1.60
69. I think that learning about the relationship between food and health is important for students.	Test	1.28	1.51
	Control	1.37	1.51

Desirable responses increased from the pre-test to the post-test for both the control and experimental group for all but question 66 which referred to there being so much information about healthy ways to eat that it is hard to know what to believe.

CHAPTER FIVE: DISCUSSION

Society has recognized the need to educate students on proper nutrition to reduce the obesity epidemic and to improve the nutritional quality of the foods consumed by students (Fried & Simon, 2007). The medical profession is concerned that the obesity rates are increasing at alarming rates which will result in decreased life expectancy and increases in diseases (Ogden, et al., 2006). At the same time the nutritional quality of the food consumed by children has deteriorated. Hidden hunger has resulted from consuming foods that do not provide the nutrients and phytochemicals needed to protect the body from many of the current diseases plaguing our nation such as diabetes, hypertension, stroke, and heart disease (Liu, 2007).

Although the need for nutrition education exists, the method to teach students in such a manner that the students will take ownership of their nutritional health and make positive changes has been difficult to achieve. The Nutrition Essentials nutrition module was used in this study as a nutrition education program to present scientifically based nutrition education to seventh and eighth grade students to determine if a classroom nutrition intervention would result in a significantly positive difference in their nutrition knowledge and attitudes. The purpose of this study was to compare pre and post-test nutrition knowledge and nutrition attitudes of 7^{th} and 8^{th} grade male and female students who received scientific nutrition information using the Nutrition Essentials: Teaching Tools for Healthy Choices nutrition module.

Summary of the Findings

Research Question One

Results of the quantitative study found that there was no statistical significant difference between the pre-treatment and post-treatment mean scores of nutrition knowledge by seventh and eighth grade students who participate in the Nutrition Essentials: Teaching Tools for Healthy Choices education module as compared to a control group. The results of the study, was consistent with other studies that did not show improvement after short term nutrition intervention (Foster, et al., 2008).

Analysis of the nutrition knowledge pre and post-test percentage of correct responses for both the test and control group were very interesting. With the exception of one question, both the test and control groups showed the same positive or negative directional change in correctly responding to the question.

Research Question Two

Results of the quantitative study found that there was no statistical significant difference between the pre-treatment and post-treatment mean scores of nutrition attitudes by seventh and eighth grade students who participate in the Nutrition Essentials: Teaching Tools for Healthy Choices education module as compared to a control group. As with research question one, the results of the study was consistent with other studies that did not show improvement after short term nutrition intervention (Foster, et al., 2008).

Analysis of the nutrition attitude pre and post-test percentage of correct responses for both the test and control group were very interesting. With the exception of one of the four nutrition attitude questions both the test and control groups showed the same

positive or negative directional change in correctly responding to the question.

Discussion of the Findings

The null hypotheses were accepted for both research questions one and two. The possibility exists that a Type 2 statistical error may have occurred and the hypotheses should have been rejected (Ary & Jacobs, 2006). Results of the majority of the analyzed study questions had lower correct scores for the post-test than the pre-test. The lower correct response rate for the post-test over the pre-test may indicate that the students were guessing at the answer for the pre and post-test indicating that little to no knowledge was gained by the nutrition module.

Answers for the nutrition attitude questions 66-69, also decreased for the post-test which could have indicated that the student changed their preference due to the study. The change in personal preference questions is of concern because the students changed from selecting the healthier responses to non-healthy responses. This study was consistent with other studies in that the students showed no improvement in their nutrition attitudes after implementing a nutrition intervention module (Kain, et al., 2008; Kamath, 2008).

It is interesting when reviewing the percentages of correct responses that even the questions that would have been expected to be answered correctly due to media coverage were answered incorrectly. The low level of nutrition knowledge that the students possessed prior to the study may have impacted the study results. Consideration should be given to the possibility that the low level of nutrition knowledge of students may be supporting the research projecting that the alarming rise in obesity will increase at a faster pace in the future (Ogden, et al., 2006).

Even though the current study indicates that the students have a lack of nutrition knowledge, the data indicated that students did not seem to believe they should change their eating habits to improve their health. These results are supported by Hsieh, (2004) and Barton, et al. (2005) who found that students believe they are healthy and do not need to change their eating habits unless they have an identified health issue such as diabetes or heart disease. One possible reason that the results were not significant was that students did not have the efficacy to learn about nutrition. However, the study did underscore the need for a nutrition module that will present nutrition education in a manner that students will grasp the knowledge.

Length of Study

The current program was of short duration lasting only 16 days. The decrease in correct responses by the students following the nutrition implementation may indicate that they were more confused about scientific based nutrition knowledge after the intervention than prior to the short term program (Powers, et al., 2005). General nutrition awareness may have been present prior to the study as indicated by some students' expressing knowledge that being overweight could impact their health. However, there was not a significant effect on the results of the nutrition knowledge and attitudes between the groups. Percentages of correct responses were lower in the post-test than the pre-test which could indicate that the pre-intervention knowledge gained was insufficient for the students to be confident of it's accuracy. The decrease in post-test scores may indicate that students are easily confused and need consistent reinforcement of sound nutritional doctrine through the use of longer interventions. The length of the study could have impacted the amount of knowledge gained and potential improvement in the quality of foods consumed by the students.

Foster, et al., (2008) recommended a minimum of 50 hours of nutrition intervention to obtain significant reduction in weight of student participants. These findings are supported by Baronowski, et al., (2003) who conducted research during a four-week summer camp for girls. Transition from the summer camp training included eight-weeks of in home follow-up with the girls and their parent. Results of Baronowski, et al., (2003) showed an increase in the consumption of fruits and vegetables, an increase in the amount of water consumed and a decrease in the percent of fat consumed in the participants diet. Additional support for longer nutrition intervention was presented in research evaluating the Exercise Your Options (EOY) nutrition intervention developed by the Dairy Council of California (Dunton, Lagloire, & Robertson, 2009).

Academic Impact of Nutrition

The reviewer noticed that the responses completed by the students for both the pre and post-test were not completed in a manner that showed evidence that the students were focused on their assignments. This observation was determined by students who would only list the first letter of their name rather than following the instructions to write their name. Comments on the surveys by the students indicated that they were unconcerned about the quality of the assignment.

Investigation into the unconcerned attitude of the students by the researcher was conducted by discussing the situation with one of the instructors who informed the reseacher that the students' are not given a grade for health that is included in their GPA. The students' are only required to pass the course. This information was substantiated by the school's policy for student promotion and retention. Research conducted on the amount of effort that students put into classes found that 79% of the students stated they

put more effort into graded classes. Students stated that they expect pass/fail classes to have a lighter workload than graded classes (Michaelides & Kirsher, 2005). In addition to lack of motivation due to the pass/fail grading, students may not have been putting their best efforts into the health class, because the numerous interruptions to the class were a subliminal message that school administration put less emphasis on their health and physical fitness than their academic success in other classes (Murimi, et al., 2007).

The lack of student motivation to learn the nutrition information presented could have a negative impact on their academic achievement in all classes. Educators want students to perform well in high stakes testing classes. However, they seem to demonstrate a lack of understanding between the possible association of teaching students how to eat healthy, and the positive benefits of the academic performance of well-nourished students' (Florence, et al., 2008).

Less than 2% of the participants selected the desirable response that skipping meals effects health. This data suggest the results reported by Chen, et al., (2008) that 30.5% of students skip breakfast could be occurring in the current school system. Eating breakfast was reported to have a positive impact on student academic status, including absenteeism and discipline (Murphy, et al., 1998). This information should be of concern to educators because students who have dips in their glucose and glycogen levels during class may be a risk for reduced academic performance (Cheng, et al., 2008; Fried & Simon, 2007; Jyoti, et al., 2005).

Teacher Efficacy

The lack of gains in nutrition knowledge and positive changes in nutrition attitudes could have been the result of teachers who were frustrated at having to teach

nutrition with numerous interruptions. Instructors of the current study were not given any incentive to participate in the study although they expressed their support of the nutrition intervention and professional support of the researcher. The instructors are certified Health and physical education teachers. However, they were not assessed as to the amount of nutrition knowledge they possessed which could impact the study results. The Exercise Your Options (EYO) program has an online teacher evaluation that must be taken prior to the teacher presenting the class to the students (Dairy Council of California, 2012). Instructors of the evaluation of the EYO curriculum were given a stipend of $75.00 to participate in the study. Current educators that use the EYO program do not receive a stipend (Dunton, et al., 2009). The Fun, Food, and Fitness Project used project trained staff to teach the nutrition program rather than the usual camp counselors (Baranowski, et al., 2003).

Teachers are reluctant to play a major role in obesity prevention or in nutrition education due to being overloaded with curriculum and social pressures to solve all problems of students in the school setting (Sutherland, et al., 2004). The current study supported reports that the amount of time allotted to health education has decreased, and health education does not have school administrative support (Sutherland, et al., 2004). The rising rates of obesity have not been reduced or prevented by school based interventions (Birch & Ventura, 2009).

Student Efficacy

The current study results for questions 66 to 69 are interesting since the responses are based on the actual scores by the students. These answers would not have been expected to be affected in a negative manner by the Nutrition Essentials module. The

responses provided by the students for these questions changed from the pre-test to the post-test.

Study Limitation and Recommendations

Results of the current study provided many questions as to why the results of the study were not significant for either of the research questions; such as to why the post-test results were lower than the pre-test results, and why students did not demonstrate any improvement following the intervention. The design of this study was developed to determine if a free, online classroom nutrition scientifically based intervention would result in a significantly positive difference in their nutrition knowledge and attitudes. Several limitations could have occurred in this study that may have impacted the study results.

The students of the intervention group may not have been representative of all rural middle school students. There may have been bias towards the instructors or a desire to give responses that would be negative toward the school nutrition program. In an effort to eliminate these limitations all the seventh and eighth grade students who were assigned to take Health the second semester of the school term were included in the study. The study instructors were the only two Health instructors who taught health classes in the small rural school district. The school nutrition program was not mentioned to the students nor was the school nutrition director present in any of the classes during the study.

The Nutrition Essentials nutrition module is intended to be taught to middle school students who are familiar with the five major food groups, and have had some exposure to nutrition terms such as vitamins, minerals, fats, cholesterol and calories

(United States Department of Agriculture Food and Nutrition Service, 2007). Pre-test results for both the control and test group may indicate that the students lacked the knowledge base for this module to be successfully implemented.

The nutrition module presentation experienced several interruptions that prevented the course from being presented in consecutive lessons as planned. Students may consider that school administration was putting less emphasis on Health classes than other classes that are tested for AYP performance. Consistently using the health class for other activities could subliminally inform students that administration does not think that student health is important. The interruptions could have interfered with the learning process of the students. Although not verbalized or observed by the researcher, the instructors could have presented the material in a negative atmosphere thus discouraging students to learn the material.

Classes that are required for AYP performance last 90 minutes, compared to Health and other classes that are not tested for AYP which last 40 minutes. The Nutrition Essentials module had to be presented in shorter class time which resulted in the instructors reviewing the material quickly and perhaps not giving the activities included in the module sufficient time to benefit the students (Periz-Rodrigo & Aranceta, 2003). The 40 minute class is not unique to the test school system. The EYO program is eight lessons designed for a 40 minute class. However, the study evaluation covered the material in an eight week period (Dunton, et al., 2009). The extended time was used to present additional support materials using handouts and videos (Dunton, et al., 2009). The short time period of the study allowed for threats to exist. Lifestyle changes that may occur due to the nutrition intervention may not be evident in the short duration of the current study.

Randomization of the control and test group students was not possible since they are assigned to the health class by school administration. To counteract the lack of group randomization the same test was used for pre and post-test to reduce the testing effect (Ary & Jacobs, 2006). Generalization of the current results should not be made based on the small study size and the lack of randomization of the students. The pre-test might have resulted in sensitization of the subject matter creating inaccurate results in the post-test scores (Ary & Jacobs, 2006). Pre-test treatment threats could have resulted from students being exposed to nutrition information and changing their eating habits for a short time rather than making long term life-style changes.

School Physical Activity and Nutrition Project (SPAN) survey was used for the pre-test and post-test evaluation. The SPAN survey was originally administered by staff that had received extensive training on how to administer the survey. The current study administrators were trained as to how to follow the SPAN survey guidelines but the training may not have been sufficient to administer the survey correctly. Use of a different survey tool may be more appropriate to determine changes resulting from short term nutritional intervention. Instructors may have benefited from additional training on how to present the Nutrition Essentials nutrition module and how to conduct the SPAN survey.

Implications for Further Research

A need exists to determine a successful method to teach students how to eat a healthy diet. Studies in the future should pursue how to provide additional insight on improving the nutrition knowledge and attitudes of students.

Health teachers have a limited amount of time to present nutrition to their

students. Classroom educators should be encouraged to incorporate nutrition into other subjects on a routine basis. Health teachers could also thread nutrition into other health related topics. Additional education time could be provided by implementing intense nutrition education at an earlier age.

Future efforts need to be made to determine ways to educate school administrators that nutrition education may positively impact academic success (Fried & Simon, 2007). School administration sets the standard for the culture of the school campus. Nutrition education is a long term goal that requires school administration support at the central office and school board level.

Current studies base most of the nutrition intervention in schools with a major emphasis on the students. Future studies should also focus on how to successfully provide nutrition education to school staff and parents by partnering with community programs already in place. The school nutrition director could be utilized to present nutrition programs at parent, teacher, and community meetings that could improve family interventions and model to students that administration believed that nutrition was important (Epstein, et al., 2001).

Additional studies conducted to evaluate the implementation of computer based nutrition programs to gain student interest may be a method that schools could use to improve student nutrition knowledge and attitudes thus improving their food choices (Kreisel, 2003). Although computer programs have not shown a significant improvement over classroom teachers in improving nutrition knowledge this method could be used to gain student interest and supplement classroom time when health classes had to be disrupted due to other school activities (Kreisel, 2003).

Repeating the study with a larger sample size would investigate if the possibility of a Type 2 error may have resulted in the acceptance of the null hypothesis. Increasing the power of the sample could possibly show that students did gain knowledge but that a larger sample size was needed to obtain a statistical significance.

Conclusions

Positive improvement in the nutrition knowledge and attitudes of students did not occur in the experimental group as a result of teaching the Nutrition Essentials nutrition module. Student responses indicated that negative learning may have occurred instead of improvement. Based on the current study results the nutrition knowledge and attitudes that would have resulted in decreasing obesity levels and improving the overall nutritional quality of a student's diet were not improved. The need for additional nutrition education was evident by the lack of knowledge and poor nutritional attitudes identified in the student responses.

Longer programs may be needed to reinforce nutrition learning to provide a significant change in student eating habits (Fahlman, et al., 2008). Local school nutrition programs support classroom education by providing nutritious food in the cafeteria along with posters supporting positive nutrition habits. However, the extended programs and cafeteria examples must be combined with a desire of educators to model good nutrition habits to students just as they model proper English language or math skills (Kubik, et al., 2002). The core stimulator in a school having a successful nutrition intervention program is the school administration (Sutherland, et al., 2004).

Schools can have a positive impact on the nutrition knowledge and attitudes of the students but the issue is much larger than any school system can solve alone. When

parents and community programs allow students to eat low quality food after school for snacks and for the evening meal, the positive impact made by the educators is reduced by the home and community environments.

Educators may not want the responsibility of teaching nutrition but they need to recognize the importance nutrition has on their students and academic outcomes. Just as an educator does not want a student to practice other unsafe lifestyle habits being overweight or nutritionally unhealthy can have just as devastating an impact on a child's future life. The students that are being taught sound nutrition today will be the parents of the future. The rampant rise in obesity in American has placed America in a critical and dangerous situation faced with soaring health care costs and a future population that may be unfit to protect our country (White House Task Force on Childhood Obesity, 2010).

A collaborative effort, by education stakeholders, must once again be made to protect our children from poor nutrition as was accomplished in the 1940's (Martin & Oakley, 2008). Providing students strong nutritional leadership to encourage healthy eating habits today and in the future is perhaps the most important subject than can be taught by our education system. Failure to address the health risks of obese and malnourished students in the school systems today will result in reduced longevity to contribute to society using the education skills that they are currently achieving.

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Appendix A

SPAN Original Questionnaire

School Physical Activity and Nutrition (SPAN) Project
Student Assent

YOUR NAME: _____

SCHOOL: _____

GRADE: _____

- You will be asked to answer questions about your food choices and physical activity (exercise).
- An adult will weigh you, measure your height, and write the results on the last page of the questionnaire.
- No one at school or at home will see your answers, how tall you are, or what you weigh.
- Taking part in this project is up to you. Your choice about taking part will not affect your grades in school or your ability to take part in any school activities.
- If you do not want to answer a question, you can skip it.
- You may stop taking part in this project during the time you are getting your height and weight taken, while answering questions, or at any other time.
- After you complete the questionnaire and are measured for height and weight, the page with your name on it (Student Assent Form) will be removed. Your name will never be used after that.
- By signing below, you agree to take part in this project.

_____ _____

Signature of Student Date

00001

SCHOOL PHYSICAL ACTIVITY AND NUTRITION (SPAN) PROJECT

STUDENT QUESTIONNAIRE

$8^{th}/11^{th}$ Grades

The following questions are about what students your age eat, what they know about nutrition, and their physical activity (exercise). Your answers will help us learn about students in Texas and will be used to design better health programs. Read each question carefully and pick the answer that is true for you. Mark that answer on your questionnaire as shown in the example below. *This is not a test, and there are no right or wrong answers. Remember, your answers will be kept private.*

Marking Instruction:
Fill in bubble(s) completely

Please Use #2 Pencil

To change your answer, erase completely

STUDENT INFORMATION

What school do you go to? _____

1. Bubble in your school ID #.

2. Bubble in today's date.

- Jan
- Feb
- Mar
- Apr
- May
- Jun
- Jul
- Aug
- Sep
- Oct
- Nov
- Dec

- 2004
- 2005
- 2006
- 2007
- 2008

3. Bubble in your grade.

- 8th
- 11th

4. Bubble in your birth date.

- Jan
- Feb
- Mar
- Apr
- May
- Jun
- Jul
- Aug
- Sep
- Oct
- Nov
- Dec

- 1983
- 1984
- 1985
- 1986
- 1987
- 1988
- 1989
- 1990
- 1991
- 1992
- 1993

5. Bubble in your age.

- 9
- 10
- 11
- 12
- 13
- 14
- 15
- 16
- 17
- 18
- 19
- 20

6. Bubble in your sex.

- Male
- Female

7. How do you describe yourself? (Fill in only *one*)

- American Indian or Alaska Native
- Asian
- Black or African American
- Mexican-American, Latino or Hispanic
- Native Hawaiian or Other Pacific Islander
- White, non-Hispanic, non-Latino
- Other

8. How tall do you think you are?

- 3 ft.
- 4 ft.
- 5 ft.
- 6 ft.
- 7 ft.

- 0 in.
- 1 in.
- 2 in.
- 3 in.
- 4 in.
- 5 in.
- 6 in.
- 7 in.
- 8 in.
- 9 in.
- 10 in.
- 11 in.

9. What do you think you weigh?

lb.

10. What language do you use with your parents most of the time?

- English
- Spanish
- Vietnamese
- Chinese
- Other

_____
(write in any other language)

Please continue on next page

These questions are about YESTERDAY.

	NONE	1 TIME	2 TIMES	3 or More Times
11. Yesterday, how many times did you eat hamburger meat, hot dogs, sausage (chorizo), steak, bacon, or ribs?	0	1	2	3+
12. Yesterday, how many times did you eat battered or fried chicken, chicken nuggets, chicken fried steak, fried pork chops, or fried fish?	0	1	2	3+
13. Yesterday, how many times did you eat gravy (either on a food or by itself)?	0	1	2	3+
14. Yesterday, how many times did you eat peanuts or peanut butter?	0	1	2	3+
15. Yesterday, how many times did you eat any kind of cheese, cheese spread or a cheese sauce? *Include* cheese on pizza or in dishes such as tacos, enchiladas, lasagna,sandwiches, cheeseburgers or macaroni and cheese.	0	1	2	3+
16. Yesterday, how many times did you drink any kind of milk? *Include* chocolate or other flavored milk, milk on cereal, and drinks made with milk.	0	1	2	3+
17. Yesterday, how many times did you eat yogurt or cottage cheese or drink a yogurt drink? *Do not count* frozen yogurt.	0	1	2	3+
18. Yesterday, how many times did you eat rice, macaroni, spaghetti, or pasta noodles?	0	1	2	3+
19. Yesterday, did you eat any *white* bread, buns, bagels, tortillas, or rolls?	0	1	2	3+
20. Yesterday, did you eat any *whole wheat or dark* bread, buns, bagels, tortillas, or rolls?	0	1	2	3+
21. Yesterday, how may times did you eat hot or cold cereal?	0	1	2	3+
22. Yesterday, how many times did you eat French fries or chips? Include potato chips, tortilla chips, Cheetos®, corn chips, or other snack chips.	0	1	2	3+
23. Yesterday, how many times did you eat vegetables? Include all cooked and uncooked vegetables; salads; and boiled, baked and mashed potatoes. *Do not count* French fries or chips.	0	1	2	3+
24. Yesterday, how many times did you eat beans such as pinto beans, baked beans, kidney beans, refried beans, or pork and beans? *Do not count* green beans.	0	1	2	3+
25. Yesterday, how many times did you eat fruit? *Do not count* juice.	0	1	2	3+
26. Yesterday, how many times did you drink fruit juice? Fruit juice is a 100% juice drink like orange juice, apple juice, or grape juice. *Do not count* punch, Kool-Aid®, sports drinks, and other fruit flavored drinks.	0	1	2	3+
27. Yesterday, how many times did you drink any punch, Kool-Aid®, sports drinks, or other fruit-flavored drinks? *Do not count* fruit juice.	0	1	2	3+
28. Yesterday, how many times did you drink any *regular* (not diet) sodas or soft drinks?	0	1	2	3+
29. Yesterday, how many times did you drink any *diet* sodas or soft drinks?	0	1	2	3+
30. Yesterday, how many times did you eat some type of frozen dessert? A *frozen dessert* is a cold, sweet food like ice cream, frozen yogurt, an ice cream bar, or a Popsicle.	0	1	2	3+
31. Yesterday, how many times did you eat sweet rolls, doughnuts, cookies, brownies, pies or cakes?	0	1	2	3+
32. Yesterday, how many times did you eat chocolate candy? *Do not count* brownies or chocolate cookies.	0	1	2	3+
33. Yesterday, how many meals did you eat?	0	1	2	3+
34. Yesterday, how many times did you eat food from any type of restaurant? (Restaurants include fast food, sit down restaurants, pizza places, and cafeterias).	0	1	2	3+
35. Yesterday, how many times did you eat or drink a snack? A *snack* is any food or beverage that you eat or drink before, after, or between meals.	0	1	2	3+

Please continue on next page

36. What type of milk do you *usually* drink? (Fill in only ONE)

- ○ Regular (whole) milk
- ○ Low-fat (2%, 1 1/2%, 1%) milk
- ○ Skim, nonfat, or 1/2% milk
- ○ Combination of the above types of milk
- ○ I don't drink milk

37. Are the foods you *usually* eat:

- ○ High in fat
- ○ Some high in fat, some low in fat
- ○ Low in fat

38. Are you a vegetarian?

- ○ No, I eat meat (beef, pork, fish, or chicken).
- ○ Yes, but sometimes I eat meat (beef, pork, fish, or chicken).
- ○ Yes, I never eat meat (beef, pork, fish, or chicken).

39. Do you *usually* take a vitamin or mineral pill?

- ○ Yes
- ○ No

40. When you think about the way you *usually* eat, would you say that your eating habits are:

- ○ Much healthier than those of most people my age
- ○ Somewhat healthier than those of most people my age
- ○ About the same as those of most people my age
- ○ Somewhat less healthy than those of most people my age
- ○ Much less healthy than those of most people my age

41. Do you usually eat or drink something for breakfast?

- ○ Almost Always or Always
- ○ Sometimes
- ○ Almost Never or Never

42. Do you eat the school lunch served in the cafeteria?

- ○ Almost Always or Always
- ○ Sometimes
- ○ Almost Never or Never

43. On how many of the past 7 days did you exercise or take part in physical activity that made your heart beat fast and made you breathe hard for *at least 20 minutes*? (For example: basketball, soccer, running or jogging, fast dancing, swimming laps, tennis, fast bicycling, or similar aerobic activities)

- ○ 0 days
- ○ 1 day
- ○ 2 days
- ○ 3 days
- ○ 4 days
- ○ 5 days
- ○ 6 days
- ○ 7 days

44. On how many of the past 7 days did you take part in physical activity or exercise for *at least 30 minutes* where your heart did *not* beat fast or you did *not* breathe hard, such as fast walking, slow bicycling, skating, pushing a lawn mower, or mopping floors?

- ○ 0 days
- ○ 1 day
- ○ 2 days
- ○ 3 days
- ○ 4 days
- ○ 5 days
- ○ 6 days
- ○ 7 days

Please continue on next page

45. On how many of the past 7 days did you do exercises to strengthen or tone your muscles, such as push-ups, sit-ups, or weight lifting?

- ☐ 0 days
- ☐ 1 day
- ☐ 2 days
- ☐ 3 days
- ☐ 4 days
- ☐ 5 days
- ☐ 6 days
- ☐ 7 days

46. In an average week when you are in school, on how many days do you go to physical education (PE) classes?

- ☐ 0 days
- ☐ 1 day
- ☐ 2 days
- ☐ 3 days
- ☐ 4 days
- ☐ 5 days

47. During an average physical education (PE) class, how many minutes do you spend actually exercising or playing sports?

- ☐ I do not take PE
- ☐ Less than 10 minutes
- ☐ 10 to 20 minutes
- ☐ 21 to 30 minutes
- ☐ 31 to 40 minutes
- ☐ 41 to 50 minutes
- ☐ 51 to 60 minutes
- ☐ More than 60 minutes

48. During the past 12 months, on how many sports teams *run by your school* did you play (do not include PE classes)? Sports teams include soccer, basketball, baseball, swimming, gymnastics, wrestling, track, football, tennis and volleyball teams.

- ☐ 0 teams
- ☐ 1 team
- ☐ 2 teams
- ☐ 3 teams or more

49. During the past 12 months, on how many sports teams run by organizations *outside of your school* (like the park district, summer leagues, YMCA or church teams) did you play? Sports teams include soccer, basketball, baseball, swimming, gymnastics, wrestling, track, football, tennis, and volleyball.

- ☐ 0 teams
- ☐ 1 team
- ☐ 2 teams
- ☐ 3 teams or more

50. Do you currently participate in any other organized physical activities or take lessons, such as martial arts, dance, gymnastics, or tennis?

- ☐ Yes
- ☐ No

51. How many hours *per day* do you *usually* watch TV or video movies away from school?

- ☐ I don't watch TV or video movies
- ☐ 1 hour
- ☐ 2 hours
- ☐ 3 hours
- ☐ 4 hours
- ☐ 5 hours
- ☐ 6 hours or more

52. How many hours *per day* do you *usually* spend on the computer away from school? (Time on the computer includes time spent surfing the Internet and instant messaging).

- ☐ I don't use the computer
- ☐ 1 hour
- ☐ 2 hours
- ☐ 3 hours
- ☐ 4 hours
- ☐ 5 hours
- ☐ 6 hours or more

53. How many hours *per day* do you *usually* spend playing video games like Nintendo®, Sega®, PlayStation®, Xbox®, GameBoy® or arcade games away from school?

- ☐ I don't play video games
- ☐ 1 hour
- ☐ 2 hours
- ☐ 3 hours
- ☐ 4 hours
- ☐ 5 hours
- ☐ 6 hours or more

Please continue on next page

54. Have you ever tried to lose weight?
- Yes
- No

55. Are you trying to lose weight now?
- Yes
- No

56. Would you like to:
- Weigh more
- Weigh less
- Have weight stay about the same

57. Compared to other students in your grade who are as tall as you, do you think you weigh:
- The right amount
- Too much
- Too little (or not enough)

58. From which food group should you eat the *most* servings each day? Choose only *one* group.
- Breads, cereals, rice, pasta
- Dairy products (milk, cheese, yogurt)
- Fats, oils, sweets
- Fruits
- Meats, fish, poultry, beans, eggs, nuts
- Vegetables
- Don't know

59. From which food group should you eat the *fewest* servings each day? Choose only *one* group.
- Breads, cereals, rice, pasta
- Dairy products (milk, cheese, yogurt)
- Fats, oils, sweets
- Fruits
- Meats, fish, poultry, beans, eggs, nuts
- Vegetables
- Don't know

60. How many total servings of fruits and vegetables should you eat each day?
- At least 2 servings
- At least 3 servings
- At least 4 servings
- At least 5 servings
- Don't know

61. What is the recommended amount of Calories from fat that you should get from the foods that you eat?
- Not more than 10% of the total food energy (Calories) in your diet
- Not more than 20% of the total food energy (Calories) in your diet
- Not more than 25% of the total food energy (Calories) in your diet
- Not more than 30% of the total food energy (Calories) in your diet
- Not more than 35% of the total food energy (Calories) in your diet

62. Which contains the most Calories?
- One gram of protein
- One gram of fat
- One gram of carbohydrate

Please continue on next page

63. What you eat can make a difference in your chances of getting heart disease or cancer.
- ☐ True
- ☐ False
- ☐ Don't know

64. People who are overweight are more likely to have a higher risk of health problems than people who are not overweight.
- ☐ True
- ☐ False
- ☐ Don't know

65. People who are underweight are more likely to have a higher risk of health problems than people who are not underweight.
- ☐ True
- ☐ False
- ☐ Don't know

66. There is so much information about healthy ways to eat that it's hard to know what to believe.
- ☐ Agree
- ☐ Neither Agree nor Disagree
- ☐ Disagree

67. The foods that I eat and drink are healthy so there is no reason for me to make changes.
- ☐ Agree
- ☐ Neither Agree nor Disagree
- ☐ Disagree

68. Skipping meals such as breakfast or lunch affects my ability to do well in my classes.
- ☐ Agree
- ☐ Neither Agree nor Disagree
- ☐ Disagree

69. I think that learning about the relationship between food and health is important for students my age to know.
- ☐ Agree
- ☐ Neither Agree nor Disagree
- ☐ Disagree

70. I think that learning about the relationship between physical activity and health is important for students my age to know.
- ☐ Agree
- ☐ Neither Agree nor Disagree
- ☐ Disagree

71. I am willing to try new foods.
- ☐ Almost Always or Always
- ☐ Sometimes
- ☐ Almost Never or Never

72. I like to eat the school lunch served in the cafeteria.
- ☐ Almost Always or Always
- ☐ Sometimes
- ☐ Almost Never or Never

73. I think the school lunch served in the cafeteria is nutritious.
- ☐ Almost Always or Always
- ☐ Sometimes
- ☐ Almost Never or Never

74. During the past 12 months, did you ever feel so sad or hopeless almost every day for two weeks or more in a row that you stopped doing some usual activities?
- ☐ Yes
- ☐ No

Thank you very much for your help!

PLEASE DO NOT WRITE IN THIS AREA

Student's Height . cm

Student's Weight . kg

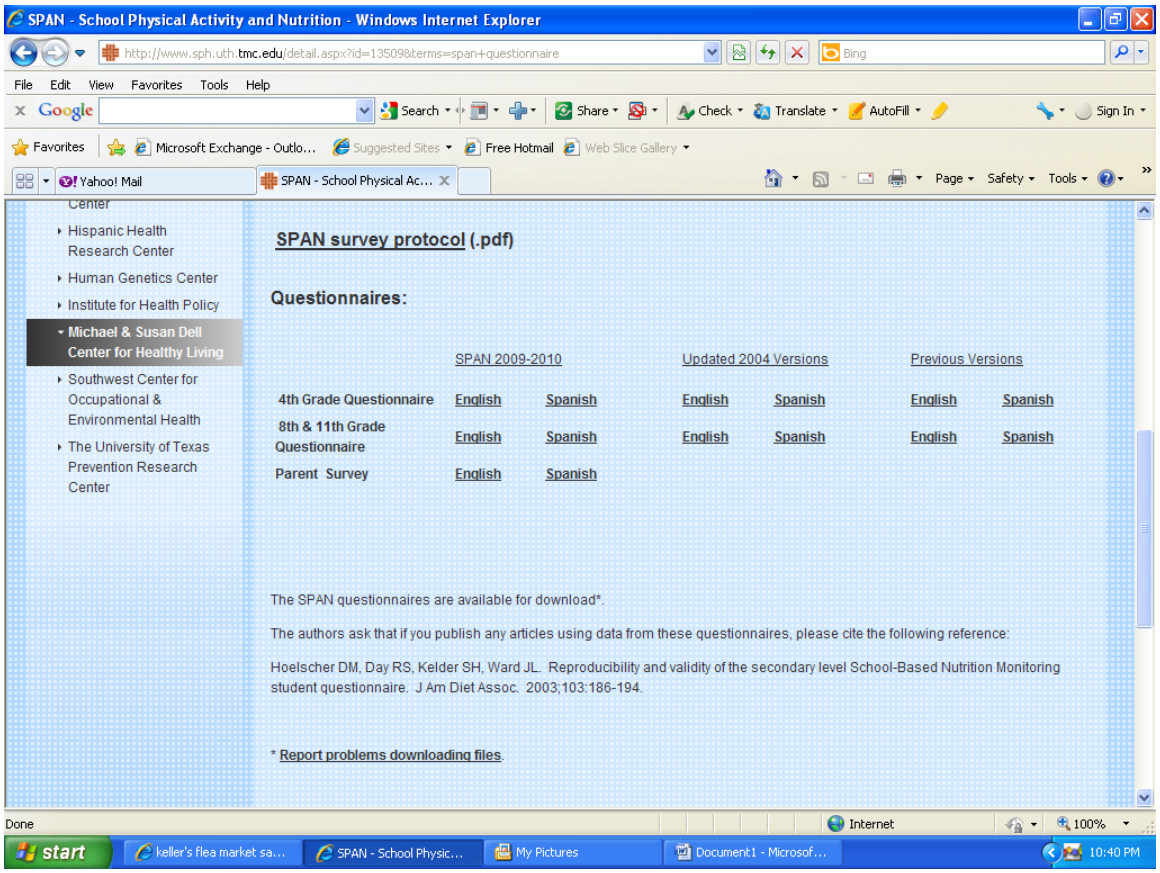
Comments: ☐

00001

J & D Data Services 10/04, v8

Appendix B

Permission to Use SPAN Questionnaire


SPAN - School Physical Activity and Nutrition - Windows Internet Explorer
http://www.sph.uth.tmc.edu/detail.aspx?id=13509&terms=span+questionnaire
Center
Hispanic Health Research Center
Human Genetics Center
Institute for Health Policy
Michael & Susan Dell Center for Healthy Living
Southwest Center for Occupational & Environmental Health
The University of Texas Prevention Research Center
SPAN survey protocol (.pdf)
Questionnaires:
SPAN 2009-2010
Updated 2004 Versions
Previous Versions
4th Grade Questionnaire
8th & 11th Grade Questionnaire
Parent Survey
English
Spanish
The SPAN questionnaires are available for download*.
The authors ask that if you publish any articles using data from these questionnaires, please cite the following reference:
Hoelscher DM, Day RS, Kelder SH, Ward JL. Reproducibility and validity of the secondary level School-Based Nutrition Monitoring student questionnaire. J Am Diet Assoc. 2003;103:186-194.
* Report problems downloading files.
Done
Internet
100%
start
10:40 PM

Appendix C

Permission to Conduct Study

Candler County Board Of Education
210 South College Street, Metter, Georgia 30439
Phone: (912) 685-5713
Fax: (912) 685-3755

To Whom It May Concern:

After carefully reviewing the details of the study proposed by Kathy Hood, she has approval to facilitate this study which will take place within the boundaries of our 7th and 8th grade health class with our current health instructors.

Signature: Thomas F Bigwood Date: 3-30-2011
School Superintendent

To: Kathy Hood

From: Evelyn Campbell Evelyn J. Campbell
Assistant Superintendent, Curriculum, Gifted, Migrant, Homeless

Subject: Consent Forms for Dissertation

Date: March 18, 2011

The designed dissertation utilizes data collected during a routine, approved health class nutrition module. Obtaining parental consent should not be required.

To: Kathy Hood

From: Robbie Dollar 03-15-2011
Principal Metter Middle School

Subject: Consent Forms for Dissertation

Date: March 18, 2011

I support obtaining passive consent forms from parents for your research. When possible Candler County Schools inform parents but do not request parents sign and return the form. Students will not be leaving the campus, and will remain under the authority of the school during the class presentation and data retrieval from students. Requesting that parents sign and return the form adds more responsibility to teachers when the consent is not necessary for our school guidelines.

Appendix D

Requests to Waive Consent Forms

To: Kathy Hood

From: Tom Bigwood, Ed. D
Superintendent, Candler County School District

Subject: Dissertation Consent Forms

Date: March 24, 2011

The proposed dissertation will be conducted as part of the regular health class. Obtaining consent forms for students to participate in regularly scheduled class activities should not be required.

Appendix E

SPAN Survey Protocol

SPAN Student Survey Administration Protocol Adjusted for use at Candler County Schools

School Physical Activity and Nutrition (SPAN) Project

I. Purpose

The purpose of the School Physical Activity and Nutrition (SPAN) Project student surveys is to collect information about dietary behaviors, knowledge and attitudes from a representative sample of students in grades seven and eight.

II. Survey Administration

A. Must be done on day following a school day, i.e., Tuesday through Friday.

B. If Monday is a holiday, the questionnaire must be administered on a Wednesday – Friday.

C. Can be administered at any time during the day.

D. The questionnaire can be read aloud to 4th grade students (recommended).

III. Staffing Needs

A. The SPAN measurement team will teach the classroom teacher how to administer the survey.

B. Teachers and other individuals can assist with classroom management and to clarify the pronunciation of words or translation of words.

IV. Materials

A. SPAN student surveys

B. SPAN student survey administration protocol

C. Pencils (one per student plus extras)

V. Administration Protocol

A. Instructions for SPAN team member are in lower case plain type.

B. Instructions to be read aloud to the students are in lower case bold italics type.

C. Pass out the student surveys and pencils.

Good morning (afternoon). Today we are surveying students your age. We would like you to complete a questionnaire. Each class asked to participate was done so at random. We will complete the first couple of pages of the survey together. Does anyone have any questions before we begin?

D. SPAN Student Survey

Please fill in your name, school and grade at the top of the first page. Allow students time to complete this section. ***Please listen as I read the first page to you. You will be asked to answer questions about your food choices and physical activity (exercise). Taking part in this project is up to you. Your choice about taking part will not affect your grades in school or your ability to take part in any school activities. You do not have to answer any questions if you don't want to. You may stop taking part in this project during the time you are getting your height and weight taken, while answering questions, or at any other time. After you complete the questionnaire, the page with your name on it (Student Assent From) will be removed. Your name will never be used after that. By signing below, you agree to take part in this project. Does anyone have any questions?*** Allow time for students to sign and date the student assent form. Please note,

students are permitted to decline to participate even if their parents gave their consent.

Turn to the next page which says "Student Information". Read the paragraph in the box at the top of the page. ***This is a questionnaire about what students your age eat and what they know about nutrition, and their physical activity (exercise). Read each question carefully and pick the answer that is true for you. Mark that answer on your questionnaire as shown in the example below. This is not a test, and there are not right or wrong answers. Remember, your answers will be kept private.***

Now we are going to fill in the Student Information section together. Write the name of your school in the blank.

Question: Bubble in your school ID#. The numbers to bubble in are in the boxes above the columns of each number.

Question: Everyone should bubble in your grade.

Question: Bubble in today's date.

Question: Bubble in your age.

Question: Bubble in the correct circle to indicate whether you are a boy (male) or a girl (female).

Question: Bubble in the circle next to the best description of yourself. Some people fall into more than one of these groups. We want you to pick the one that you think best describes you.

Question: Bubble in what language you use with your parents most of the time.

The first series of questions of the survey deal with foods that you ate or drank yesterday. Yesterday was (name of day). Think about what you ate and what you drank yesterday. Please count only what you ate or drank yesterday, even if it was not a normal day for you.

Suppose you ate green beans and salad for lunch and mashed potato and broccoli for dinner, which circle would you bubble in? (Wait for responses.) You ate two vegetables for lunch and two vegetables for dinner, so you ate four vegetables which count for the question. You would bubble in the 3+ circle. This means you ate vegetables three or more times yesterday. Remember, when you answer this question on your survey, you will consider only the vegetables you ate yesterday.

Are there any questions about the instructions I've just explained? (If students ask questions about specific survey questions, help clarify the questions for the students, but do not provide answers.) ***If you have a question while you are taking the survey, please raise your hand and someone will help you. You may begin.***

VI. After survey is completed

Check to make sure all answers are bubble in completely. If a question is not completed, ask the student if they intended to complete the question or leave it blank. They are allowed to leave a question blank if they want. Be sure to reassure students that you are not checking their answers for accuracy, but making sure all of the questions were answered. ***Thank you for your participation in this project!***

Appendix F

Revised SPAN Questionnaire Page 1

STUDENT INFORMATION

1. What is today's date?_____
2. Circle your grade. 7^{th} 8^{th}
3. What is your birth date? Please state the month, day and year. _____
4. What is your age? _____
5. Circle your sex. Male Female
6. How do you describe yourself?

   ___American Indian or Alaska Native

   ___Asian

   ___Black or African American

   ___Hispanic or Latino

   ___Native Hawaiian or Other Pacific Islander

   ___White, non-Hispanic, non-Latino

   ___Other

Appendix G

Revised SPAN Questionnaire Page 6

63. What you eat can make a difference in your chances of getting heart disease or cancer.
- ☐ True ☐ False ☐ Don't know

64. People who are overweight are more likely to have a higher risk of health problems than people who are not overweight.
- ☐ True ☐ False ☐ Don't know

65. People who are underweight are more likely to have a higher risk of health problems than people who are not underweight.
- ☐ True ☐ False ☐ Don't know

66. There is so much information about healthy ways to eat that it's hard to know what to believe.
- ☐ Agree ☐ Neither Agree nor Disagree ☐ Disagree

67. The foods that I eat and drink are healthy so there is no reason for me to make changes.
- ☐ Agree ☐ Neither Agree nor Disagree ☐ Disagree

68. Skipping meals such as breakfast or lunch affects my ability to do well in my classes.
- ☐ Agree ☐ Neither Agree nor Disagree ☐ Disagree

69. I think that learning about the relationship between food and health is important for students my age to know.
- ☐ Agree ☐ Neither Agree nor Disagree ☐ Disagree

70. I think that learning about the relationship between physical activity and health is important for students my age to know.
- ☐ Agree ☐ Neither Agree nor Disagree ☐ Disagree

71. I am willing to try new foods.
- ☐ Almost Always or Always ☐ Sometimes ☐ Almost Never or Never

72. I like to eat the school lunch served in the cafeteria.
- ☐ Almost Always or Always ☐ Sometimes ☐ Almost Never or Never

73. I think the school lunch served in the cafeteria is nutritious.
- ☐ Almost Always or Always ☐ Sometimes ☐ Almost Never or Never

74. During the past 12 months, did you ever feel so sad or hopeless almost every day for two weeks or more in a row that you stopped doing some usual activities?
- ☐ Yes ☐ No

Thank you very much for your help!