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THE EFFECT OF NUTRITION KNOWLEDGE ON FOOD CHOICES AND BODY MASS INDEX PERCENTILE RANKINGS OF ELEMENTARY SCHOOL CHILDREN: RESULTS FROM AN IN-SCHOOL NUTRITION EDUCATION PROGRAM

by

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A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Public Affairs in the College of Health and Public Affairs at the University of Central Florida Orlando, Florida

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ABSTRACT

The prevalence of overweight and obese children has increased dramatically in the United States over the past 20 years and is a symptom of multiple systemic and cultural changes that have significantly influenced alterations in energy intake, energy expenditures, and the energy balance of children across the nation. School-based obesity prevention programs addressing nutrition and healthy eating behaviors within the school environment and cultural context provide a unique opportunity to educate and engage students in healthy food consumption practices. This study evaluated the effectiveness of a three-year elementary school nutrition education program for students in grades kindergarten through fifth using a longitudinal analysis of two separate data sets, a nutrition skills behavior assessment survey of self-reported eating behaviors, and body mass index (BMI) scores derived from height and weight measurements of program participants. Nutrition survey results indicated that students reported making healthier food choices from August 2001 to November 2004, with a significant decrease in reported consumption of fats/oils/sweets and significant increases in reported consumption of milk, meat, vegetables, fruit and grains. BMI results indicated a 7.8% decline in the percentage of students in the “overweight” and “at-risk for overweight” categories between August 2001 and October 2004. The combined results of both measures indicate that the nutrition education program appeared to positively affect eating behaviors and body mass index percentages. Implications of the study and strategies for further research are proposed.
To Taylor—my husband of thirty-five years, 

your belief in me, and your love and constant support 

have provided the solid foundation for my success. 

I love you.
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CHAPTER ONE: STATEMENT OF THE PROBLEM

The Prevalence of Childhood Obesity

The prevalence of overweight and obese children has increased dramatically in the United States over the past 20 years and is a symptom of multiple systemic and cultural changes that have significantly influenced alterations in energy intake, energy expenditures, and the energy balance of children across the nation. This has resulted in more and more children becoming obese (Anderson & Butcher, 2006). In 2001, the Surgeon General of the United States published a “Call to Action to Prevent and Decrease Overweight and Obesity” (2006, p. v). The document states that, “overweight and obesity have reached nationwide epidemic proportions” (2006, p. v).

According to the Centers for Disease Control (The importance of physical activity, 2004), obesity is on the rise for children and youth across the nation. Ogden, Flegal, Caroll, and Johnson (2007, p. 1) report that data, from the National Health and Nutrition Examination Surveys (NHANES) for children and youth of various ages from 1971 to 2004, show “increases in overweight among all age groups.” They report that among preschool children the “prevalence of overweight increased from 5.0% to 13.9% among school-aged children, aged 6-11 years, the prevalence of overweight increased from 4.0% to 18.8% . . . and . . . among school-aged adolescents, aged 12-19 years, the prevalence of overweight increased from 6.1% to 17.4%” (Ogden, Flegal, Caroll & Johnson, 2007, p. 1).

The Center for Health and Health Care in Schools report, titled, Childhood Overweight What the Research Tells Us (2005, p. 1, para. 1) and a National Institute of Health research report (Strategic plan for NIH obesity research: A report of the NIH obesity research task force,
2004) indicate that, “the percent of school-age children 6-11 that are overweight nearly tripled since 1970 rising from 6.5% to approximately 16% during the same time period” and that, “obesity is impacting young people of Mexican and African-American descent particularly” (Strategic plan for NIH obesity research: A report of the NIH obesity research task force, 2004, p. 9, para. 3). The NIH report (Strategic plan for NIH obesity research: A report of the NIH obesity research task force, 2004, p. 9) also indicates that “the dramatic increase in obesity prevalence over the past two decades is considered a consequence of the interaction of genetic susceptibility with behavioral changes and with factors pervasive in today’s environment that promote increased caloric intake and sedentary lifestyles.” In addition, according to the NIH report (Strategic plan for NIH obesity research: A report of the NIH obesity research task force, 2004, p. 9), “obesity shortens life expectancy: on average, people who are moderately obese have a life expectancy two to five years less than those who are not overweight or obese.”

The evidence of significant increases in the percentage of children and youth who are overweight and at-risk for overweight continues to accumulate. In their review of trends in childhood obesity rates, Anderson and Butcher (2006, p. 24) suggest that, “BMI is becoming more unequally distributed: the heavy have gotten much heavier. Furthermore, obesity is not evenly distributed across socio-demographic groups.” They indicate that minority children and those in lower socioeconomic groups are more likely to be overweight than their white, higher socioeconomic counterparts. In addition, Anderson and Butcher (2006, p. 24) point out that those with, “susceptibility to obesity will come down with it.”

identified overweight and obesity as one of the ten indicators that will be used to provide a snapshot of the health of the nation. One of the objectives selected by Healthy People 2010 (2004, p. 5) is “to measure progress among children, adolescents and adults” regarding the obesity health indicator and, “to reduce the proportion of children and adolescents who are overweight or obese” (2004, p. 5). Healthy People 2010 further supports the position of the Centers for Disease Control (CDC), that overweight and obesity substantially increase the risk factors for “high blood pressure, high cholesterol, type 2 diabetes, heart disease and stroke, gallbladder disease, arthritis, sleep disturbances and problems breathing, and certain types of cancers” (2004, p. 5).

The Georgetown University Center on an Aging Society (Childhood obesity—A lifelong threat to health, 2002, p. 1) published a report decrying the fact that, “almost 14 million children—24 percent of the U.S. population ages 2 to 17—are obese. An additional 8.6 million children are at risk for obesity.” More importantly, the report indicates the fact that “some 24% of children from lower income households are obese, compared to 19 percent of children from higher income households.” The report further indicates that one third of black children and over one fifth of white children are obese with a larger percentage of boys and children from the South being obese. As reported earlier, it is important to emphasize the fact that the incidence of obesity isn’t equal across gender and race. The apparent connection between childhood obesity and income level is further indicated by the fact that more obese children are covered by Medicaid than private insurance and that the families of obese children pay a substantial amount of out-of-pocket for health care, 25% (Childhood obesity—A lifelong threat to health, 2002, p. 1).
The American Obesity Association (2002), the ERIC Digest (2004), and the National Association for Sport and Physical Education (2002) have also published articles about the childhood “obesity epidemic.” Vail (2004) and Black (2004) both identified childhood obesity as the “largest emerging issue” facing our children. Again, they emphasized the fact that the personal toll of childhood obesity (health, economic, social) is significant for all overweight children. Thorpe, List, Marx, May, Heigerson, and Frieden (2004) support the fact that there is a continuing increase in the percentage of children who are overweight and at-risk for overweight with an emphasis on minority children, specifically black and Hispanic, who are at much greater risk for childhood obesity than their white counterparts. Denny, Holtzman, Goins, and Croft (2005, p. 826) indicated that American Indians and Alaska Natives are also significantly more likely to be obese than their Caucasian counterparts; as much as 50% higher in women. This further substantiates the fact that minority children are at significantly greater risk for being overweight.

Story, Evans, Fabsitz, Clay, Rock, and Broussard (1999) studied the prevalence of obesity in American Indian communities. They found that a combination of genetic factors, environmental factors, economic factors and developmental factors relating to maternal diabetes during pregnancy, have significant impact on the obesity rates in American Indian children. They found that several studies reported increases in obesity in American Indian children and that “the prevalence rates of obesity are higher in American Indians, [so that] they will probably be disproportionately affected by obesity-related morbidity” (Story, Evans, Fabsitz, Clay, Rock & Broussard, 1999, p. 747S). Wickrama, Wickrama, and Bryant (2006, p. 647) supported those findings in their study which looked at community influences on adolescent obesity. They found that, “the prevalence of obesity is significantly higher in poor communities than in affluent
communities; and it is higher among African Americans, Hispanics and Native Americans than among Whites.” In the Pathways Study of American Indian school children, the participating American Indian students reported that tribe-specific studies indicated that obesity percentages ranged from 25% to 46% in the 5-18 year age group (Caballero et al, 2003, p. 1030).

Several articles (Martin, 2004; O’Loughlin, Paradis, Meshefedjian, and Gray-Donald, 2000; The Arkansas assessment of childhood and adolescent obesity, 2004) present evidence of significant increases in the percentage of children and youth who are overweight ($\geq 95^{th}$ age- and gender-specific percentile for body mass index) and at-risk for overweight ($\geq 85^{th}$ to $< 95^{th}$ age- and gender-specific percentile for body mass index). In the Arkansas study (2004), it was found that 21% of the children and youth in that state met or exceeded the CDC criteria for being overweight and 17% were at risk for overweight. The Montreal study by O’Loughlin, Paradis, Meshefedjian, and Gray-Donald (2000) not only supports the Arkansas study, but shows more alarming percentages in the at-risk for overweight (35.9%) and overweight (15.9%) ranges and indicates that the rate of percentage increase per year for children and youth in those high risk categories is 1.3% per year for at-risk for overweight, and 1.0% per year for overweight.

Recently, Ogden et al (2006, p. 1549) analyzed the height and weight measurements of 3958 children and adolescents obtained in 2003-04 as a part of the National Health and Nutrition Examination Survey (NHANES), they found that the prevalence estimates of overweight among children “has increased significantly during the 6-year period from 1999 to 2004.” They indicated that in 2003-04, 17.1% of children and adolescents were overweight (based on BMI). Although they found that there was no significant difference in prevalence of overweight between male and female children and adolescents, they did find significant differences between racial/ethnic groups with Mexican American children and adolescents having significantly
greater prevalence of overweight. One of the most critical findings of their study with regard to minority populations was the fact that “Mexican American and non-Hispanic black female children and adolescents were more likely to be overweight compared with non-Hispanic white female children and adolescents” (Ogden et al, 2006, p. 1550).

In Kids Count State-Level Data Online provides the state-by-state percentages of overweight and obese children and teens, by gender (Kids Count State-Level Data Online, 2007). The 2003 data revealed that the percentage of children and teens in the overweight or obese categories ranged from a low of 22% in Colorado to a high of 38% in Kentucky. The average percentage of children and teens that were overweight or obese across the United States was 31%. Every indicator suggests that these percentages will continue to rise across the country.

In 2004, the Florida Governor’s Task Force on the Obesity Epidemic issued a report on the obesity epidemic in Florida. It stated that obesity has become a major health problem, not only in Florida, but also across the nation. According to that report, “the prevalence of obesity has nearly doubled over the last decade” (Obesity in Florida, report of the governor’s task force on the obesity epidemic, 2004). In 2004, the Winter Park Health Foundation and the Community Health Improvement Council (Winter Park Health Foundation, 2004) published findings related to health and obesity in Central Florida. Although this report focused on adults in the Central Florida area, the report still has implications regarding the percentage of overweight children in Central Florida. The report specified that 22.2% of the people living in the four counties in Central Florida area were obese; which is 7.2% above the 15% Healthy People 2010 objective. It also confirmed that minorities, again, make up a higher percentage of Central Floridians who are obese with 20.2% of Hispanics and 27.7% of Blacks who are obese. Finally, the research indicated that only 24.5% of adults in Central Florida are consuming five or more servings of
fruits and vegetables per day which is significantly under the Healthy People 2010 goal of 75% or higher. The prevalence of obesity in the children and youth and adults in Central Florida reflects the obesity crisis across the United States.

**Consequences of Obesity**

Numerous studies (Koplan et al, 2005; Strategic plan for NIH obesity research, 2004; The Arkansas assessment of childhood and adolescent obesity, 2004; and Ritchie, Ivey, Masch, Woodward-Lopez, Ikeda, and Crawford, 2001; Frary and Johnson, 2000) indicate that there are severe, long-term health consequences for overweight children and youth. The risk for becoming an overweight adult is many times higher in overweight children. The risk for chronic diseases such as high blood pressure, diabetes, blood lipid disorders, coronary artery disease, and osteoporosis, is also much higher in overweight children. Currently, there is an epidemic of type 2 diabetes, formerly known as “adult onset” diabetes, in children. The National Institute of Medicine (Koplan et al, 2005, p. 2) is predicting that, “for children born in the United States in 2000, the lifetime risk of being diagnosed with type 2 diabetes at some point in their lives is estimated at 30 percent for boys and 40 percent for girls, if obesity rates level off.” Zizza et al (2004) compared the length of hospital stays between normal and obese individuals with the conclusion that obese individuals experience longer hospital stays than normal weight individuals.

Stephen R. Daniels (2006, p. 47) notes that “many obesity-related health conditions once thought applicable only to adults are now being seen in children and with increasing frequency.” Daniels (2006) indicates that there are six areas where the obesity epidemic is having short- and long-term effects on our children: 1) cardiovascular problems such as heart disease, 2) metabolic
disorders such as type 2 diabetes, 3) pulmonary complications such as sleep disorders, 4) gastrointestinal disorders such as gastro esophageal reflux, 5) skeletal abnormalities such as tibia vara, and 6) psychosocial issues such as depression. It is clear that sedentary lifestyles and physical inactivity are significant risk factors for obesity in children and youth, and are also predictors of long-term negative health consequences. In addition, it is apparent that a high fat, high sugar diet is also a predictor of long-term negative health consequences.

Anderson and Butcher (2006, p. 19) state that there are some significant changes in the environment that have affected the energy balance (energy intake vs. energy expenditure) of our children: 1) the changes in the food market such as the increase in soda consumption and an increase in portion sizes, 2) changes in the built environment that create barriers to exercise such as the fact that schools are further away so fewer children walk to school, 3) changes in schools and child care which may be resulting in an increase in calorie dense foods and beverages, and 4) changes in parenting roles and the hours that children are watching television and playing computer games. One of the most critical arguments that Anderson and Butcher (2006, p. 24) make is that genetics plays a significant role in overweight and that environmental changes may affect weight gain in genetically susceptible populations. These cultural and environmental changes have occurred gradually over time with the result that changes in eating behaviors have become fixed habit patterns in society. The most visible changes include a substantial increase in portion sizes, the tendency to choose more flavorful, higher fat foods, and an increase in the consumption of high calorie beverages such as sodas, for example.

There are many severe economic costs to obesity. According to the National Institute of Medicine (Koplan et al, 2005, p. 2) “national health care expenditures related to obesity and overweight in adults alone have been estimated to range from approximately $98 billion to $129
billion.” The National Institutes of Health (Strategic plan for NIH obesity research, 2004, p. 1) reports that obesity “leads to devastating and costly health problems, reduces life expectancy, and is associated with stigma and discrimination. [That] obesity is a strong risk factor for such serious diseases as type 2 diabetes and heart disease; it is also a risk factor for certain cancers and is associated with depression and other medical conditions.” This means that the variety of long-term illnesses resulting from obesity may have potentially catastrophic economic impact on future healthcare systems in our country. Future impact on the Medicaid population could be even higher since a higher percentage of minority and low socioeconomic groups are affected by obesity.

It is clear that childhood obesity is a serious health issue. Not only are our children fatter than ever before, the percentage of children who are overweight in all age groups continues to increase at a rapid rate. Research indicates that intervening early in a child’s life, with programs designed to teach good nutrition and healthy eating behaviors, will become increasingly important to the health of the adult each child will become. In addition, studies (Black, 2004; Harper, 2006; and Keirle & Thomas, 2000) indicate that our children and youth are less active, eating more, and getting heavier. As a result, childhood obesity has become a critical concern for families, communities, and health professionals across the country. The social, economic and health consequences of obesity will continue to increase without early intervention and health promotion programs. Programs that include successful strategies for teaching our children to eat more nutritiously are critical to the future health of our communities and our nation. Effective evaluation models that clearly capture the results of such programs are needed to ensure that effective program models are replicated.
Rationale for the Study

Childhood obesity has become one of the most common, and preventable, health problems facing children in America. As noted earlier, national data indicates that over 16% of our nation’s children and youth are overweight or obese. According to a report by The Center for Weight and Health (Ritchie, 2001) interventions to address child health and risk for obesity should “ideally begin with children prior to the onset and consolidation of risk-related behaviors after which time lifestyle habits may be harder to influence.” In addition, the Centers for Disease Control suggest that schools have the opportunity to play a significant role in contributing to either the health, or lack thereof, of students (School Health Defined: Coordinated School Health Program, 2004). In fact, the Centers for Disease Control have provided excellent tools to aid schools, school districts, and state departments of education in the development of coordinated school health programs that encompass eight dimensions applicable to the health and welfare of children (2004). These include the Coordinated School Health Program (CSHP), the School Health Policies and Programs Study (SHPPS), and the School Health Index (SHI) which is an evaluative tool based on the idea that a consistent approach to the development of school health promotion programs must include the practices most likely to result in improved health outcomes (CDC.gov, 2004).

Wechsler, McKenna, Lee, and Dietz (2004) in their article, Childhood Obesity, stress the importance of the role of schools in preventing childhood obesity. They state that, “schools cannot solve the obesity epidemic on their own, but it is unlikely to be halted without strong school-based policies and programs” (Wechsler, McKenna, Lee and Dietz, 2004, p. 6). They identify four reasons why schools are a critical venue in which to focus child obesity prevention efforts (Wechsler, McKenna, Lee and Dietz, 2004, p. 6):
• Over 95% of young people are enrolled in schools.

• Promotion of physical activity and healthy eating have long been a fundamental component of the American educational experience, so schools are not being asked to assume new responsibilities.

• Research has shown that well-designed, well-implemented school programs can effectively promote physical activity, healthy eating, and reductions in television viewing time.

• Emerging research documents the connections between physical activity, good nutrition, physical education, and nutrition programs, and academic performance.

They continue to maintain that the implementation of a comprehensive school health program with its widespread focus on improving child health outcomes, one that emphasizes nutrition and physical activity, “is entirely consistent with the fundamental mission of schools: educating young people to become healthy, productive citizens” (Wechsler, McKenna, Lee and Dietz, 2004, p. 11).

In a Brookings Institute policy brief, Haskins, Paxson, and Donahue (2006, p. 2) discuss the importance of fighting obesity in the school setting. They suggest that “schools have the opportunity [then] both to influence the nutrition children receive on a regular basis and to help children establish healthful lifelong eating habits.” A notable researcher in the field, Mary Story, supports the position of Wechsler and his associates. In her article, School-Based Approaches for Preventing and Treating Obesity, she states that, “the school environment provides multiple food and nutrition activities, experiences, and exposures. These include not only school meals and classroom curricula, but also food sold in vending machines, school stores and snack bars; fund-
raising events; classroom snacks and parties; use of food to reward and to discipline; corporate-sponsored nutrition education materials; and in-school advertising of food products” (Story, 1999, p. S48). It is apparent that there is sound theoretical, social, institutional, and governmental support for the implementation of obesity prevention and health promotion programs within the school setting. In fact, other than in the family setting, schools may provide the optimum opportunity in which to intervene in the childhood obesity epidemic.

As stated earlier, there have been multiple studies that focus research on the childhood obesity phenomenon (Frary, Johnson, & Wang, 2004; Drewnowski, Almiron-Roig, Marmonier, & Lluch, 2004; Ebbling, Pawlak, & Ludwig 2002, Carraro & Cebrain, 2003; Evans, Renaud, Finkelstein, Kamerow, & Brown, 2006; Vail, 2004; Green & Reese, 2006; and Harper, 2006. In addition, many studies (Kandiah, 2002; Davis, Davis, Northington, Moll, & Kolar, 2002); Lowe, Horne, Tapper, Bowdery, & Egerton, 2004; Sallis, et al, 2003; Story, 1999; Sutherland, Gil & Binns, 2004); Dixey, Shaota, Atwal, & Turner, 2001; Auld, Romaniello, Heinmendinger, Hambidge, & Hambidge, 1999; O’loughlin, Paradis, Meshefedjian, & Grey-Donald, 2000; Danielzik, Pust, Landsberg, & Muller, 2005; and French, Story, Fulkerson, & Hannan, 2004) have focused on evaluating programs designed to address this phenomena, specifically, nutrition education programs in the school setting. Those studies, both explorative and empirical, address a multitude of approaches to tackling childhood obesity in the school setting. It is important to note, however, that there are few research studies that evaluate the effects of in-school obesity related programs over a significant length of time using cohorts. While there are some longitudinal studies, most are very short-term (three to six months) and do not provide longer term evaluation of results.
In one elementary school nutrition education program study, Auld, Romaniello, Heimendinger, Hambridge, and Hambridge (1999) used a quasi experimental design to evaluate the effectiveness of the intervention using a pre- and post-test during the 1997-1998 school year. Bellisle and Rolland-Cacherat (2000) surveyed French children about their dietary intake over a four-year period, from 1993 to 1997, but this was simply a dietary observation study. Dixon, McKenzie, et al (1997) assessed fat intake in children after participation in a three month nutrition education program. They found that children who replaced fatty foods ate more fruits and vegetables. This was a short-term study with limited ability to suggest any positive long term results.

Kain, Uauy, Albala, Vio, Cerda, and Leyton (2004) studied a six month nutrition and physical activity program on changes in body fat percentages and physical fitness levels. The results showed increased physical fitness for both genders and lower body fat percentages in boys only. This study was of longer duration than the previous one, but still covered a very short time period in which to demonstrate significant changes. In fact, overall, BMI scores increased, at least in the short-term. Kandiah and Jones (2002) studied the effect of a three week school nutrition program on food choices of fifth graders. Again, this was another very short-term study that was only able to demonstrate limited results.

In her article, School-based Approaches for Preventing and Treating Obesity (1999, p. S43), Story found eleven short-term studies that demonstrated “positive though modest results.” A longer duration nutrition study covered an eighteen month time period. Powers, Struempler, Guarino, and Parmer (2005) analyzed the results of a six week nutrition education program for second and third grade students over an eighteen month period. They found that nutrition
education programs that teach healthy eating behaviors have the potential to improve eating behaviors.

Finally, one of the most important longitudinal studies to look at obesity prevention is the Kiel Obesity Prevention Study (KOPS). In this study, two low level health promotion interventions were implemented—one was a school-based intervention addressing nutrition and physical activity, and the other was family-based and involved in home professional consultations with families in the Kiel community (Danielzik, Pust, Landsberg, & Muller, 2005). The children were followed for four years, and were re-evaluated at the tenth year. Most studies of nutrition education and childhood obesity prevention programs are of short duration and involve the use of pre- and post-test to determine the program results. However, the KOPS study assessed the prevalence of overweight and obesity, and the long-term effects of school and family interventions. The study program used low level nutrition intervention strategies and included an initial baseline survey with two follow-up surveys over the course of the four year period. So far, they found that school intervention “decreases the incidence and increases the remission of overweight” (Danielzik, Pust, Landsberg & Muller, 2005, p. S81). The study also concluded that obesity is a societal issue and that environmental interventions must be implemented to “complement school- and family-based interventions” (Danielzik, Pust, Landsberg, & Muller, 2005, p. S78).

Many studies have looked at the necessary components of school nutrition programs, focusing from a variety of theoretical viewpoints. There have been several case studies and literature reviews that clearly highlight the importance of school nutrition programs and their potential effects on childhood obesity. There are, however, very few actual studies that are longitudinal in design. It is apparent that there are very few longitudinal studies that examine
nutrition education programs that focus on obesity prevention for school children, particularly those using the same cohort population.

It is clear that there is a paucity of research that includes evaluation of the long-term impact of school-based nutrition programs on participants. This lack of longitudinal research limits one’s ability to provide an accurate assessment of the contribution that such programs may make toward positively intervening in the childhood obesity phenomena. As discussed earlier, there have been some studies that use repeated measures from year to year, but, again, not with the same cohort population. In addition, most nutrition studies are short-term using either observations of school lunch consumption or self reports of eating behaviors in a pre-test, intervention, post-test format.

One of the most critical issues affecting the implementation of school-based obesity prevention studies is the lack of availability of student data. Student data is often severely limited due to the need for confidentiality and historically, although there are many school-based nutrition programs, data has not been collected in a uniform, consistent manner. The end result is that there is a noteworthy deficiency of research studies that capture the long-term effects of school-based nutrition intervention programs on childhood obesity. In addition to the lack of longitudinal studies, there is a scarcity of studies that assess the impact of in school nutrition education programs using cohort groups. Consequently, there is a considerable need for a longitudinal study, using the same cohort, that examines the relationship between the theory, goals, implementation methodology, and results of a school-based nutrition program - a study that can assess intermediate changes in the eating behaviors and long-term body mass index percentile ranking results of nutrition program participants. This study will help to address that research gap.
This study will also make some key contributions in terms of theory and methodology. There is a true need to be able to identify strong theoretical support for the use of in-school nutrition education programs that address multiple facets of the school environment such as staff and administration, in class curricula, student knowledge and behavior, school culture, and family and community involvement. The lack of empirical studies that examine the results of individual, systemic and cultural interventions within the school environment are practically non-existent, especially regarding in-school programs that address the issues of healthy eating and obesity. This necessarily weakens the contention that in-school health promotion and obesity prevention programs provide a unique opportunity to address behaviors in children that may lead to obesity in adulthood.

This study seeks to identify specific theories that support social, cognitive, behavioral, and environmental approaches to the development of healthy eating behaviors and a subsequent increase in the percentage of children with normal BMIs. It is distinctive from other studies given that, from the outset, it focuses on the importance of the involvement of teachers and administrators, students, and parents as key stakeholders in the change process. It provides the opportunity to assess the impact of a program that make use of age appropriate curricula, developed to be used as part of the regular school curriculum and that is applied consistently across grade levels. It is a multi-dimensionally designed program that is based in the recognition that for behavioral changes to become permanent, they require support from the entire school environment. It also recognizes that, to be enduring, changes in eating behaviors must be sustained over a longer period of time. Short-term studies, although important in their ability to demonstrate the relationship between nutrition education and changes in eating behavior, fail to demonstrate long-term results.
This study will use secondary data from two longitudinal databases containing student data gathered from nutrition surveys and BMI assessments over the three year period of the nutrition program. It uses a repeated measurement design and includes the same cohort of subjects over the entire three year time period. The ability to follow the same students over three years provides a unique opportunity to truly assess the impact of the nutrition program and validates the importance of the study and its contribution to obesity prevention research. The study uses time series analysis that includes the use of an F test of univariate repeated measurement to analyze a short-term or intermediate nutritional outcome (healthy eating behaviors), and a McNemar Test for Comparing Independent Proportions to assess the longer-term outcome (BMI), using a single cohort group (Agresti & Finlay, 1997). From a measurement perspective, the design is two dimensional. This is due to the use of two independent outcome measures, a short-term or intermediate outcome measure and a long-term outcome measure. This results in a measurement system that is unique with regard to other in-school nutrition program studies, and better able to provide additional information on the effect of the program on eating behaviors and on changes in Body Mass Index (BMI) scores.

This study should provide much needed information regarding the impact of a comprehensive nutrition education program on participants over time. Accordingly, this elementary school nutrition study will provide the opportunity to assess the long-term impact of a nutrition education program on elementary school age children. It will have the ability to assess the effectiveness of the nutrition program on two distinct measures—self-reported eating behaviors and Body Mass Index percentile rankings of elementary school children grades first through fifth grade. This study will be able to provide critical insight into the relationship between environment, education, cognition, and culture on healthy eating behaviors and BMI.
That information should be helpful in the future development of school nutrition programs across the county. It should also help guide future research into nutrition education in the schools and its impact on the health of our children.
CHAPTER TWO: LITERATURE REVIEW

The purpose of this study is to examine the effectiveness of an elementary school nutrition education program for students in grades kindergarten through fifth through a longitudinal analysis of self-reported eating behavior surveys and body mass index percentages of program participants over a three-year time span. A review of literature to guide the analysis of this program can appropriately begin with a clarification of the negative changes that have occurred in the American diet that have resulted in an increase in overweight and obese children, the importance of good nutrition and what constitutes a healthy diet, the importance of eating healthy, nutritious foods and the corresponding impact of that information on the subject matter of nutrition education programs for children. In addition, exploration of the related theories will be conducted to determine theoretical support for the program design, content and anticipated results.

Changes in the American Diet

There have been many significant changes to the American diet that have had a serious negative influence on the health of Americans, both young and old. According to the Center for Civic Partnerships (Local strategies to increase healthy eating and physical activity, 2003, p. 1), “U.S. food availability from 1970-1996 increased 500 calories to 3,800 calories per capita and fat by 25 percent, but the availability of fruits and vegetables increased by only nine-tenths of a serving.” In addition, the Center for Civic Partnerships (Local strategies to increase healthy eating and physical activity, 2003, p.1) indicated that our beverage consumption habits have
changed for the worse: “[with the] milk supply decreasing from 25.5 to 8.5 gallons per capita [and the] soft drink supply more than doubling from 24.3 to 53 gallons per capita.”

Societal changes, with their resulting impact on families, have also played an important role in the decrease in healthy, nutritious eating behaviors and the resulting increase of obesity in our children and youth. Koplan, Liverman, and Kraak, (2005, p. 2) report that, many [societal] changes – such as both parents working outside the home, longer work hours by both parents, changes in the school food environment, and more meals eaten outside the home . . . “often affect what children eat, where they eat, and how much they eat . . .” In addition, there have been many other societal changes such as an increasingly diverse population with resulting changes in cultural views, a significant change in television viewing with the related exposure to advertising, and a noteworthy trend in marketing patterns affecting children and youth.

Dietz and Gortmaker (2001, p. 337) stress that “between the completion of the second National Health Examination Survey (NHANES II) [in 1980], and the third (NHANES III) in 1994, the number of children and adolescents considered overweight . . . increased by 100% in the United States.” Dietz and Gortmaker (2001) go on to assert that the change in obesity rates occurred across all age, gender and ethnic groups and that these changes can only be the result of environmental effects on energy. Kranz, Siega-Riz, and Herring evaluated diet quality trends among preschoolers between 1977 and 1998. They found that “although overall diet quality has improved over time, overall energy intake has risen significantly, and there has been a shift from consumption of fats as a high proportion of total energy intake to one of nonfat macronutrients (for instance, added sugars)” (Kranz, Siega-Riz, & Herring, 2004, pp. 1528-1529).

The environmental changes that have resulted in an increase in the availability of foods for consumption and the promotion of those foods by the media have been going on for decades.
There are several powerful forces exposing our children to food products that are potentially harmful if eaten either in abundance or as substitutes for a balanced and nutritious diet. At the Maternal and Child Health Bureau Seminar on Adolescent Health, Steven Gortmaker (2003, p. 10) indicated that the most important forces influencing the poor nutrition and resulting obesity in young people are the “food producers” and the “fast food industry,” “advertisers for food and video/film industries,” and the “television and video/film production and distribution industry.”

Another environmental factor was examined by Lopez (2004) as he looked at the relationship between urban sprawl and the risk for being overweight or obese. He found that urban sprawl was indeed “associated with an increased risk for being overweight or obese” (Lopez, 2004, p. 1576), that it “may reduce the amount of time available for physical activity because parks or fitness facilities are more distant . . . [and] it also may affect diet by increasing the distance to supermarkets or it may increase the cost of nutritious food by causing the conversion of farmland to urban uses” (Lopez, 2004, p. 1577).

The increased availability of fast foods and soft drinks in schools makes those items readily accessible for consumption by students in the school setting. Although elementary school children have less exposure to soda machines, they are continuously exposed to high fat/high calorie foods through fund raisers, during and after school activities, and ala carte offerings in school cafeterias. In addition, candy and high caloric snacks have become part of the reward system that many teachers use in their classrooms. As a result, sugars represent 19% of the total energy consumption of 6-11 year olds, with soft drinks contributing the greatest percentage (22%) of added sugars—a huge increase over the last 20 years (Frary, Johnson, & Wang, 2004, p. 63).
The report, The Obesity Epidemic in Florida (2001, p. 5), summarizes these findings by stating that, “over the past 20 years—the time period during which the epidemic of obesity has emerged—dramatic changes have occurred in the social and physical environments, while genetics and physiology have remained largely unchanged . . . For example advertisements and media messages, ‘super-sized’ portions, and promotional pricing encourage the consumption of foods that are high in calories, sugar, or fat and low in nutrition, while plentiful fast food restaurants, vending machines and convenience stores make these foods readily available and easily accessible.” In addition, several studies (Denny, Holtzman, Goins, & Croft, 2005; The Obesity Epidemic in Florida, 2001; Ogden, Carroll, Curtin, McDowell, Tabak, & Flegal, 2006; Gortmaker, 2003) have indicated that poor nutrition and related obesity occur in far greater percentages in minority populations including African Americans, Hispanics and American Indians, and in lower socio-economic populations. Paxson, Donahue, Orleans, and Grisso (2006, p. 11) point out that “neighborhoods where low-income and minority children live typically have more fast-food restaurants and fewer vendors of healthful foods than do wealthier neighborhoods.”

Zephier, Himes, and Story looked at the prevalence of overweight and obesity in American Indian children and youth. According to them, “obesity in American Indian children has emerged as a major health threat” (Zephier, Himes, and Story, 1999, p. S28). In their study, Zephier, Himes and Story (1999, p. S28) looked at all of the children attending primary and secondary schools “with at least 50% of enrolled children identified as American Indian ethnicity and located on or near the Indian reservations included in the Aberdeen Area HIS.” They found that, 38.6% of the youth had BMIs greater than the 85th percentile and 20% had BMIs greater than the 90th percentile. This means that American Indian children had a 2.5 times greater
prevalence of overweight than expected. Zephier, Himes, and Story (1999, p. S30) concluded that, “overweight is an important public health problem for both genders and all school-age groups of American Indians.” In their 2001-2002 study of American Indian/Alaskan Native adults, Denny, Holtzman, Goins, and Croft (2005, p. 5, para. 2) found that, “the prevalence of obesity was approximately 50% higher among AIAN [American Indian/Alaskan Native] women than among White women and the prevalence of diagnosed diabetes was almost twice as high.” The findings in both studies support the increased risk for obesity in the American Indian population, both children and adults.

Low income is an important factor to consider when examining the relationship between food availability and healthy eating behaviors. For example, to further illustrate the relationship between food consumption and the costs of “healthy” foods, the results from a study that examined the association between diet quality and estimated diet costs, Drewnowski, Darmon, and Briend (2004, p. 1555) indicate that, “diets high in fats and sweets represent a low-cost option to the consumer, whereas the recommended ‘prudent’ diets cost more.” Ebbeling, Pawlak, Ludwig, and Lancet (2002) discuss the fact that the decrease in fat consumption has been accompanied by an increase in refined carbohydrate consumption. They also point to a pervasive trend toward increased portions and increased consumption of “fast foods.” It is clear that there have been many significant social, environmental, and behavioral changes over the last few decades that have contributed to the decrease in nutritious, healthy food consumption and to an increase in obesity rates in all children—particularly, minority and low-income children.
The Importance of Good Nutrition and Choosing a Healthy Diet

The importance of choosing a healthy diet relative to reducing risk factors for obesity cannot be over-emphasized. With the decline in healthy eating behaviors and an increase in the consumptions of fats, oils and sweets, educating and encouraging our children to eat healthier foods have become increasingly critical to their long-term health and longevity.

A clear understanding of children’s perceptions of what constitutes healthy eating behaviors is a critical factor in the design, development, and implementation of nutrition programs for children. An awareness of what constitutes good nutrition is imperative if children are going to be able to learn to apply the principles of sound nutrition in an effort eat a more healthy diet. In one study, Dixey, Sahota, Atwall, and Turner (2001, p. 73) reported that, “children understood the concept of eating a healthy balance of foods, that a mixture of foods is important, and that concepts of thinness and fatness were linked with concepts of healthy eating.” However, they also learned that knowledge alone is not sufficient for behavior change since, “children are adept at learning what they are supposed to know yet doing what they would like to do” (Dixey, Sahota, Atwall, & Turner, 2001, p. 77). It is clear from the study that behaviors, attitudes and values toward eating, as well as knowledge concerning healthy eating behaviors, all need to be addressed in a quality nutrition program.

A study by Frary, Johnson, and Wang (2004) examined the association between consumption of foods and beverages high in added sugars and the consumption of foods in the food pyramid groups among 3038 children and youth, ages 6–17 years, in the United States. Five categories of foods and beverages were identified as, “major sources of added sugars in the diets of U.S. children and adolescents” (Frary, Johnson & Wang, 2004, p. 58). There were several findings in the study (Frary, Johnson & Wang, 2004, pp. 60-61):
1. Fat consumption increased as sugar-sweetened beverages, sugars and sweets, and sweetened grains increased (p. 60);

2. Intakes of fiber decreased for children as intakes of sugar-sweetened beverages, sugars and sweets, and sweetened grains increased (p. 60);

3. Total added sugars increased when children aged 6-11 years consumed presweetened cereals and sweetened dairy products (p. 60); and

4. The number of fruit servings decreased as intakes of sugar-sweetened beverages increased for both children and adolescents (p. 61).

These findings plainly demonstrate that there is a consistently inverse relationship between consumption of sugar-sweetened beverages, sugars and sweets, and sweetened grains and consumption of fiber—including fruits and vegetables, and dairy products.

In another study by Lin and Morrison (2002), it is interesting to note that fruit consumption appears to be a better predictor of BMI than vegetable consumption and that “overweight children and obese adults of both genders consumed significantly less fruit than their healthy-weight counterparts” (Lin and Morrison, 2002, p. 30). In the article, they also surmised that “how vegetables are eaten could be a key” to levels of consumption (Lin and Morrison, 2002, p. 32). In addition, Dixon et al (1997, p. 868) indicated that, “studies have shown that intakes of many nutrients increase when dietary fat is reduced.”

There are many dietary components involved in assessing eating behaviors. The substitution of lower fat foods for higher fat foods is one dietary change that could have a significant impact on nutrition and health. Drewnowski, Darmon, and Briand (2004, p.1555) reveal that there is “solid evidence that high fruit and vegetable consumption plays a major role
in lower risk of heart disease and stroke and in lower total mortality.” These findings coincide with Lin and Morrison (2002, p. 29) who indicate that overweight children eat fewer fruits than their healthy-weight counterparts. The results of these studies support the assumption that a diet rich in fruits and vegetables and low in fat provides a reduced risk for heart disease and other diseases, greater nutrient consumption and reduced risk for obesity. In addition, societal attitudes, social acceptance, and peer pressure play important roles in food consumption and balanced nutritional intake.

A Healthy People 2010 (2004, p. 5) report recommends that strategies designed to achieve a reduction in obesity and overweight include a “healthy diet and regular exercise over time.” This means that it is critical for children and youth to develop healthy eating behaviors in early childhood to ensure healthy weight in adulthood. Dietary guidelines include basic recommendations that “persons aged 2 years and older choose a healthful assortment of foods that includes vegetables; fruits, grains (especially whole grains); fat-free or low-fat milk products; and fish, lean meat, poultry, or beans” (Healthy People 2010, 2004 p. 5).

The new USDA (2005) dietary guidelines include the recommendations that children should consume a variety of nutrient-dense foods and beverages among the basic food groups, and that a balanced eating pattern needs to be adopted with a focus on the consumption of whole-grain products. Numerous studies (Worsley 2002; Perez-Rodrigo & Aranceta, 2003; Auld, Romaniello, Heimendinger, Hambidge, & Hambidge, 1999; Trager, 2004) cite the importance of nutrition knowledge and its significant association with healthy eating behaviors. In addition, according to a report by Ritchie, Ivey, Masch, Woodward-Lopez, Ikeda, and Crawford (2001) the interventions to address child health and risk for obesity should begin before children adopt
risk-related behaviors, such as unhealthy eating patterns, because later on lifestyle habits may be far harder to influence

Nutrition in the School Setting

The Importance of School Nutrition Programs

Children spend from six to ten hours per day in before, during, and after school activities including extended daycare services which are in addition to regular school hours. As a result, schools have the opportunity to provide the appropriate educational, environmental, and behavioral support services that can significantly affect the nutritional health of children. This is even more vital for children who come from lower income families because they often receive two meals (breakfast and lunch) and additional snacks per day from the school cafeteria. The more health-oriented a particular school environment is, the more integrated the nutrition curriculum, and the more behaviorally supported good nutrition is, the more likely that students will be healthier. Dietz and Gortmaker (2001, p. 346) stated that, “school-based programs among elementary, middle, and high school students represent an important channel for behavioral change because of near-universal enrollment and the potential to affect behaviors of children that persist into adolescence and adulthood.”

According to Haskins, Paxson, and Donahue (2006):

Children spend a large part of their lives in school. They begin attending school at age five—and in many cases, especially with children from low income families, at age four or even three—and most remain there until age eighteen. Nearly every school in the nation serves at least one and often two meals a day, five days a week, over all these years. Schools have the opportunity, then, both to influence the nutrition children receive on a regular basis and to help children establish healthful lifelong eating habits.
In April 2003, the American Dietetic Association, the Society for Nutrition Education, and the American School Food Service Association presented a position statement regarding school nutrition services and school nutrition education programming, and their impact on school health. They stated that, “comprehensive nutrition services must be provided to all of the nation’s preschool through grade 12 students and that they be integrated with a coordinated, comprehensive school health program and implemented through a school nutrition policy” (American Dietetic Association, Society for Nutrition Education, & American School Food Service Association, 2003, p. 57). In addition, they recommended comprehensive nutrition education programs that provide nutrition knowledge and healthy eating skills in a sequential, comprehensive nutrition education curriculum from preschool through 12th grade (American Dietetic Association, the Society for Nutrition Education, and the American School Food Service Association, 2003, p. 59).

Schools play a substantial role in contributing to either the health, or lack thereof, of students. “The school environment provides multiple food and nutrition activities, experiences, and exposures. These include not only school meals and classroom curricula, but also food sold in vending machines, school stores and snack bars; fund-raising events; classroom snacks and parties; use of food to reward to discipline; corporate-sponsored nutrition education materials; and in-school advertising of food products” (Story, 1999, p. S48).

In-school nutrition programs that focus on changing the “norms” existing at each school with regard to cafeteria content, fund-raising activities, and snacks for in-school events could have a profound impact on the overall nutrition of students. In addition, in-class education units, as part of math, science, and physical education curricula, could have major bearing on the healthy eating behaviors of students who participate in those programs. Currently, efforts to
incorporate healthier nutritious offerings in the school setting are in direct conflict with “traditional” fund-raising efforts, classroom rewards and incentives, and possibly out-of-date cooking equipment in cafeterias and lunchrooms.

In their article, “The Role of Schools in Obesity Prevention,” Story, Kaphingst, and French (2006, p. 111, para. 3) discuss the fact that most school-aged children in the U.S. eat “a large share of their daily food while they are there [in school].” In addition, Story, Kaphingst, and French (2006) emphasize the fact that 99 percent of all public and 83 percent of private schools participate in the National School Lunch Program, and 78 percent participate in the school breakfast program. Again, according to Story, Kaphingst, and French (2006) children who participate in school meal programs have a significantly higher percentage of micro nutrients than children who do not. It is important to note, however, that most of those same schools serve a la carte food items that do not fall under federal guidelines and tend to be higher in fats and sugars.

The incorporation of frequent “fast-food” dining events into each family’s lifestyle has drastically increased the amount of saturated fats, sugars, and simple carbohydrates in the diets of children across the country. Fast foods have also made significant incursions into the school environment with “take out” style booths set up in lunchrooms across the school districts of America. Again, Story, Kaphingst, and French (2006, p. 116) state that “competitive foods sold to students [at school] are displacing fruits and vegetables and other healthful foods and contributing to excessive fat and saturated fat intake.” They also identify the ways in which competitive foods are introduced into the school environment, such as a la carte menu items, fund-raisers by school clubs, sports teams and Parent Teacher Associations, vending machines, and snack bars, etc.
Economics plays an important role in the contradiction between messages about the importance of good nutrition and the sales of competitive foods in the school environment. From a monetary standpoint, vending machines and fund raiser proceeds provide much-needed capital to finance sports teams, clubs, and many other school activities such as recognition ceremonies. According to Story, Kaphingst, and French (2006, p. 117), “School districts nationwide have also negotiated contracts for product sales, primarily soft drinks . . . many contracts increase the share of profits schools receive when sales volume increases.” As a result, it is difficult to persuade schools to provide a more nutrition conscious environment when it could result in a significant reduction in income.

According to the Florida Department of Health, Florida Youth Physical Activity and Nutrition Survey (2003, pp. 7-10), “22.9 percent consumed fruit juice, fruits, green salad, and vegetables such as broccoli, spinach, carrots, squash, tomatoes, or green beans, 5 or more times a day.” In addition, “approximately one fifth (21.0%) of middle school students drank 3 or more glasses of milk per day, one fourth (22.6%) ate 2 or more ‘healthy snacks’ like fruit, apples, carrots, dried fruit or fruit and nut mix per day, and one fourth (22.6%) drank 2 or more sodas per day” (Florida Youth Physical Activity and Nutrition Survey, 2003). Equally as important, “almost half of the students (49.8%) ate at fast food restaurants two or more days” per week and 34.62% of students had access to fast foods in school during lunch time (Florida Youth Physical Activity and Nutrition Survey, 2003, pp. 7-10).

The relationship between nutrition and academic achievement is well documented. According to a report by Action for Healthy Kids (2004, p. 13), “well-nourished students tend to be better students, while poorly nourished children tend to have weaker academic performance and score lower on standardized achievement tests.” In addition, “students who are ‘food
insufficient’ have significantly lower math scores and are more likely to repeat a grade, see a psychologist, and be suspended from school” (Action for Healthy Kids, 2004, p. 13). In their article, School Feeding, Cognition and School Achievement, Grantham-McGregor and Olney (2006), found that there is a link between good nutrition and school performance. In fact, they found that providing school meals to disadvantaged populations could benefit school performance.

In Florida, the Governor’s Task Force on the Obesity Epidemic has identified specific recommendations for improved nutrition as follows (Obesity in Florida, report of the governor’s task force on the obesity epidemic, 2004, pp. 23-27):

- Families should coordinate with schools, community organizations, and policy makers to support and sustain healthy lifestyles among youth (P. 23).
- Communities should promote lifelong healthy nutrition through opportunities available within each locale and to create, support and maintain new partnerships to assist in this effort (P. 23).
- Community organizations should review programs and determine options for promoting healthful nutrition opportunities into current and future planning (P. 24).
- Every school district should be required to maintain an independent nutrition advisory panel to review and determine strong district policies surrounding all nutritional offerings at schools and that school nutrition offerings include daily school breakfasts and lunches, vending selections, a la carte selections, fundraising selections, and other food options that are available on school grounds (P. 25).
As noted earlier, childhood obesity has become one of the most common health problems facing children in America and over 16% of our nation’s children and youth are overweight or obese. According to Dietz, Bland, Gortmaker, and Schmid, (2002), “the rapid increases in childhood and adolescent overweight between 1980 and 1999 can only be explained by environmental factors.” In addition, ethnic and cultural values and expectations have had a significant impact on perceptions of what constitutes obesity and on the rate of obesity in children from specific ethnic and cultural backgrounds. According to Davis, Davis, Northington, Moll, and Kolar (2002), “Body Mass Index levels were significantly higher for black and Mexican American girls than for white girls. These differences were evident as early as ages 6 to 9.”

In response to the mounting evidence of dramatically increasing obesity rates in children and adolescents, the Council of Chief State School Officers issued a policy statement on school health that included the following components (Policy Statement on School Health, 2004, p. 3):

- Health education motivates students to improve and maintain their health by ensuring the delivery of age-appropriate classroom instruction that addresses the physical, emotional, and social dimensions of health.
- Physical education provides opportunities for regular physical activity and planned sequential skill building for lifelong physical fitness.
- Food services ensure access to nutritious, affordable, appealing foods in an environment that supports healthy eating behaviors. School policies promote the provision of healthy foods and beverages in a la cart sales, vending machines, as snacks, and at all school-sponsored events.
• A safe, supportive, and healthy school environment creates a setting for positive learning experiences.

• School staff wellness programs promote the well-being of all school employees, who serve as role models for students.

• Parents, community resources, and schools work together to address their shared goal of promoting student success and well-being.

These policy statements were developed in response to the fact that only 2 percent of school-age children consume the recommended minimum number of servings for all five major food groups in the Food Guide Pyramid and about half (51.7%) of U.S. students were enrolled in a physical education class and one-third (32.2%) in daily physical education (Policy Statement on School Health,, 2004).

At a policy level, “the Department of Health and Human Services has made obesity prevention a top public health priority, and the Centers for Disease Control and Prevention (CDC) is taking the lead on many of the department’s current initiatives and programs” (Gerberding & Marks, 2004, p. 1478). It is clear that local, state, and federal governments, including school districts, all believe that childhood represents an important, and potentially critical, opportunity to facilitate behavioral changes that will slow the obesity epidemic in the United States. It is also apparent that “school-based prevention measures not only make sense, they can be cost-effective as well” (Gerberding & Marks, 2004, p. 1479) in the treatment and prevention of childhood obesity.

In Guidelines for Childhood Obesity Prevention Programs: Promoting Healthy Weight in Children (2003, p. 1), nutritionists indicated that obesity prevention should focus on a “health-
centered, rather than a weight-centered approach that focuses on the whole child.” This position supports a policy and practice emphasis on active living and eating in healthful and nutritional ways. This means that individuals and organizations must create nurturing environments that support healthy eating.

It is clear that “a comprehensive, successful program will focus on promoting and supporting healthful lifestyles for all children at home, in school, and in the community as integral to the well-being of children of all sizes and ages . . . through the development and implementation of activities that a) create a nurturing environment, and b) provide education on healthful eating” (Guidelines for Childhood Obesity Prevention Programs: Promoting Healthy Weight in Children, 2003, p. 1).

Setting appropriate goals for programs, whether in school, in the family, or in the community, are critical to the success of a substantive health promotion effort. In Guidelines for Childhood Obesity Prevention Programs: Promoting Healthy Weight in Children (2003, pp. 1–2), the following goals were identified:

- Set goals for health, not weight, as appropriate for growing children.
- Set goals for a nurturing environment that promotes all aspects of growth and development for children.
- Set goals for healthy eating.

School-based Nutrition Program Strategies

Schools offer the unique opportunity for children to not only receive nutrition education, but to apply that knowledge through nutritious food choices. This relationship between nutrition education and behavior change can have long lasting effects on the diets of America’s children.
Tab Forgac (1999, p. 47) defines nutrition education as, “any set of learning experiences designed to facilitate the voluntary adoption of eating and other nutrition-related behaviors conducive to health and well-being.” He goes on to define the most critical elements of effective nutrition education programs (Forgac, 1999, p. 48):

- An effective education model that includes a knowledge/attitude/behavior model and stresses the application of that knowledge within the context of the environment;
- The education program must be age-appropriate, and must include the education level, students’ cultural backgrounds, and the environment in general.
- Effective instructional design which includes sound theoretical methodologies such as health belief model, behavior modification, social cognitive theory, etc., and activities that involve active participation in the learning process.
- Planned social support that includes parents, teachers, school administrators, the cafeteria staff, local grocery stores, and programs such as the “5 A Day” program
- An appropriate eating environment that provides food choices consistent with the goals and outcomes of the nutrition education program.
- As assessment process that determines whether or not the program is effective, and includes outcomes or goals, and evaluation instruments such as pre- and post-tests.

Trager (2004, pp. 16-19) identifies some practical tools for schools to use to promote healthy weight in children:

- Classroom opportunities: teachers often have the flexibility to incorporate information about lifestyle choices that support good health into their lesson plans (p. 16);
• Food Service Opportunities: by establishing a dialogue with parents, businesses, and other concerned groups, schools can have better success in improving the nutritional value of all foods available (p. 17);

• School Health Opportunities: the Institutes of Medicine recently issues a report that calls for schools to conduct annual assessments of students’ weight and to make that information available to parents (p. 18);

• Physical Education Opportunities: resources should be allocated for indoor gyms, outdoor playgrounds, and adequate staff needed to run such programs (p. 18); and

• Community Opportunities: community partnerships with the private sector can augment a school’s effort to reduce the burden of childhood overweight (p. 19).

In an article published by the National Association of State boards of Education, Wechsler, McKenna, Lee, and Dietz (2004, pp. 6-10) summarize ten guidelines for schools to use to help students adopt healthy eating and activity behaviors:

• Address physical activity and nutrition through a Coordinated School Health Program (CSHP) approach (p. 6);

• Designate a school health coordinator and maintain an active school health council (p. 7);

• Assess the school’s health policies and programs and develop a plan for improvement (p. 7);

• Strengthen the school’s nutrition and physical activity policies (p. 7);

• Implement a high-quality health promotion program for school staff (p. 8);

• Implement a high-quality course of study in health education (p. 8);

• Implement a high-quality course of study in physical education (p. 8);
• Increase opportunities for students to engage in physical activity (p. 9);
• Implement a quality school meals program (p. 10); and
• Ensure that students have appealing, healthy choices in foods and beverages outside of the school meals program (p. 10).

Based on this research, it is readily apparent that school nutrition education programs must incorporate an ecological or environmental focus that integrates curricula, behavior modification, and environmental supports for healthy eating behaviors.

Many national organizations support the implementation of comprehensive quality school nutrition education programs across the nation. In a joint position paper, the American Dietetic Association, the Society for Nutrition Education, and the American School food Service Association (2003, p. 57) stated that, “comprehensive nutrition services must be provided to the entire nation’s preschool through grade 12 students. These nutrition services shall be integrated with a coordinated, comprehensive school health program and implemented through a school nutrition policy.” In addition, the USDA and the CDC have published a manual filled with school nutrition success stories. In their Executive Summary (2006) they identify six themes from successful school nutrition programs across the country (Making it happen: School nutrition success stories, executive summary, 2006, p. 1):

1. One champion, such as a parent, foodservice manager, or school principal, is usually the driving force behind the change.
2. Improving school nutrition involves multiple steps; teams with diverse skills and backgrounds are well positioned to undertake such change.
3. A useful starting point is to assess the current nutrition environment of the school to identify strengths and weaknesses.

4. Attention to the change process is important in order to help sustain the change.

5. Improvements are occurring, but more data are needed to document their impact.

6. Change is occurring at all levels: school, school district, State, and national.

They also recommend establishing nutrition standards for competitive foods, influencing food and beverage contracts, making healthy foods and beverages more available, adopting standard marketing techniques to promote healthy food choices, limiting student access to competitive foods, and using fundraising activities and rewards that consistently support student health (Making it happen: School nutrition success stories, executive summary, 2006, pp. 2-4).

According to Dietz and Gortmaker (2001, p. 346) “a substantial number of school-based interventions are effective.” They described these interventions as including, “classroom components, teaching students, and motivating them to healthier habits, following sound theoretical models” (Dietz and Gortmaker, 2001, p. 346). They also emphasized the importance of environmental interventions such as reducing the fat in school lunches, eliminated high fat and caloric vending machine items and emphasizing fruits and vegetables as desirable meal choice alternatives.

**School-based Nutrition/Obesity Interventions**

There are so many types of weight reduction or obesity prevention programs, that it is essential to require a careful examination of existing empirical studies that evaluate program effectiveness. There is a substantial need for well designed studies of nutrition education
programs that have sound theoretical support. According to Boon and Clydesdale (2005), many childhood obesity studies use a combination of approaches to achieve programmatic goals. Sallis et al (2003) studied environmental and policy interventions for eating and physical activity at twenty-four middle schools. They found that environmental and policy interventions alone were not effective in reducing fat intake at school. This finding supports the importance of nutrition education in conjunction with behavior modification and policy interventions as critical components necessary to affect a change in eating behaviors.

One of the most extensive studies to look at a school-based intervention for childhood obesity is the Pathways study. The Pathways study was designed as a multi-site study of obesity prevention in Native American children (Lohman et al, 2000). The Pathways program had multiple components including: an extensive training program for foodservice staff to ensure reduction of total fats and saturated fats; culturally sensitive physical education classes; an extensive nutrition education curriculum and physical education curriculum, family event nights and family activities for students and their families. The curriculum and family education and activity components of the program were based on Social Learning Theory and the study included 1704 American Indian third to fifth graders from 41 schools. The results of the study showed that, an appropriate school intervention can promote positive changes in knowledge of nutrition and healthy eating behaviors and self-reported healthy eating and physical activity behaviors in American Indian schoolchildren (Davis et al, 2003).

Several studies have examined the relationship between knowledge of nutrition and food choices, the influence of school nutrition programs on healthy eating behaviors, and the importance of using the school setting to promote healthy lifestyles. Worsley (2002, p. 582), reported that there are some influential factors that affect nutrition and healthy eating behaviors:
1. The perceived consequences of the behavior (health belief model);
2. Attitudes and beliefs about the behavior (social cognitive theory); and
3. Confidence in being able to perform the behavior, which is defined as self-efficacy (social learning theory).

Auld, Romaniello, Heimendinger, Hambidge, and Hambidge (1999) reported that often schools don’t provide nutrition education in a consistent and comprehensive manner sufficient enough to influence dietary behaviors. This is due to factors that influence classroom implementation such as, “support of school administrators, resources, and teacher training,” and the need for consistent teacher reinforcement of behavior change messages (Auld, Romaniello, Heimendinger, Hambidge, & Hambidge, 1999, p. 406).

There have been several other studies that have used multiple approaches to multi-component, school-based interventions (Boon & Clydesdale, 2005). They include programs like APPLES (Active Program Promoting Lifestyle Education) which included a curriculum that focused on obesity risk factors and school action plans to promote better eating and physical activity habits (Boon and Clydesdale, 2005, p. 513). Girls in the two year study increased fruit and vegetable consumption. Planet Health was another study that looked at male middle school students and focused on environmental changes by training food service staffs on low fat menus, by encouraging parents to promote healthy food choices for their children, and the development of student health committees that put together healthy activities (Boon & Clydesdale, 2005, p. 513). The participants in the study showed improved BMIs and physical activity levels.

In a study by Sutherland, Gill, and Binns (2004), a cross-sectional random sample representing each grade level of elementary school children were selected along with their
parents and the school staff and health workers who agreed to participate. The purpose of the study was to examine the attitudes of students, parents, school staff and health workers “towards the factors that contribute to childhood obesity” (Sutherland, Gill, and Binns, 2004, p. 139) and the school’s role in obesity prevention, and to assess the BMI percentile rankings of the participating students. One of the key findings of the study indicated that a significant portion of the students, 37.7%, were either overweight (25.7%) or obese (12.0%). In addition, the attitude survey results suggested that there was concern that the children would not outgrow obesity, that what children eat directly affects their weight and that, “it is important for schools to play a major role in promoting the health of children” (Sutherland, Gill & Binns, 2004, p. 139).

An English study by Keirle and Thomas (2000, p. 173) examined the influence of school health education programs on the knowledge and behavior of school children towards nutrition and health. They found that, “students from the more health promoting schools were more knowledgeable of what constitutes a healthy diet and benefits and risks to health” (Keirle & Thomas, 2000, p. 173). A study by Kandiah and Jones (2002), also demonstrated the significant effectiveness of a nutrition education program on nutrition knowledge scores and healthy food choices of fifth grade children. And finally, a Team Nutrition Pilot Study (Levine et al, 2002) indicated that, if properly implemented, a school-based nutrition program could be very effective.

Mary Story (1999) looked at school-based approaches to preventing obesity in children. She identified two types of prevention programs; “obesity-specific prevention programs” (Story, 1999, p. S46) and “broad-based cardiovascular disease (CVD) prevention programs” (Story, 1999, p. S46). The obesity-specific prevention programs ranged from those that used a combination of classroom nutrition education programs, physical education programs and a
modified school lunch program (Story, 2004, p. S46, para. 3), to one that had four components, physical activity, food service, classroom curriculum and family involvement (Story, 2004, p. S46, para. 5). In addition, Story (2004) suggested that a comprehensive, integrated model for obesity prevention that addressed health education, health services, school food services, nutrition environment, school physical education, school worksite health promotion, school commitment and support, and integrated community and school efforts would have the most impact on the health of children.

The importance of implementing childhood obesity prevention programs that address nutrition education in schools and in the community has become critical as the percentage of children and youth in the at-risk and overweight categories continues to escalate. School-based nutrition programs are critical to the long-term healthy lifestyle of future generations of adults. Two studies, Perez-Rodrigo and Aranceta (2003) and Lowe, Horne, Tapper, Bowdery, and Egerton (2004) explore school-based nutrition education programs and subsequent challenges and recommendations for school personnel who decide to implement school nutrition education programs.

In “Nutrition Education in the Schools,” Perez-Rodrigo and Aranceta (2003) identified the primary interactions between actors and environmental challenges in school-based nutrition education programs (see Figure 1).
They also recommended that policy strategies include informal and formal rules that are developed collectively, and educational strategies that include efforts to increase health awareness, communication, and skill building. Finally, they recommended that “cultural relevance is of utmost importance . . . the message should be addressed in a way that children can understand and should teach the skills and knowledge required to improve or strengthen healthy eating habits” (Perez-Rodrigo and Aranceta, 2003, p. 83). Perez-Rodrigo and Aranceta (2003, p. 83) also listed 14 characteristics of successful school-based nutrition education programs (see Table 1).
Table 1: Characteristics of Successful School-based Nutrition Education Programs

<table>
<thead>
<tr>
<th>Behavioral focus</th>
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<tr>
<td>Theory-driven strategies</td>
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<tr>
<td>Adequate time and intensity</td>
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<tr>
<td>Family involvement</td>
</tr>
<tr>
<td>Multi-component strategies</td>
</tr>
<tr>
<td>Developmentally appropriate</td>
</tr>
<tr>
<td>Considers needs of students, teachers and school</td>
</tr>
<tr>
<td>Self-assessment elements (older children)</td>
</tr>
<tr>
<td>Self-efficacy, strengthen skills, influence attitudes, behavioral capability</td>
</tr>
<tr>
<td>Adequate teaching methods</td>
</tr>
<tr>
<td>Modify school environment: access to healthy food; school food policies; school meals</td>
</tr>
<tr>
<td>Teacher training opportunities</td>
</tr>
<tr>
<td>Cultural relevance</td>
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<tr>
<td>Evaluation</td>
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</tbody>
</table>

Several studies validate the effectiveness of nutrition education programs in the schools. Lowe, Horne, Tapper, Bowdery, and Egerton (2004) evaluated the effectiveness of a peer modeling and rewards-based intervention to increase fruit and vegetable consumption in children in a school-based nutrition program. They found that “peer modeling and rewards-based intervention was shown to be effective in bringing about substantial increases in children’s consumption of, and expressed liking for, fruits and vegetables” (Lowe, Horne, Tapper, Bowdery, and Egerton, 2004, p. 510). Powers, Struempler, Guarino, and Parmer (2005) looked at the effects of a Social Cognitive Theory-based nutrition education program on the dietary behavior and nutrition knowledge among second-grade and third-grade students. They found that there were significantly improved dietary behaviors, significantly greater improvements in overall nutrition knowledge, and that there was a strong correlation between the gains in dietary behavior and nutrition knowledge.
Schools have the opportunity to provide programs that will have a valuable impact on the prevention and treatment of childhood obesity. There have been several very successful school-based prevention and intervention programs that target childhood obesity and health. It is also clear from the research, that programs targeting younger children appear to be more successful (Perez-Rodrigo & Aranceta, 2003; Kandiah, 2002). Although school-based prevention programs are multiplying across the country, there have still been relatively few studies that examine the effectiveness of those programs. As a result, addition research is critical to inform the development of nutrition programs in schools across the country. The need for empirical studies of school-based nutrition programs further substantiates the importance of this elementary school study.

**Theoretical Frameworks**

There are several theoretical models that may potentially support the creation, development, and application of the nutrition program that is being evaluated in this study. In addition, there are existing theoretical models that support the use of the self-report nutrition survey instrument used in this study. Since the program has been in existence for several years, and the data is secondary data, the exploration of applicable supporting theories becomes even more imperative. With that in mind, this theoretical exploration is focused on the theories that might articulate most clearly the rationale for the construct of the program, the relationship of the program components and their impact on reported changes in the target population, a rational theoretical explanation as to why the program might influence the desired changes in the target population, and the method used to assess program effectiveness. There are five theories that may have some applicability in providing a rationale for the program and its intended influence
on the behavioral and physical changes that will be specified in the study—the influence of a nutritional education program on reported eating behaviors and body mass index percentile ranking. Those five theories are Choice Theory, the Health Belief Model, Transtheoretical (or Stages of Change) Model, Social Cognitive Theory, and the Theories of Reasoned Action and Planned Behavior.

**Choice Theory**

Choice Theory evolved in the late 1990’s from Reality Therapy, an approach developed by William Glasser. Glasser’s early clinical work focused on working with clients to take responsibility for, “what they were doing in the present, rather than dwelling upon feelings of what happened to them in the past” (Corey, 1985, p. 398). There are several key concepts that transferred from Reality Theory to Choice Theory (Corey, 1985, pp. 399-403):

- Responsibility and Human Needs: “the ability to fulfill one’s needs, and to do so in a way that does not deprive others of the ability to fulfill their needs” (p. 399);
- Success Identity: “being able to give and accept love, feel that they are significant to others, experience a sense of self-worth, and become involved with others in a caring way” (p. 400);
- Rejection of the Medical Model: believes that “mental health is equated with the responsible fulfilling of one’s needs or drives and mental illness is what occurs when people are unable to control the world to satisfy their needs” (p 400);
- Emphasis on the Present: “focus remains on the client’s current condition” (p. 401);
- Value Judgments: “stresses the importance of getting clients to face the issue of right and wrong behavior” (p. 401);
• De-emphasis on Transference: “sees transference as unimportant” (p. 401);
• Emphasis on Conscious Factors: “seen as often detrimental to the therapeutic process” (p. 402); and
• Existential/Phenomenological Orientation: “we perceive the world in the context of our own needs and do not perceive the world as it really is” (p. 402).

Choice theory teaches that we are all driven by “four psychological needs embedded in our genes: the need to belong, the need for power, the need for freedom, and the need for fun. It is based on the premise that the only person whose behavior we can control is our own (Glasser, 1997). One of the most important concepts of Choice Theory is the idea of the “quality world”—the personal world that is at the core of our lives because it is composed of the “people, things, and beliefs that we have discovered are most satisfying to our needs” (Glasser, 1997, p. 3). In Glasser’s opinion, students seek to establish a quality world for themselves to meet their four psychological needs (Rose, 2003). In addition, Glasser felt very strongly that “we humans ultimately have power over our behaviors, that we are conscious creatures who can examine our circumstances and try to bring our needs into alignment with our environment” (Rose, 2003, p. 53).

Glasser applied the key concepts of Choice Theory in the development of his “quality school” concept, which was based on the following six characteristics (Rose, 2003, p. 53):

1. Relationships are based on trust and respect, and ongoing discipline problems are nonexistent;
2. The focus of education is on useful information, not mere schooling;
3. All students do some truly excellent work, both in their perception and that of a professional educator;

4. Students and teachers know and actively use Choice Theory;

5. Students do well on ‘high stakes’ proficiency tests; and

6. All concerned view the school as a place where they like to be.

It was Glasser’s belief that when Choice Theory is applied within the classroom context, students will want to achieve based on the attainment of their four psychological needs relation to their school environment. He believed that when students are placed in a quality school environment and told that they will not fail, but that they need to do the work, they would succeed.

**Health Belief Model**

According to Finfgeld, Wongvatunyu, Conn, Grando, and Russell (2003), the Health Belief Model dates back to the 1950s when it was constructed to account for the reasons why people might not take advantage of low-cost preventive health care services. According to this model, the likelihood that an individual will incorporate a preventative behavior is influenced by the following multiple interacting beliefs (Finfgeld, Wongvatunyu, Conn, Grando, & Russell, 2003, p. 293):

- Perceived Severity: belief that a potential health problem is serious;
- Perceived Threat: the belief that one may be susceptible to the health problem;
- Perceived Benefit: the belief that the benefits of the behavior change will outweigh the costs;
• Perceived Barriers: the negative aspects of a particular behavioral action such as financial costs, inconvenience, or pain; and

• Self-Efficacy: the belief that one has the ability to change one’s behavior and achieve the desired outcome.

The Health Belief Model provides insight into why people make health decisions and creates a process for encouraging change (Health Behavior Models, 2006). According to Strecher and Rosenstock (Glanz, Lewis and Rimer, eds., 1997, pp. 44-46), the Health Belief Model contains five basic components; perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and cues to action. They indicate that people who perceive themselves to be vulnerable to specific health conditions will, if they believe the benefits are important enough and if those benefits out weight barriers to change make sometimes significant behavioral changes to improve their health outlook (Glanz, Lewis and Rimer, 1997, p. 44).

According to Finfgeld, Wongvatunyu, Conn, Grando, and Russell (2003): Wardle, Haase, and Steptoe (2004): and Kain et al (2004), the balancing of beliefs between perception of barriers to change and self-efficacy or the perceived ability to change must be balanced to ensure that there is a perceived method for behavioral change. As a result, desired outcomes within the context of the Health Belief Model are based on one’s desire to act, to attain and maintain a behavioral change that will result in increased health (see Figure 2).
**Transtheoretical or Stages of Change Model**

The Transtheoretical Model was developed over the last eighteen years or so by James O. Prochaska (Miller, W. R., & Heather, N., 1986; Prochaska, DiClemente & Norcross, 1992; Prochaska, Norcross & DiClemente, 1994; and Gurman, & Messer, 1995). It began with a comparative analysis of the major theories in psychoanalysis including psycho-analytic, humanistic/existential, gestalt/experiential, and cognitive and behavioral (Prochaska, DiClemente & Norcross, 1992). Prochaska’s goal was to develop a unified, integrated approach in identifying the ways in which people change. He analyzed the various schools of psychotherapy and tried to isolate the processes of change identified in each system and then organized those processes into similar categories for study. As a result of this method, Prochaska identified ten major categories to describe the process of change that spanned a cross section of psychoanalytic theories. Although generally the same, these categories did vary slightly in content and ranking from article to article. They are as follows (Gurman, & Messer, 1995, p. 408):
1. Consciousness raising
2. Dramatic relief
3. Self-reevaluation
4. Environmental reevaluation
5. Self-liberation
6. Social liberation
7. Counter conditioning
8. Stimulus control
9. Reinforcement management
10. Helping relationship

The identified categories listed in the process of change had the most empirical support and also, according to Prochaska, reflected the ways in which people use change processes to overcome whatever obstacles or problems that they are facing (Prochaska, Norcross & DiClemente, 1994; Gurman & Messer, 1995).

One of the key elements in Prochaska’s Transtheoretical Model is that people move through the change process in a variety of situations and environments including within the therapeutic/education session and without the therapeutic/education session, with support and without it, prior to receiving therapy, education, or support and subsequent to receiving therapy, education, or support (Gurman, & Messer, 1995). In fact, one critical observation includes the fact that people change all the time— with help and without it. So identification of a common set of stages of change must incorporate the understanding that change is a human process.
As the stages of change categories were developed, they evolved from four change categories to six, with five stages of change being used for most empirical research studies. Early in the theoretical development process, Prochaska (Miller, & Heather, ed., 1986, p. 5) identified four stages of change: pre-contemplation, contemplation, action, and maintenance. Later, that evolved to five stages of change by adding the preparation stage between contemplation and action. Finally, a termination stage was added to the stages of change model. However, this stage has also been referred to as relapse, depending upon the research study that is using the Stages of Change Model (Feinstein, & Feinstein, 2001). However, termination appears the most frequently and consistently in clinical studies, especially those dealing with substance abuse issues where termination is a very real part of the process.

According to Prochaska, “individuals move cyclically through the six stages of change” (Gurman, & Messer, 1995). They are (Prochaska, Norcross & Diclemente, 1994, pp. 40-46; Prochaska, DiClemente & Norcross, 1992, pp. 1102-1105): 1) pre-contemplation, which is where the individual has no thoughts of changing behavior or quitting an undesirable behavior; 2) contemplation, which is where an individual may contemplate changing an undesirable behavior and begin to think seriously about it, but are not yet ready to make the change; 3) preparation, which where the individual prepares to change behavior, begins to initiate some behavioral changes, and plans to begin overt change within an specified amount of time; 4) action, where the individual overtly changes behavior and often modifies her surroundings (such as removing food from the house) to support behavioral change success; 5) maintenance, where the individual strives to maintain the overt changes that have occurred during the action period and must strive to prevent relapse; and 6) termination, which is the ultimate goal for all individuals who
implement change, and that is to continue the new behavior(s) without fear of relapse. See Table 2.

Table 2: Stages and Processes of Change (Gurman, A. S., & Messer, S. B., 1995. p. 413)

<table>
<thead>
<tr>
<th>Pre-contemplation</th>
<th>Contemplation</th>
<th>Preparation</th>
<th>Action</th>
<th>Maintenance</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Consciousness Raising</td>
<td>Dramatic Relief</td>
<td>Environmental Reevaluation</td>
<td>Self-Reevaluation</td>
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<tr>
<td></td>
<td>Contingency Management</td>
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<td>Helping Relationship</td>
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<td>Counter Conditioning</td>
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<td></td>
<td>Stimulus Control</td>
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One of the main purposes of the Transtheoretical Model, with its identification and clarification of the stages of change and the change process, is to provide educators, clinicians, health professionals, and (most importantly) the individuals needing to change behavior with the tools to identify the optimum time for them to “take action” with regard to the change(s) they want to make. The key to successful change, according to Prochaska, Norcross, and DiClemente (1994, p. 39), “is knowing the stage you are in for the problem at hand.”

The Transtheoretical Model has been used in many studies involving exercise programs, weight loss programs and health promotion programs. Several studies, (Rhodes, Berry, Naylor & Higgins, 2004; Guillot, Kilpartick, Hebert & Hollander, 2004; Zizzi, Keeler, & Watson II, 2006; Nigg, 2001; Carmack Taylor, Boudreaux, Jeffries, Scarinci & Brantley, 2003; Fallon & Hausenblas, 2004) all looked at the applicability of the Transtheoretical Model as it applies to
adherence to exercise programs. Guillot, Kilpartick, Hebert, and Hollander, (2004, p. 1) found that identification of the stages of change in conjunction with social support “may assist in stage-based interventions that help individuals adhere to their rehabilitation program.” In addition, Zizzi, Keeler, and Watson II (2006) used the Transtheoretical Model, and the stages of change, to determine readiness and success in relation to goal-oriented physical activity behaviors. They found that “convergent validity” linking the Transtheoretical Model and self-reported physical activity behavior with goal orientation theory may provide a new direction for applied research in exercise behavior.

Nigg (2001) studied adolescent exercise behavior change in a longitudinal study. The study showed that the Transtheoretical Model can “serve as a framework to understand adolescent exercise behavior” (Nigg, 2001, p. 11). In another study, Carmack Taylor, Boudreaux, Jeffries, Scarinci, and Brantley (2003) sought to validate the Transtheoretical Model for exercise behavior due to the fact that the process of change is a dynamic process which could lend itself to stage specific interventions. Fallon and Hausenblas (2004) studied the Transtheoretical Model in relation to exercise and the termination stage. They defined the termination stage as “five years of exercise adherence” (Fallon & Hausenblas, 2004, p. 41). They found that people can move from maintenance to termination at the five year mark of consistent exercise. It is clear from these studies, that the Transtheoretical Model, and its constructs, is a useful tool when studying readiness, goal orientation, and long-term success in exercise programs.

As indicated earlier, there have also been studies that examine the applicability of the Transtheoretical model in weight management, diet, and exercise, and in treating obesity. Green, Riebe, Ruggiero, Caldwell, and Blissmer (2003) evaluated a home-based weight management
program using the Transtheoretical Model. In this study, the stages of change were used to assess readiness to change and the results demonstrated that the home-based program based on the Transtheoretical Model “was effective for weight reduction and found improvement in diet and exercise behaviors” (Green, Riebe, Ruggiero, Caldwell & Blissmer, 2003, p. 140). In another study by Frenn and Malin (2003), which looked at diet and exercise in low-income, culturally diverse middle school students, they found that the use of the constructs of the Transtheoretical Model, with processes and strategies based on stage of change, resulted in students having significantly lower dietary fat intake.

Macqueen, Brynes, and Frost (1999) assessed whether the stages of change could predict which study participants would lose weight. The results indicated that the stages of change model might help identify the patients who are most motivated to change. Another longitudinal study by Morera, et al (1998) assessed the Stages of Change Model for desirable psychometric properties and found that it did, indeed prove to be stable and reliable. Finally, in a study that investigated the relationships between physical activity, health attitudes and behavior using the States of Change Model, Clement, Schmidt, Bernaix, Covington and Carr (2004, p. 291) found that, “the participants whose scores fell in the higher stages of the Transtheoretical Model reported greater levels of physical activity, consumption of more fruits, vegetables and water, and less consumption of high-fat/high-calorie foods.”

The Transtheoretical Model has been widely used in health promotion studies. Niederhouser (2004) used a Stages of Change assessment as a part of a family risk behavior study. The Transtheoretical Model was used to determine readiness to change as a part of the management of health risk behaviors. It was also used to help tailor the interventions so that they would be successful. The study found the use of the Stages of Change assessment process to be
helpful in determining readiness for change and successful behavioral change. Feinstein and Feinstein (2001) studied the use of the Transtheoretical Model in conjunction with Brief Motivational Interviewing, Prevention Oriented Primary Care, and Psychotherapy for Health Change to address complex health issues and behaviors over a two year period with some success. Duran (2003) used the Transtheoretical Model in conjunction with motivational interviewing to motivate health behavior changes with the result that there is some success in motivating behavioral changes.

Based on prominent studies, it is important to note that the Transtheoretical Model is most applicable in an intervention modality, including one that intervenes in high risk behaviors in an effort to prevent future illness such as heart disease, stroke, diabetes, etc. It has not been used widely in strictly health promotion programs that seek to educate and reinforce attitudes and behaviors that will, hopefully, result in increased health over the lifespan.

**Social Cognitive Theory**

Social Cognitive Theory (SCT) has its origins in Social Learning Theory (SLT) which began back in the early 1940’s (Brown, 2005). However, in the early 1960s, Albert Bandura (1969, 1977, 1993, 1995, 1998, 1999, 2000, & 2005) led the transition from SLT to SCT based on his heavy emphasis on the cognitive aspects of social interaction. Bandura (1999) felt that earlier theorists, particularly behaviorists, had not addressed the issue of observational learning which focuses on the fact that human beings learn from observation, not just from experience. He believed that humans could choose, or not choose, to adopt observed behaviors.

According to Malone (2002, p. 10, para. 2), the major concepts of Social Cognitive Theory include the following:
learning by vicarious reinforcement (modeling, imitation, and identification), symbolic activities (language and gestures), forethought activity (cognitive anticipation of consequences), self-regulatory capabilities (goal setting, and self-direction), self-reflecting capability (self-evaluation), self-efficacy (confidence), and self-reinforcement.

Social Cognitive Theory also focuses on the fact that behavior and learning occur within the social context. It emphasizes the importance of cognition and its role in relation to both behavior and the environment. Bandura based his theory on three core assumptions about how people cognitively respond to their experiences within the environmental, social context and how their thoughts influence behavior. These three key constructs reflect the belief that there is a reciprocal relationship between behavior, personal factors (cognition) and environmental factors (see Figure 3). The three key interactions, behavior/environmental, environmental/personal, and personal/behaviors are all reciprocal in nature. They are dynamic relationships and therefore reflect the varying strengths of the influences affecting each combination of the interactions. These interactions reflect the processes inherent in reciprocal determinism (Bandura, 1977).
All three types of interactions are reciprocal, so the personal/behavior interaction, involves a bi-directional relationship between one’s thoughts and emotions, ones emotions and actions, and one’s actions and thoughts. This means that one’s thoughts and feelings can affect one’s behavior but that one’s behavior can also affect one’s thoughts and feelings. In the case of environment/personal interactions, the environmental influences, including social influences and the physical nature of the environment, affect one’s personal beliefs, expectations and sense of competence, but in reverse, individuals can induce specific reactions from the environment due to physical and emotional attributes. In the case of the behavior/environment interaction, behavior is modified by the social and physical environment and the way individuals experience respond to stimuli in their environment.

According to Jones (1989), “Social Cognitive Theory’s strong emphasis on one’s cognitions suggests that the mind is an active force that constructs one’s reality, selectively encodes information, performs behavior on the basis of values and expectations, and imposes
structure on its own actions.” This supports the idea that an individual’s reality is formed through the interaction of environment and cognition. In addition, when one applies the concepts of Social Cognitive Theory to health education and health behaviors the following constructs have the most direct application (Health Behavior Models, 2006, p. 2):

- Reinforcement: reinforcements are either positive or negative consequences of behavior;
- Behavior capability: in order for a change to take place, one must learn what to do to change and how to do it;
- Expectancies: the value one places on the expected result. If the result is important to the person, the behavior change that will yield the result is more likely to happen;
- Self efficacy: belief in one’s ability to successfully change one’s behavior. Self efficacy is connected with another constructed called “outcome expectations”; and
- Reciprocal determinism: the dynamic relationship between the individual and the environment.

According to Baranowski, Cullen, and Baranowski, (1999, p. 20) a working diagram of Social Cognitive Theory would look like this (see Figure 4):
In his article, Perceived Self-Efficacy in Cognitive Development and Functioning (1993), Bandura assesses the application of Social Cognitive Theory to instructional strategies in the classroom. In his article he focuses on four distinct focus areas for socio-cognitive strategies (Bandura, 1993, pp. 140-144):

- Teacher’s Self-efficacy: this includes the understanding that the level of a teacher’s sense of self-efficacy will affect their ability to support development of students’ academic self-directedness (p. 140);
- Collective School Self-Efficacy: this reflects the understanding that staff belief systems strongly affect school cultures that will then either support or resist optimum school functioning as a social system (p. 140);
• Parental Self-Efficacy and School Involvement: this emphasizes the importance of family cultures and belief systems and their effect on their children’s cognitive development (p. 143); and

• Student Self-Efficacy: the importance of individual self-efficacy in enhancing personal accomplishment (p. 143).

Social Cognitive Theory has direct application to health promotion programs, particularly since the general concept of health has shifted from a disease model to a health promotion model. Current literature abounds with the basic concept that, “by managing their health habits, people can live longer” (Bandura, 2005, p. 245). Social Cognitive Theory provides a framework that not only identifies predictive factors relating to health behaviors, but also provides a framework within which positive change can occur.

**Theories of Reasoned Action and Planned Behavior**

The theories of Reasoned Action (TRA) and Planned Behavior (TPB) are closely related due to the fact that the Theory of Planned Behavior is a “second generation theory” based on the Theory of Reasoned Action, much as Social Cognitive Theory has its roots in Social Learning Theory. The Theory of Planned Behavior was developed in response to criticism of the Theory of Reasoned Action from various researchers across the years concerning the important element of perceived behavioral control (Ajzen, 1988), or in Bandura’s (1993) terms—self-efficacy. The following discussion will describe the two theories, their similarities, and research regarding the efficacy of the theories in relation to intention and behavior.
**Theory of Reasoned Action**

For more than a decade social scientists have studied the relationship between attitudes and behaviors. It has been traditionally accepted that attitudes, do indeed, influence behavior. However, in 1980, Ajzen and Fishbein developed the concept that between attitude and behavior, there is an additional mediating variable, namely that of intention. This concept was instrumental in the creation of the Theory of Reasoned Action (TRA) which postulates that intention is comprised of two contributing constructs one’s attitude toward a specific action and one’s normative views of that action. Ajzen (1988) describes normative beliefs as a respondent’s perception of how he or she feels others view the prescribed behavior.

Since the basic premise of the Theory of Reasoned Action (TRA) is that behavior can be predicted on the basis of one’s intention to do that behavior it stands to reason that, “people intend to perform a behavior when they evaluate it positively and when they believe that important others think they should perform it” (Ajzen, 1998, p. 177, para. 2). In addition, the more one intends to perform a certain behavior, the more likely one will perform it (Armitage, Conner, & Norman, 1999). According to Ajzen and Fishbein (1980), this theory explains the fact that intention is the “mediator of the attitude-behavior relationship” (Armitage & Christian, 2003, p. 190). It plainly states that behavioral intentions are explained by attitudes, either positive or negative. In addition, other researchers, (Becker & Gibson, 1998; Donald & Cooper, 2001) support the TRA premise that attitudes and social norms influence the formation of behavioral intentions, and behavioral intentions can actually predict behavior because they tend to mediate external influences on behavior.

The purpose of the Theory of Reasoned Action is to “predict and explain behavior” (Chatzisarantis & Biddle, 1998, p.304). According to the Fishbein and Ajzen model, “intentions
to act are the most immediate determinants of social action” (Chatzisarantis & Biddle, 1998, p. 304). In addition, Gotch and Hall (2004) and Chatzisarantis and Biddle, (1998), agree that behavioral intentions are a “direct function of attitudes and subjective norms.”

Another component of the Theory of Reasoned Action that is essential to understand is that, “a behavior is under complete volitional control when environmental barriers and/or personal factors do not interfere with performance of the behavior” (Charzisarantis and Biddle, 1998, p. 304, para. 2). In other words, if environmental barriers and personal obstacles can be controlled, the Theory of Reasoned Action indicates that behaviors can then be most strongly influenced by behavioral intentions, which are thus influenced by attitudes and subjective norms (Gotch & Hall, 2004). See Figure 5:

![Figure 5: Theory of Reasoned Action (Ajzen, 1988, p.118)](image)

The theory of reasoned action provides a critically important explanation for the relationship between intention and behavior, but is obviously limited by external variables that can affect the performance of the behavior. Within the school setting, external variables that can
influence the intention-behavior relationship could be such things as teachers’ and administrators’ attitudes toward nutritious eating, attitudes and behaviors of cafeteria managers that affect the food choices available in school food service programs, and the possible willingness or unwillingness on the part of a teacher to eliminate high sugar/high fat food rewards, etc. One last concept that is a critical component of the Theory of Reasoned Action is the, “stability of intention” (Chatzisarantis & Biddle, 1998, p. 205). Stability of intention means that an individual’s intention does not undergo a change between the indication of intention and the subsequent behavior. This has some significance in the use of self report surveys and the importance of minimizing the time period between the behavior and the self report of that behavior.

**Theory of Planned Behavior**

The Theory of Planned Behavior is, in reality, Ajzen’s attempt to address “the problem of incomplete volitional control (Ajzen, 1988, p. 132). It is, in actuality a “next step” or extension of the Theory of Reasoned Action. Ajzen realized that, “one’s outcomes are under the control of one’s own behavior versus under the control of such external factors as powerful others or chance” (Ajzen, 1988, p. 104, para. 1). This very important concept is compatible with Bandura’s (1995) concept of self-efficacy—where one believes one is capable of a specific behavior. The Theory of Planned Behavior incorporates the concept of self-efficacy, or perceived behavioral control, into the theoretical constructs of the Theory of Reasoned Action. In other words, the theory of Planned Behavior differs from the Theory of Reasoned Action because a new variable, or construct, perceived behavioral control, “predicts intentions and behavior directly in situations where control over the behavior is incomplete” (Chatzisarantis & Biddle,
The Theory of Planned Behavior is exactly the same as the Theory of Reasoned Action with the one exception of the Perceived Behavioral Control variable. See Figure 6.

![Theory of Planned Behavior Diagram](image)

Figure 6: Theory of Planned Behavior (Armitage & Christian, 2003, p. 193)

There has been considerable debate about the construct of perceived behavioral control. Several researchers (Greenslade & White, 2005; Millar & Shevlin, 2003; Payne, Jones & Harris, 2005; Sparks, Hedderley & Shepherd, 1992) have discussed the definition and conceptualization of perceived behavioral control, likening it to Bandura’s (1996) concept of self-efficacy. The results of that debate lead to Ajzen (2001) redefining perceived behavioral control to be a combination of self-efficacy and the ability to control. In addition, there are two contributing constructs of perceived behavioral control. They are affective attitude which reflects enjoyment of the behavior, and cognitive attitude which reflects the perceived benefit of the behavior (Ajzen & Timko, 1986).
There have been multiple studies using both the Theory of Reasoned Action and the Theory of Planned Behavior to explain the relationship between attitudes, subjective norms, perceived behavioral control and intention, and intention and subsequent behavior. Bagozzi, Yi, and Baumgartner (1990) looked at how attitudes influence behavior and to what degree. They found that when “behavior required substantial effort, the mediating role of intentions was strong, and attitudes had only indirect effects on behavior” (Bagozzi, Yi & Baumgartner, 1990, p. 45). This is an important concept in relation to the theories of Reasoned Action and Planned behavior because it identifies the importance of the relative effort required by a specific behavioral change in relation to the strength of the intention to behave in a specific manner. In their 2004 study, Yzer, Hennessy and Fishbein (p. 159) concluded that “perceived control and perceived difficulty can be distinguished from each other.” They also noted that, “perceived difficulty may in fact be a measure of attitude” (Yzer, Hennessy & Fishbein, 2004, p. 159). In addition, Trafimow et al (2002) discovered that perceived difficulty and perceived control related differently to attitude, intention, and behavior.

According to Saba and Natale (1998, p. 21), “the theory of reasoned action developed by Ajzen and Fishbein has been widely used in the food choice area, demonstrating strong relationships between attitudes, beliefs, and food choice.” The goal of a study done by Saba and Natale (1998) was to explore the most important predictors of consumption using olive oil, seeds oil, and butter. They wanted to explore whether or not a change in attitude would result in a change in eating behaviors. In addition they wanted to know if habit affected food choice and consumption (Saba & Natale, 1998). They found that intention had a, “positive and significant affect on the consumption of each of the three types of foods” used in the study (Saba & Natale, 1998, p. 21).
In their study of the role of attitudes, intentions and habit in predicting consumption of fat containing foods in Italy, Saba, Vassallo, and Turrini (2000) tried to determine the most important predictors of consumption using the Theory of Reasoned Action by measuring intention, beliefs, attitudes, and habit. They found that, based on Ajzen’s model, “all correlations [attitude and intention, attitude and habit, habit and intention] were significant” (Saba, Vassallo & Turrini, 2000, p. 542, para. 8). However, habit was found to be more important in influencing behavior than intention (Saba, Vassallo & Turrini, 2000, p. 542). It is important to note that the study validated the use of the Theory of Reasoned Action in studying the relationship between intention and subsequent behavior.

Sparks, Hedderley, and Shepherd (1992) explored the relationship between attitudes and behavior through the use of the Theories of Reasoned Action and Planned Behavior. They noted that, historically, there have been control issues regarding the adoption of healthier diets that include financial constraints, internal factors such as taste preferences, nutritional knowledge, and external factors such as price and availability (Sparks, Hedderley & Shepherd, 1992, p. 58). The objectives of the study were to (Sparks, Hedderley & Shepherd, 1992, p. 59, para. 2):

examine the relationship of self-reports of attitude variability to the components of the theories of reasoned action and planned behavior; to examine how attitude variability relates to perceived control and specific problems associated with the consumption of particular foods; to examine different dimensions of perceptions of control.

The results of the study confirmed that the theories of Reasoned Action and Planned Behavior can be applied to food choice situations, but that causative factors are complex and may be out of the control of the individual. The study also suggests that the Theory of Planned
Behavior is more likely to apply where food choices are voluntary and environmentally supported (Sparks, Hedderley & Shepherd, 1992).

In another study by Bagozzi and Warshaw (1992), structural equation modeling was used to look at the attitude-behavior relationship. They tested the theory of reasoned action by “investigating the functional relations among attitude, subjective norm, and intentions and the predictive relationship between these variables and subsequent behavior” (Bagozzi & Warshaw, 1992, p. 603). The findings of their study concluded that “the theory of reasoned action is totally supported for losing weight….attitude and subjective norm predict intentions and intentions predict behavior, in concert with the theory of reasoned action” (Bagozzi & Warshaw, 1992, p. 628, para 2). Also important, they found that intentions “fully mediated” the impact of a subjective norm (Bagozzi & Warshaw, 1992, p. 628, para 2).

Gotch and Hall (2004) used the theory of reasoned action to predict nature-related activities/behaviors in children. Within the context of that study they explored the attitudinal and normative influences on behavioral intent. Using a questionnaire that assessed student attitudes toward participation in nature-related activities, participation levels, intentions to participate and subjective norms for participation (Gotch & Hall, 2004, p. 163), they found that the Theory of Reasoned Action could, indeed successfully predict nature-related behaviors, and that the way to change behaviors is to target individual’s attitudes about the desired behavior.

Lambert, Conklin and Meyer (2001) studied parents’ beliefs toward their children’s participation in the National School Lunch Program. The study focused on the behavioral and normative beliefs of parents toward their elementary school children’s participation in the National School Lunch Program (Lambert, Conklin & Meyer, 2001, p. 13). The study used four focus groups at two elementary schools in Mississippi. The discussions were documented and
then analyzed by food service experts, and then beliefs that fell into similar categories were identified and arranged in descending order of frequency of occurrence (Lambert, Conklin & Meyer, 2001, p. 14). Through the use of focus groups in combination with the Theory of Reasoned Action provided a conceptual framework for identifying the most important behavioral belief groupings, parent information, child’s preferences, parental control, nutrition, and amount of time to eat. Parent’s perceptions concerning those five categories had a significant impact on their willingness to support their child’s participation in the National School Lunch Program.

In another study by Trost, Saunders, and Ward (2002), the theories of Reasoned Action and Planned Behavior were used to predict physical activity in middle school children. An in class survey was used to measure “attitudes towards physical activity, perceived behavioral control, and intentional to be physically active” (Trost, Saunders & Ward, 2002, p. 97, para. 4). In addition to the self-report survey, an activity monitor was used to “directly assess participation in moderate-to-vigorous physical activity” (Trost, Saunders & Ward, 2002, p. 98, para. 2). The results of the study confirmed that there was a “significant direct path from perceived behavioral control to moderate-to-vigorous physical activity” (Trost, Saunders & Ward, 2002, p. 100, para. 4). Armitage (2005) also completed a study that used the Theory of Planned Behavior to predict participation in physical activity. They found that “perceived behavioral control was significantly predictive of intentions and actual behavior” (Armitage, 2005, p. 235).

In a fairly recent study of African American students and their intention to graduate from high school, Davis, Ajzen, Saunders and Williams (2002, p. 810) found that, based on the Theory of Planned Behavior questionnaire, “intentions to complete the school year were accurately predicted from attitudes, subjective norms, and perceived behavioral control.” They
also found out that, three years later, intentions and perceived behavioral control also predicted graduation (Davis, Ajzen, Saunders and Williams, 2002, p. 810).

In summary, there are multiple studies that verify the relationship between intention and behavior, moderated by the construct of perceived behavioral control (or self-efficacy). The theories of Reasoned Action and Planned Behavior have been studied extensively, particularly with regard to the strength of the relationship between intention and behavior (or behavioral change) and the strength of the relationship between attitude and perceived behavioral control and intention and how that influences actual behavior (or behavioral change). Kraft, Rise, Sutton, and Roysamb (2005) felt that perceived behavioral control might be over estimated in relation to behavior and that attitude might be under estimated in relation to behavior. However, there is consensus across studies that intention, as defined by attitude and perceived behavioral control, does predict behavior.

**Theoretical Applicability**

Choice Theory, the Health Belief Model, Social Cognitive Theory, Theories of Reasoned Action and Planned Behavior, and the Transtheoretical or Stages of Change Model have all been used in the context of preventative health education and intervention programming. Each theory has been used in some sort of classroom context, whether in the health or education setting. Glasser incorporated Choice Theory (originally Reality Theory) into classroom interventions addressing individual student achievement processes. He developed the “quality school” concept based on the use of Choice Theory in the classroom. Rosenstock and Bekker, amongst others, have used the application of the Health Belief Model, not only in disease interdiction programs, but also in health promotion programs focusing on preventative education. Such programs
include nutrition education, exercise and activity programs, and training programs that focus on preventative health practices.

Many studies (Hendy, Gustitus & Leitzel-Schawlm, 2001; Powers, Struempler, Guarino, and Parmer, 2005; Rinderknecht & Smith, 2004; Wilson, Friend, Teasley, Reaves, and Sica, 2002; Schunk, 1999; Tollefson, 2000; Martin, 2004; Bandura, Barbaranelli, Vittorio, and Pastorelli, 1996) have relied on Bandura’s Social Cognitive Theory as the fundamental theory for many prevention programs, particularly with children and youth. The dynamic interaction between personal cognitive factors, environmental factors and personal behaviors, as explained by Social Cognitive Theory, are particularly applicable to nutrition education programs and an in-school emphasis on the knowledge and application of healthy eating behaviors. Social Cognitive Theory takes into consideration the individual, the social context or culture, and the power of “collective enablement” (Bandura, 1998, p. 23). In addition, Bandura (1993) emphasizes the importance of self-efficacy in the context of environment, cognition, and behavioral change. The triadic reciprocity paradigm, plus the concept of self-efficacy, ensures that Social Cognitive Theory provides an efficient explanation for approach taken in the elementary school nutrition education program dealt with in this study.

Ajzen’s and Fishbein’s Theories of Reasoned Action and Planned Behavior provide clear insight into the nature of attitude, subjective norms (or social acceptance of the change behavior), perceived behavioral control (or self-efficacy) and their effect on intention and the strength of that intention, and then subsequently, the predictive validity of intention and the resulting behavioral change. This theory provides strong support for the school nutrition education program and the importance of the education approach (individual, group and environmental) and behavioral activities and practice exercises that are inherent in the program curricula. In
addition, both theories provide support for the validity of the nutrition pre- and post-surveys that provide self-report information on food choices and eating behaviors. As a result, the Social Cognitive Theory and the Theories of Reasoned Action and Planned Behavior provide crucial explanations for the nutrition program and the predictive efficiency of the nutrition survey evaluation tool used to determine program results. Those two theories are the most relevant to program and survey efficacy.

A summary of the five theories, including Choice Theory, Health Belief Model, Transtheoretical Model, Social Cognitive Theory and Theories of Reasoned Action and Planned Behavior, is shown in Table 1. A comprehensive review of theoretical literature clarifies the fact that Social Cognitive Theory will provide a firm theoretical explanation to support the in-school nutrition education program, its construct, and its contribution to healthy eating behaviors as a part of a healthy lifestyle. The theories of Reasoned Action and Planned Behavior support the use of the nutrition survey which identifies intention as well as recollection of the food choices of those being surveyed. The use of Social Cognitive Theory and the Theories of Reasoned Action and Planned Behavior provide the strongest explanation for the nutrition program goals and its four identified dimensions of educational focus, and for the use of the nutrition survey to analyze food choices and eating behaviors of the participants in the school nutrition program. These two theories should provide a strong explanation of the relationship between program development, implementation, and individual student results. The emphasis on the cognitive, behavioral and environmental dimensions in addition to the essential component of self-efficacy, support the argument that Cognitive Behavioral Theory provides the most applicable explanation for the program’s efficacy. In addition, the theories of Reasoned Action and Planned Behavior with their emphasis on the relationship between intention and behavior support the use of the
self-report nutrition survey assessment tool. Table 3 summarizes the five theories addressed in this chapter.

<table>
<thead>
<tr>
<th>Theory</th>
<th>Author</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choice Theory</td>
<td>Glasser</td>
<td>Personal responsibility; achievement based on meeting one’s needs</td>
</tr>
<tr>
<td>Health Belief Model</td>
<td>Rosenstock and Becker</td>
<td>Balancing one’s beliefs about self-efficacy and barriers to change</td>
</tr>
<tr>
<td>Transtheoretical or Stages of Change Model</td>
<td>Prochaska</td>
<td>Identifies six stages of change including pre-contemplation, contemplation, preparation, action, maintenance, and termination</td>
</tr>
<tr>
<td>Social Cognitive Theory</td>
<td>Bandura</td>
<td>Cognition and its role in relation to behavior and environment – includes self-efficacy</td>
</tr>
<tr>
<td>Theories of Reasoned Action and Planned Behavior</td>
<td>Ajzen and Fishbein</td>
<td>Attitude, subjective norm, and perceived behavioral control influence the strength of intention – intention predicts</td>
</tr>
</tbody>
</table>

Program Theory Rationale

There are several researchers who have emphasized the importance of using early interventions to affect behavioral changes in nutrition consumption. According to Kandiah (2002, p. 271), “behavioral changes become more resistant to change after grade six.” Gerberding and Marks (2004) also emphasize the importance of childhood as the most effective time period to influence long-term behavioral changes. Perez-Rodrigo and Aranceta (2003, p. S82) state that, “nutrition during childhood contributes to maintaining health and optimal learning capacities.”

In addition, other researchers such as Perez-Rodrigo and Aranceta (2003) and Forgac (1999) support the position that schools are uniquely suited to providing nutrition education. Forgac (1999, p. 47) states, “nutrition education in schools offers a unique opportunity to
integrate the teaching of nutrition and the application of that knowledge to achieve behavior change. Perez-Rodrego and Aranceta (2003, p. S82) support the importance of schools as a critical venue for nutrition education saying, “schools provide the most effective and efficient way to reach a large segment of the population: young people, school staff, families, and community members.”

As stated earlier, literature reflects numerous studies that support the use of the school environment to implement behavioral change strategies and the use of social cognitive theory in the development of program theory. It provides a basis for understanding the cause and effect relationship between specific program components and approaches, and resultant changes in eating behaviors and BMI. Multiple studies, although short-term, have explored the relationship between curriculum, program activities, and sustained programmatic interventions, and the environmental, cognitive, and behavioral interactions that are necessary to support long-term changes in nutritional consumption of children. Most importantly, the study program is built based on cognitive behavioral intervention theory. The literature and empirical research is very clear that cognitive/behavioral interventions along with continuous reinforcement will result in behavioral change.

The nutrition program in this study was designed based on research into current best practices such as the Coordinated School Health Model (Coordinated School Health Program, 2005) and nutrition and brain function (Conyers, 2000). It was also constructed based on the understanding of school administration and personnel that the school environment is the optimal environment (with the exception of families) for a nutrition program to have impact—which is born out in best practice and research literature.
There was consensus among the administrator, faculty and staff, that to sustain changes in eating behaviors, those changes must be reinforced through a transformation in the overall school culture. As a result, the study program model addresses children’s health within the school setting and uses an environmental perspective to ensure that cultural changes not only went hand-in-hand with individual behavioral changes, but also provided environmental support for those changes. It uses a combination of curriculum components that focus on nutrition, activities that educate, reward and encourage healthy eating behaviors, and school culture-related events and activities that encourage participation and “buy-in” of staff, students and families. Those program components reflect underlying cognitive/behavioral theory, particularly social cognitive theory which recognizes the importance of environment in behavioral change.

According to the elementary school administration and staff, there was explicit recognition that, to influence changes in nutrition consumption behavior, it was necessary to develop a multi-dimensional approach to program implementation. As a result, the program approach included concurrent activities at the parent/family level, school level and classroom level. In addition, it was important to involve administration, teachers and staff, students and parents as co-participants in the nutrition education and behavioral change process.

Research literature supports the many programmatic factors that were developed in the school nutrition program and subsequently used to facilitate changes in eating behaviors and longer-term changes in BMI scores. First, were the dimensions targeted for intervention, administrative commitment and support; teacher staff education and involvement; student education and involvement; and parent/family education and involvement. This approach is support by program literature developed and disseminated by the Coordinated School Program Model (2005).
In addition, the nutrition education program contained four focus areas for nutrition intervention that were sustained over the entire three year period, and which resulted in program consistency in its core activities from year to year: in school activities involving administration, teachers, staff, and parents; in class activities and curriculum development involving teachers and students; educational literature and activities involving parents and families; and in school and in class activities and recognition programs targeting administration, teachers and staff (See Appendices A, B, C, D). A review of literature (Forgac, 1999; Trager, 2004; Weschsler, McKenna, Lee & Dietz, 2004; Making It Happen: School Nutrition Success Stories, Executive Summary, 2006) supports the use of the four focus areas as effective components of a nutrition education program seeking to affect behavioral changes in nutrition consumption. Each of the four focus areas was essential to the subsequent behavioral change process.

The elementary school nutrition program was designed to address the relationship between education and cognition, between the social environment and values, between culture and behavioral change supports, and, most importantly, to address the sustained triadic relationship between all three components. It was also designed to be based on cognitive/behavioral theories that emphasize the need for continuous reinforcement of positive behavioral changes to ensure that those changes can be sustained over time. The nutrition program includes consistent reinforcement of the nutrition education principles through daily curriculum modules in mathematics that address the importance of a variety of foods to ensure good nutrition, on energy input through eating and energy output through exercise, through weekly activities in every class at each grade level, and daily nutrition facts disseminated through use of morning announcements at the elementary school.
The program provides multiple group events that educate staff, students and parents, and establishes a collective environment for learning that leads to cognitive changes in individuals and group members resulting in cultural changes within the group context. Basically, everyone “buys in” to the idea that teaching, learning and practicing good nutrition is an important part of learning within the school setting. Finally, the program also provided regularly scheduled parent/family and home nutrition education reinforcement on a regular schedule through newsletters sent to the families on a monthly basis.

The basic program components of the intervention influence behavioral changes in student nutrition consumption by: first, educating the students about good nutrition through daily curriculum elements, daily nutrition education updates, weekly class activities, large scale group events involving staff, family and students; second, reinforcing healthy eating behaviors through in class, in school and at home rewards systems; third, through changes in cafeteria selections; fourth, through the use of continuous nutrition information modules sent home to parents and families, with subsequent follow up activities that involved parents in the education process; and finally, through regularly scheduled family nights that focuses on the importance of good nutrition and its effect on learning. The interrelationship between these program components is critical to a sustained effort that reflects continuous reinforcement of positive behavioral changes and discourages negative behaviors regarding food consumption. The result is a nutrition education program that has the ability to influence nutrition consumption and subsequent BMI scores. Each component reflects nutrition education, behavioral change support, and sustained behavioral changes.

The school nutrition program theory reflected the following relationships:
• Administration, teachers and staff, and students participate in school activities on a daily (morning announcements, healthy tip for the day), weekly (weekly healthy lunch menu distributed), and quarterly (family nights and teacher appreciation healthy activities);

• In class activities that focus on nutrition and healthy eating on a daily (CHEW math problem), weekly (nutrition related activities, new healthy recipes, “walking through the pyramid”), and monthly (nutrition and healthy eating information sheets, water facts);

• Family involvement activities that focus on knowledge of nutrition and application of that knowledge in monthly (nutrition information fact sheets, newsletter tips for healthy recipes and healthy snack alternatives), quarterly (family nights), and yearly (healthy school celebration event); and

• A system of rewards and behavioral reinforcements including daily (tokens for bringing healthy lunch to school or eating healthy selections from the cafeteria), weekly (reward tokens for drinking water regularly and carrying a water bottle to class), and yearly (healthy school celebration with individual, class, school and family recognition of healthy eating behaviors sustained over the school year).

All of these program relationships reflect the underlying support of cognitive/behavioral theory, specifically—social cognitive theory, due to its emphasis on triadic reciprocity and the importance of self-efficacy. The students had to not only learn about the fundamentals of good nutrition and demonstrate that knowledge through daily behaviors, but also for behavior to be sustained, they needed to have a belief in their own ability to adopt healthy eating behaviors and sustain them over time. Self-efficacy is a critical component of sustained behavioral change. The nutrition education program theory is presented in Figure 7.
There is a strong relationship between supportive theories of human behavior, practice theory, and the nutrition education program. It is clear that theoretical research supports the potential success of the nutrition education and its resultant impact on healthy eating behaviors and an increase in the percentage of students with normal BMI scores. It can be hypothesized that consistent participation, across dimensions, in the nutrition program in this study should result in positive changes in eating behaviors and body mass index of the program participants.
CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

Purpose of the Study

The purpose of this study is to evaluate the effectiveness of a school-based nutrition program on: 1) reported healthy eating behaviors; and 2) the percentage of students in the overweight and at-risk for overweight Body Mass Index (BMI) percentile ranges. The goals of this study are to determine whether or not the program resulted in improved food choices and eating behaviors in the participating students, and in a reduction in the percentage of students in the at-risk for overweight category (BMI ≥ 85%) and overweight category (BMI ≥ 95). It is anticipated that this study can be used to determine whether the school-based nutrition program was effective by analyzing whether there is a relationship between the nutrition program and an increase in healthy eating behaviors and the nutrition program and normalcy of body mass index scores for the student participants.

Research Questions and Hypotheses

In keeping with the goals of the program interventions, the study research questions asked whether the program was successful in influencing improvements in the specified target areas. The hypotheses are as follows:

Hypothesis 1: Participation in the nutrition program will improve participants’ healthy eating behaviors as reported by the students.

Hypothesis 2: Participation in the nutrition program will result in a decrease in the proportion of students with BMI percentile scores in the “overweight” (combining overweight and at-risk for overweight) range.
Subjects

The research study subjects were drawn from those students attending the elementary school where the nutrition education program was developed and implemented. The study population was comprised of a sample taken from the school-based nutrition program participants (approximately 560 students), ages five to eleven, who participated in the nutrition and/or the BMI assessment processes, whose information was then available (who were in attendance during the nutrition survey days and the height and weight recording sessions), and who participated in the nutrition program over the entire three year period of the study. The information for this study was taken from existing, secondary data provided by school administration that were then analyzed for purposes of the study. All student identifiers have been removed.

Design of the Study

Program Rationale

The elementary school identified in this study was designated as the demonstration study site of a local health initiative that focused on elementary school-age children by providing nutrition education, nutrition and health-related curriculum activities, and other support activities in grades K through five. It was chosen because its student population is representative of other schools in the area. Demographically speaking, it is a “middle of the road” school with a representative sampling of students from diverse racial, ethnic, and economic backgrounds. Because of this, the elementary school is uniquely situated to provide objective data that can be generalized to the larger community student population.
In addition, the elementary school has a lower mobility rate than many schools of similar demographic characteristics. This fact contributed significantly to an increased opportunity to provide a trend analysis of the program and its effect on participants over time due to the increased likelihood that there would be a larger number of students who were able to participate in the study over the course of the entire four-year period. The elementary school profile is as follows (see Appendix A):

<table>
<thead>
<tr>
<th>Table 4: Elementary School Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enrollment</td>
</tr>
<tr>
<td>Staffing</td>
</tr>
</tbody>
</table>
| Ethnicity                         | 70% white  
|                                   | 13% Hispanic  
|                                   | 11% black  
|                                   | 06% other races  
|                                   | 25% free and reduced lunch students  
|                                   | 30% mobility rate |

This study analyzes the results of an in-school nutrition education program from its beginning in August 2001 through October 2004. Originally, the program was developed as a way to increase student academic performance through improved nutrition and hydration. This remained a critical marketing point throughout the three-year study. However, this outcome is not assessed in this study. The program also supported the importance of increased physical activity, but primary focus was placed on nutrition throughout the study time period. The program was funded as a pilot study through local foundation money. The project goals and outcomes as stated in the proposal are shown in Tables 5 and 6 (see Appendix A).
Table 5: Goals of the Elementary School Nutrition Grant as Stated in the Proposal

<table>
<thead>
<tr>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improve student behavior and learning environment in classroom</td>
</tr>
<tr>
<td>Improve student test scores</td>
</tr>
<tr>
<td>Reduce school absenteeism due to illness</td>
</tr>
<tr>
<td>Produce children who have internalized and used sound thinking to make life choices regarding nutrition and exercise</td>
</tr>
<tr>
<td>Increase the number of adults and children who exercise regularly</td>
</tr>
</tbody>
</table>

Table 6: Project Changes and Outcomes as Stated in the Proposal

<table>
<thead>
<tr>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change the nutritional content of school breakfasts and lunches to include foods which are nutritionally sound and which aid students in learning</td>
</tr>
<tr>
<td>Change the curriculum taught in elementary schools to include real-life mathematics and critical thinking which supports good nutrition and exercise choices</td>
</tr>
<tr>
<td>Make the provision of brain-healthy snacks and water as part of basic school curricula</td>
</tr>
<tr>
<td>Increase the number of adults and children who exercise regularly</td>
</tr>
<tr>
<td>Serve as model for expansion of these principles to other districts</td>
</tr>
</tbody>
</table>

From its inception, the program involved school administration and staff as key stakeholders in its creation and implementation. It was understood from the beginning, that for a nutrition program to have any affect, it had to become part of the school culture and include consistent outreach to the students’ parents and their families. It also needed to be incorporated into the daily classroom curricula. As a result, the program was incorporated throughout the school day and included ongoing communication with administrators, teachers, and parents, as well as students. The program also involved key focus areas for activities such as administration, staff and parent education efforts, the development of an in-class math curriculum focusing on nutrition, multiple age-appropriate activities created for student involvement, monthly newsletters with information for staff, parents, and students, and school family nights that included education sessions and activities for students and their families.
The original grant proposal included references to existing research on nutrition and the brain (see Appendix A, for brain research references used to promote the program). The primary program goal was to make significant changes in the health and performance of students, families, and staff by implementing current research on the brain and nutrition. The brain research provided a basic understanding that children are better able to learn and perform when they have proper nutrition, hydration, exercise, and snacks. Research was also used to demonstrate that the incorporation of education concerning nutrition and exercise into school curricula would produce better learners with less absenteeism, healthier staff, and promote long-term health benefits for the participating students. From the beginning, a strong connection was made between nutrition and academic performance—the primary goal of any educational institution. This was a critical program component due to the importance of creating “buy in” from district and school administration, faculty, parents, and students.

The elementary school sought grant funding over a three year period to (see Appendix A):

- Hire consultants to train teachers, students, and parents about current research regarding nutrition and the effects of healthy habits on a child’s capacity to learn and perform academically.
- Develop a “HealthMath” (Conyers, 2000) curriculum which used real-world nutrition applications to teach mathematical principles.
- Provide nutrition consultation to revise the meals served in the school cafeteria to provide healthier meal choices.
- Fund the revisions to the cafeteria meal menus and brain-healthy snack for all children.
- Increase water availability to all students and staff to optimize performance and learning.
• Provide specific opportunities for children, families, and staff to incorporate the healthy nutrition principles into real life.

• Fund a part-time staff position to administer the program, to coordinate the school’s efforts with other schools in the area and at the state and local level, and to coordinate the evaluation of the project and results, if any.

Program Implementation

Getting Started (see Appendix A)

The program coordinator and principal initiated the development of the nutrition program with the understanding that they would need to create a program that could, in effect, change the culture of the entire school (Bandura, 1977, 1993, 1998). With that in mind, they recognized that “buy in” was critical to a successful change process within the school environment. They realized that the entire initiative needed to commence with an intensive education effort to gather support for the nutrition program. That meant that they needed to be able to demonstrate a connection between the nutrition program and student academic success.

Preparatory to the first year, the program development coordinator and principal met with members of the School Advisory Committee (SAC) (see Appendix A). The school SAC committee is comprised of administration, faculty, and parents who provide oversight and community input, financial support, and in kind support in an effort to promote a variety of school programs. Next, they met with the teachers to brainstorm ways in which such a program could be implemented in the school setting, and what types of activities could be developed that would integrate successfully into the daily school curriculum and be relevant to each grade level
in such a way that the education process was enhanced. The principal and coordinator also met with the school cafeteria manager to enlist support and suggestions for lunch and snack menu changes. This was a slow process and met with significant initial resistance.

A critical next step in the program development process was to meet with school district administrators (particularly food services administrators) to ensure district support for the nutrition program, including potential changes to the school lunch menu. The support of the school district food service administrator helped ensure that the school cafeteria manager would support healthier food choices in the school lunch program. The principal and coordinator also met with community leaders and local businesses in an effort to develop support for the school nutrition program.

Recognizing the need to educate themselves regarding the importance of nutrition, health and academic performance, the principal and coordinator researched relevant literature, and identified and attended national conferences on nutrition and brain development such as the Harvard Learning and the Brain Conference (which occurs on an annual basis, see Appendix A). Finally, they secured funding for three years to ensure a sustainable source of revenue while the program was being implemented. Program implementation over the course of the three year time period focused on four critical dimensions: administrative commitment and support; teacher staff education and involvement; student education and involvement; and parent/family education and involvement. These four dimensions were essential in the effort to encourage a substantial paradigm shift in attitudes, beliefs, and behaviors concerning nutrition, health, and academic performance as demonstrated by a substantial cultural change at the school over the three years of the program (Bandura, 1977, 1993, 1998). The four focus areas for nutrition intervention were
sustained over the entire three year period. This resulted in program consistency in its core activities from year to year (see Table 7).

Table 7: Core Program Tasks and Outcomes: Year One–Year Three

<table>
<thead>
<tr>
<th>Tasks</th>
<th>Outputs</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers write Health Math (CHEW) curriculum and use it with students</td>
<td>All students 1-5 began each day with a CHEW math problem</td>
<td>Curriculum was developed and used daily–3 years</td>
</tr>
<tr>
<td>Educate staff, parents, and students about nutrition and healthy brain</td>
<td>Create newsletter, morning announcements, and in-class activities</td>
<td>All families and staff receive monthly newsletters and other educational materials</td>
</tr>
<tr>
<td>Make healthy changes to cafeteria breakfast and lunch menus</td>
<td>Fat content in school breakfasts and lunches is less than 30% and very low in sugar</td>
<td>Students learned how to plan a healthy menu. They could read food labels and better understand nutrition content.</td>
</tr>
<tr>
<td>Work with students and staff to increase water intake.</td>
<td>Water bottles were purchased and provided to staff and students. A new school fountain with filtered water</td>
<td>Students and staff brought water bottles to school and used them in class.</td>
</tr>
<tr>
<td>Send staff to local and national conferences on nutrition, health, and academic performance</td>
<td>Travel funds were provided to send various staff to conferences</td>
<td>Staff attended three conferences on health, nutrition, and the brain</td>
</tr>
<tr>
<td>Teach students to learn how to make healthy snacks for home and school</td>
<td>In-class activities were developed to teach ways to make a variety of healthy snacks.</td>
<td>Students learned how to make healthy snacks at home and in school.</td>
</tr>
<tr>
<td>Increase physical activity with students, parents, and staff.</td>
<td>Create more interest in physical activity by using toe tokens to reward physical activity.</td>
<td>Students learned about the connection between exercise and health.</td>
</tr>
<tr>
<td>Increase community awareness.</td>
<td>Community presentations are being made.</td>
<td>Community awareness is increasing.</td>
</tr>
</tbody>
</table>

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In-school Activities

There were many program components that affected the entire school environment such as the presentation of healthy tips for the day during the morning news report and using weekly themes that emphasized nutrition, hydration, and a healthy brain. In addition, parents became increasingly involved in the program and were asked to participate in many of the in-class nutrition activities.

Each year the PTA purchased new water bottles for the students and teachers so that staff and students had water available at all times on the school campus. In addition, over the three years, teachers gradually allowed the children to drink from their water bottles in the classroom as they became convinced that having water bottles available to the students did not result in disruption to the education process. It is important to note that this was a significant deviation from standard school practices which limit water consumption in the classroom.

There was an increased emphasis on healthy foods and on foods from different nations and cultures. The cafeteria would have theme days that focused on specific cultures; there would also be in-class education modules that discussed the culture of the day and the important foods of that culture. The fourth and fifth grade students also planted and sustained a school garden of edible plants which were then used in recipes during classroom activities for all grade levels.

As stated in Chapter Two, there were many in-school activities that involved the principal, teachers and staff, and students as they participated in in-school nutrition program activities on a daily (morning announcements, healthy tip for the day), weekly (weekly healthy lunch menu distributed, foods from different cultures), and quarterly (family nutrition nights and teacher appreciation healthy activities). There were very consistent applications of programmatic elements applied across the entire school population.
In-class Activities and Curriculum Development (see Appendix B)

As part of the systematic approach to curriculum development, in-class activities, and educational opportunities that was used over the entire three year period, a health math curriculum called Changing Habits for Everyone’s Well being (CHEW) was created by the teachers and adjusted to each grade level (Conyers, 2000). Math problems were created and inserted into the curriculum of each grade level on a yearly basis to ensure continued student interest and involvement. Several in-class activities were also developed such as “walking through the food pyramid,” making healthy fruit smoothies, and choosing healthy snacks such as fruits and vegetables rather than sugar snacks (see Appendix C). In addition to these core activities, new activities were added each year to enhance the learning experience for students, parents, and teachers.

There were daily in-class activities for each class, in every grade level that focused on nutrition and healthy eating such as the daily CHEW math problems, weekly in-class activities such as creating healthy recipes, making fruit smoothies, and monthly in-class activities such as “walking through the pyramid,” along with monthly nutrition and healthy eating information sheets, water facts and puzzles with nutritional facts.

Since a primary focus of the program was to influence environmental/cultural change, teachers were encouraged to evaluate their classroom situations for the purpose of assessing ways in which they could improve attitudes and behaviors about nutrition, healthy eating, and school success. They were also encouraged to use healthy snack rewards rather than candy rewards for good behavior or academic performance and were provided with a list of healthy snack alternatives by the program coordinator.
Parent and Family Involvement (see Appendix C)

The nutrition program emphasized the connection between nutrition, health, and learning by sending home critical health information flyers that emphasized the importance of sleep, eating a good breakfast, healthy snacks and lunches, etc. Nutrition fact sheets were sent home at least monthly, and more often during intense periods of academic testing. Health concepts, including the importance of nutrition, received increased emphasis during preparation for, and execution of, the standardized tests required by state law. In addition, each year there were quarterly parent/family nights that focused on nutrition and brain development, and special holiday and end-of-year giveaways for students and parents such as the Kids Discover Brain magazine.

Parent participation was a continuous part of the core program efforts as was the monthly newsletter. On a monthly basis, the school newsletter contained a special column with healthy menu selections for children and parents. The newsletter also provided continuous updates to parents and family members about program activities during any given week and month. In addition, as part of the in-class activities with the students, information was often sent home to parents informing them about the healthy activity of the day. The information flyers included such things as recipes or descriptions of the activities.

Administration Faculty and Staff (see Appendix D)

Teachers and staff were rewarded for their efforts in creating health conscious classroom environments. They were given gift certificates, free massages, and many other “healthy” rewards to recognize their efforts. Parents were involved through their participation in SAC and the PTA, and were routinely invited to parent nights and family nights at the school where
additional information on health, nutrition, and academic performance were provided. The program coordinator actively sought support from the local businesses in the community. One result was that the local health foods store sponsored events that encouraged the students to bring their parents to the store where many “kid friendly” health food activities were provided along with discounts and free samples of nutritious snacks.

**First Year of the Program**

The first year of the nutrition program focused on the development of school nutrition curricula, engaging the principal, teachers and parents in the nutrition program activities and education events, developing school activities for students in each grade level and incorporating them into the school day (see Appendices A, B, C, and D for program examples). In addition, the coordinator ensured that specific program tasks and outcomes were identified and achieved for the first year and each year. The initial program activities and outcomes were maintained throughout the three year period. There were additional curriculum, project, and activity additions during subsequent years to ensure that the program maintained the interest of the staff and students.

The first year began with a “kick off” on September 5, 2001. The kick off was planned as an evening event for teachers and parents and where information was provided on the nutrition, the brain and learning, by Marcus Conyers (a national speaker on the brain and learning) and best practices in school-based nutrition programming by Healthy Kids Challenge (a national non profit whose mission is to raise awareness and encourage healthy changes in eating and nutrition). A local health food store provided healthy snacks for parents and students, and provided handouts and literature about healthy food choices for children. In addition, faculty and
parents formed walking groups and participated in recipe sharing opportunities with one another. Table 8 shows the basic implementation outline started during the first year of the program (see Appendix A). It is important to note that the nutrition education activities for teachers, students, and parents were critical to the successful development of the program due to their importance in influencing the kinds of environmental, cognitive, and behavioral changes that would, hopefully, be reflected by healthier food choices and subsequent increases in academic performance, and changes in BMI percentile rankings (Bandura, 1977, 1993, 1998).
Table 8: How to Start a Brain-based Nutrition Program (see Appendix A)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Begin with SAC discussions</td>
</tr>
<tr>
<td>2.</td>
<td>Move to district discussions</td>
</tr>
<tr>
<td>3.</td>
<td>Register and attend conferences—Harvard</td>
</tr>
<tr>
<td>4.</td>
<td>Obtain funding</td>
</tr>
<tr>
<td>5.</td>
<td>Involve the school and community—beginning in 2001-2002</td>
</tr>
<tr>
<td>6.</td>
<td>Install water fountains</td>
</tr>
<tr>
<td>7.</td>
<td>Give water bottles to students and staff</td>
</tr>
<tr>
<td>8.</td>
<td>Do pre and post assessments of nutrition knowledge and healthy food choices</td>
</tr>
<tr>
<td>9.</td>
<td>Do pre and post assessment of heights and weights for BMI measurements</td>
</tr>
</tbody>
</table>
| 10. | Begin **CHEW** curriculum **Changing Habits for Everyone’s Well being**  
   - Form teacher writing team  
   - Each student starts the day with a math/health problem of the day |
| 11. | Kick-off September 5, 2001 with Marcus Conyers (national speaker on the brain and learning) and Healthy Kids Challenge (started by Cooking Light Magazine) **Walk Through the Pyramid**—supplies donated by Whole Foods |
| 12. | Back to school Brain Gym presentation for parents |
| 13. | Healthy menu selections in monthly newsletter |
| 14. | Cooking in the classrooms for children with education about the brain |
| 15. | Holiday giveaways for children and parents—books and lunch bags |
| 16. | End of the year gift for families—**Kids Discover Brain** magazine |
| 17. | Health snacks before and during FCAT testing (grades 3-5 for 4 days) |
| 18. | Parent walking groups formed—4 afternoons per week |
| 19. | Faculty and Staff participate in **Walk the Talk** |
| 20. | Community presentations |
| 21. | Attended conferences  
   - **Learning in the Garden of Good and Evil**—February (10 participants)  
   - **Hearts and Minds**—April (3 participants)  
   - **Learning and the Brain**—May (8 participants) |

The first year of the program provided a coordinated approach to nutrition education (the cognitive component), cultural/environmental changes (environmental component), and behavior modification (behavioral component) that included a consistent daily, weekly, and monthly system of rewards for positive reinforcement.
Second Year of the Program

The second year of the nutrition program followed the same identified tasks and outcomes as in year one. In addition, the program coordinator met with community leaders to increase community awareness of the nutrition program and solicited further participation of local organizations and businesses, increased the amount of home-related resources to share with families, redesigned and refurnished the cafeteria to improve the ambience of the facility with attractive tables, inside and outside the cafeteria. Twenty-seven teachers and school district administrators went to conferences on nutrition, learning, and the brain held in California, Florida, and at Harvard. The goal of participation at the conferences and the importance of the information presented there was to enhance staff commitment to the nutrition program over the three-year time period.

Third Year of the Program

During the third year of the program, the CHEW curriculum continued to be developed so that three years worth of daily problems were created for each grade level participating in the nutrition program. In addition, during the third year, a Florida Department of Agriculture and Department of Education program, called Fresh 2 U, was used as a source of information for Wednesday spotlights of fruits and vegetables that were made available for the students to try. The goal of this portion of the program was to encourage the students to try new fruits and vegetables (Fresh 2 U, 2007). The program coordinator constantly researched web resources to further enhance the education component of the program for teachers, parents, and students. The result was an increase in the variety of information sources, activities, and educational applications.
The school cafeteria also continued to receive attention. During the third year additional benches and tables were added to those purchased during the second year of the grant. Murals were painted on the cafeteria walls during the summer between the second and third years of the program to add to the enjoyment of the lunchroom experience. It was expected that improving the surroundings in the cafeteria would result in an environment more supportive of the increased emphasis on healthy, nutritious eating.

Attendance at national conferences, by some of the teachers and the principal, was reported to be one of the most influential programmatic efforts to change administration and teacher perceptions and culture. District administrators, food service administrators, principals from other schools, and additional teachers from the nutrition program school, were able to attend conferences that focused on the importance of nutrition to brain development, optimum school performance, and childhood obesity. The program principal and coordinator presented at three national conferences – two at the Harvard Learning and the Brain Conference in 2003 and 2004, and one at a national school board conference with a local school board member. The presentations focused on how to start brain-based nutrition programs in elementary schools. These activities appeared to have significant impact on the program’s ability to influence and educate the surrounding community about the importance of nutrition, brain development, and childhood obesity. They also appeared to increase support from within and without the school community, which could result in enhancing the cultural impact of the nutrition program on the subsequent attitudes, beliefs, and behaviors of the students.
Research Design

Procedures

Nutrition Survey

The Healthy Kids Challenge Food Guide Pyramid Self-Report Questionnaire for Grades K-2 and Grades 3-8 was used to assess healthy food choices for breakfast, lunch snack and dinner (see Appendix E) (Healthy Kids Challenge, 2001). Classroom teachers were provided with instructions detailing exactly how to administer the nutrition survey to students (see Appendix E). The students were asked to select the food they would usually eat for breakfast, lunch, dinner and snacks from the survey which included ninety-six food pictures, located on four pages separated into breakfast, lunch, snacks, dinner. This was to aid them in making their selections. Their selections were classified into food pyramid categories of fats/oils/sweets, milk, meat, vegetables, fruit, and bread/cereal/rice/pasta. A combination category was also used. The nutrition survey was administered at four separate intervals over the three-year time period; in August 2001, May 2002, February 2004, and November 2004.

The nutrition survey study participants were taken from the students who participated in the nutrition program over the entire three-year period, and who were in attendance at school and available in class to respond to the nutrition survey all four times the survey was administered. The nutrition survey sample is comprised of the fifty-eight students who met this requirement. The sample excludes new students to ensure the elimination of possible bias as a result of changes of the sampling frame.
BMI Information

Height and weight information was gathered for every available student during each academic year of the study. Heights and weights, used to calculate BMI scores were completed in the nurse’s office or in the physical education teacher’s office. All BMI measurements were completed within a one-week time frame. To ensure consistency in weighing and measuring, students were asked to remove shoes and jackets prior to having their heights and weights measured on the school nurse’s scale and in the P.E. teacher’s office. Partial inches and/or pounds were rounded to the nearest inch or pound and recorded on an Excel spreadsheet for later analysis.

Each participant’s BMI was calculated from his or her height and weight using the BMI. Then, the BMI figure was classified into “overweight,” “at-risk for overweight,” “underweight,” or “normal” based on the definition given by the Center for Disease Control (National Center for Health Statistics, 2006). The CDC defines “overweight” as being the top 5 percent (or 95th percentile and above) of the BMI index, “at-risk for overweight” as the top 15 percent to 5 percent (or 85th to 95th percentile), “normal” as the middle 80 percent (or 5th to 85th percentile) and “underweight” as the bottom 5 percent (or below the 5th percentile), (National Center for Health Statistics, 2006).

A design of repeated measures was used in which program participants’ BMI scores were observed during the three year period of program intervention. In this design, BMI data were gathered five times in August 2001, May 2002, August 2002, August 2003, and October 2004. Of 560 elementary school students, 90 had their BMIs collected all five times during the study period. As a result, 90 students were included in the BMI study sample. As stated earlier, the BMI study participants were taken from the students who participated in the nutrition program
over the entire three-year period, who were in attendance at school, and available to have their heights and weights recorded all five times during the study period. The BMI study sample is comprised of the 90 students who met this requirement. The sample excludes new students to ensure the elimination of possible bias as a result of changes of the sampling frame. This explains the reduction in the number of students from 560 to 90.

**Study Variables**

**Independent Variable**

The independent variable in this study is the nutrition program. All students and teachers attending the elementary school participated in the nutrition program for the duration of each of the four academic years covered by this study. The program was provided from August through May for each academic year. The program coordinator and school principal provided joint oversight for program development and implementation.

Over the course of the three-year time period, the program focused on four critical dimensions: administrative commitment and support, teacher staff education and involvement, student education and involvement, and parent/family education and involvement.

Through the use of four focus areas of intervention including in-class education and activities, teacher staff education and activities, parent family education and activities and in-school education and activities such as the cafeteria enhancement efforts, the nutrition intervention program, including specific activities and curricula, were sustained over the entire three-year period. This resulted in consistency in the program’s core activities from year to year.
**Dependent Variables**

The dependent variables were those variables that represented the BMI percentile scores and the self-reported eating behaviors of the nutrition program student participants. The nutrition variables included specific categories of food consumption such as consumption of fats, oils, and/or sweets, consumption of milk, cheese, eggs, yogurt, and/or dairy products, consumption of meats, consumption of vegetables, consumption of fruits, consumption of grains, and combination foods. Table 9 provides an operational summary of dependent variables.

Table 9: Operational Definition of Dependent Variables

<table>
<thead>
<tr>
<th>Variable Label</th>
<th>Variable Definition</th>
<th>Variable Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Mass Index</td>
<td>Calculation by gender, body height, weight, and month of students participation</td>
<td>Dependent</td>
</tr>
<tr>
<td>Fos</td>
<td>Consumption of fats, oils, and/or sweets</td>
<td>Dependent</td>
</tr>
<tr>
<td>Mlk</td>
<td>Consumption of milk, cheese, eggs, yogurt, or other dairy products</td>
<td>Dependent</td>
</tr>
<tr>
<td>Metg</td>
<td>Consumption of meats</td>
<td>Dependent</td>
</tr>
<tr>
<td>Vgtbl</td>
<td>Consumption of vegetables</td>
<td>Dependent</td>
</tr>
<tr>
<td>Frtgr</td>
<td>Consumption of fruits</td>
<td>Dependent</td>
</tr>
<tr>
<td>Bcrp</td>
<td>Consumption of bread, cereal, rice, or pasta</td>
<td>Dependent</td>
</tr>
<tr>
<td>Cmb</td>
<td>Combination foods</td>
<td>Dependent</td>
</tr>
</tbody>
</table>

There were also control variables that were extracted from school data such as gender, age, and grade. The inclusion of these control variables in the analysis will allow for additional
analysis of the impact of the nutrition program across the sample student population. Table 10 provides an operational definition of the control variables.

Table 10: Operational Definition of Control Variables

<table>
<thead>
<tr>
<th>Variable Label</th>
<th>Variable Definition</th>
<th>Variable Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade</td>
<td>Student’s grade level</td>
<td>Control</td>
</tr>
<tr>
<td>Age</td>
<td>Student’s age</td>
<td>Control</td>
</tr>
<tr>
<td>Gender</td>
<td>Student’s gender</td>
<td>Control</td>
</tr>
</tbody>
</table>

Data Analysis

Nutrition survey results have been entered onto Excel spreadsheets and transferred to SPSS for analysis. In addition, BMI scores have been calculated and exact percentile rankings have been determined using the Centers for Disease Control NutStat program (Epi-Info, 2007). Those scores were also transferred to SPSS for analysis.

A design of repeated measures will be used to assess program participants’ knowledge of nutrition and reported eating behaviors over the three-year time period of the program intervention. Program participants' nutrition consumption was measured four times. The initial survey was conducted in August 2001, and subsequent surveys were collected in May 2002, February 2004, and February 2005. Of approximately 560 registered elementary school students, fifty-eight students participated all four times in the nutrition survey during the three year period. As a result, fifty-eight students were included in the nutrition consumption portion of the study.

Descriptive statistics will be used to analyze the demographic characteristics of the nutrition consumption survey sample population. In addition, paired sample tests will be completed on daily serving averages for breakfast, lunch, snack, and dinner, for each data
collection point during the program evaluation period. An F test of univariate repeated measurement will be used to show mean consumption of identified foods and t tests of daily serving averages will show whether or not any changes are significant.

Program participants’ BMI scores were calculated using the following calculation: BMI = (Weight in pounds) / (Height in inches)× (Height in inches) × 704.5. Each participant’s BMI percentile rankings were then calculated from his or her height and weight by NUTSTAT, a BMI calculator recommended by the Center for Disease Control and Prevention (National Center for Health Statistics, 2006).

The measure of program effect is BMI proportion, the McNemar test of comparing dependent proportions will be applied (Agresti and Finlay, 1997). The logic for using BMI proportion and the McNemar test is due to the fact that comparing BMI scores can be misleading. BMI appears to be an interval variable, its means can be calculated and compared. However, even though statistical tests could then be performed to analyze the mean difference during different time periods (two sample t-tests for example), results from the tests on mean difference would not provide meaningful information to the researcher. This is due to the fact that since the change in mean is sensitive to age (based on CDC growth charts), a larger BMI of a subject doesn’t necessarily indicate that his or her BMI deteriorates over time. By the same token, a smaller BMI also doesn’t necessarily indicate that the BMI is getting better over time.

The use of the McNemar test ensures that the use of BMI proportions is controlled by age. For example, the same BMI value can be classified as “normal” for the 10-year old group, but “overweight” for the 7-year old group. This is the reason why BMI proportions are used in this study. The McNemar is a test for proportion difference. It is a test of two dependent proportions. In this study, the null hypothesis is that the population proportions of the two
proportions are same. In this case, that is the “overweight and at-risk for overweight” proportion in baseline BMI scores is the same to the “overweight and at-risk overweight” proportion in four subsequent years of BMI scores.

One of the strengths of this study design is the fact that, from an evaluation standpoint, it is two dimensional. The use of two measures, one a short-term or intermediate outcome measure and the other a long-term outcome measure, should result in a stronger measurement process with which to determine results. This measurement model is unique when compared to other in-school nutrition program studies, and better able to provide important information on the effect of the program on eating behaviors and on changes in Body Mass Index (BMI) percentile scores.
CHAPTER FOUR: FINDINGS

The focus of this research study is to assess the impact of the nutrition education program on the participating students in the elementary school over the three-year time period of the pilot program, from 2001 to 2004. The results presented in this chapter reflect the analysis of the nutrition survey data and the body mass index (BMI) data used to compute percentile rankings. The nutrition survey is identified as a shorter-term, or intermediate, evaluation measure due to the fact that although it will be used over the three years of the study, eating behaviors should change fairly quickly in response to the nutrition education program. Also, body mass index is identified as a longer-term variable because the change in BMI should require more time between onset of the program and BMI results. It is important to note that, based on the program theory model, and due to the fact that the populations in the two separate datasets are not linked, the results for each measure must be treated as independent.

The research findings from this study will be presented in the following order: first, a description of the nutrition survey and BMI study samples; second, a discussion of the nutrition survey evaluation results including hypothesis testing, and third, a discussion of the BMI evaluation results including hypothesis testing.

Study Subjects

The research study subjects were drawn from those students attending the elementary school where the nutrition education program was developed and implemented. The population studied consists of approximately 560 students, ages five to eleven, who attended the elementary school from August 2001 through May 2006. The study population excluded those students who
participated in special education programs, who left the school during any academic year, or who were added to the school population during any academic year. The sample was also limited to students who remained at the elementary school for all three years.

The study population is represented through the use of two datasets, one provides the nutrition consumption information and the other set provides the height and weight information along with the calculated BMI and percentile rankings. Since the two data sets are separate and, without common student identifiers, it is impossible to directly link the students in the nutrition data set with students in the BMI data set. The sample population derived for each data set is independent and was based on the students’ availability for evaluation at each point in time over the three year period. Therefore, although the data sets are comprised of cohorts and represent samples from the same cohort population, the students in the sample population may vary. As a result, the total number of participants meeting the three-year criteria for each measure varies from data set to data set. However, since both sets include students who attended the elementary school over the entire assessment period, it is probable that the sets do share students in common.

**Nutrition Consumption Survey Sample**

As was stated earlier, the nutrition survey study participants were taken from the students who participated in the nutrition program over the entire three-year period, and who were in attendance at school and available in class to respond to the nutrition survey all four times the survey was administered. The nutrition survey sample is comprised of the fifty-eight students who met this requirement. The sample excludes new students to ensure the elimination of possible bias as a result of changes of the sampling frame.
Demographic data, including grade and gender, were obtained on the sample population. The nutrition evaluation targets the students who were tested all four times during the three-year study period. Of the fifty-eight students in the sample, thirty are male (52%) and twenty-eight are female (48%). The gender distribution is shown in Figure 8.

![Figure 8: Gender Distribution of the Nutrition Survey Sample (n= 58)](image)

Since the nutrition consumption evaluation targets those students who were tested all four times during the three-year time period of the study, the population sample is comprised of the students who were in the first and second grades in August 2001. This is due to the fact that third grade students in August 2001 had graduated to middle school by November 2004. However, the first and second grade students were tested all four times. During August 2001, eighteen students
in the sample were in the first grade (31%) and forty were in the second grade (69%). The grade distribution is shown in Figure 9.

Figure 9: Grade Distribution of the Nutrition Survey Sample (n=58)

**Body Mass Index (BMI) Sample**

The body mass index (BMI) study participants were taken from the students who participated in the nutrition program over the entire three-year period, and who were in attendance and available to have their height and weight measurements taken all five times during the study period. The BMI sample is comprised of the ninety students who met this requirement. Demographic data, including grade, age, and gender, were obtained on the sample population. Of the ninety students in the sample, fifty-two are male (58%) and thirty-eight are female (42%). The gender distribution is shown in Figure 10.
Since the BMI evaluation targets those students who were tested all five times during the three-year time period of the study, the population sample comprises the students who were born in 1992, 1993, 1994, 1995, and 1996. Date of birth was chosen as the most relevant demographic for analysis due to its relevance to the CDC growth charts and their relationship to age and BMI scores (Centers for Disease Control and Prevention, 2004). Program participants’ BMI scores were calculated using the following calculation: \[ \text{BMI} = \frac{\text{Weight in pounds}}{(\text{Height in inches}) \times (\text{Height in inches}) \times 704.5} \] (National Center for Health Statistics, 2006). The sample includes one student who was born in 1992, thirteen students who were born in 1993, thirty-seven students who were born in 1994, twenty-seven students who were born in 1995 and twelve students who were born in 1996 (see Table 11). As can be seen from the table, the majority of the students were born in 1994 and 1995.

![Gender Distribution of the BMI Sample (n=90)](image)

Figure 10: Gender Distribution of the BMI Sample (n=90)
Table 11: Age Distribution of the BMI Students (n=90)

<table>
<thead>
<tr>
<th>Year of Birth</th>
<th>Number of Students</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1992</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>1993</td>
<td>13</td>
<td>14.4</td>
</tr>
<tr>
<td>1994</td>
<td>37</td>
<td>41.1</td>
</tr>
<tr>
<td>1995</td>
<td>27</td>
<td>30.0</td>
</tr>
<tr>
<td>1996</td>
<td>13</td>
<td>13.3</td>
</tr>
<tr>
<td>Total</td>
<td>90</td>
<td>100</td>
</tr>
</tbody>
</table>

Nutrition Survey Outcome Results

Hypothesis Testing—Nutrition Consumption

The Healthy Kids Challenge Food Guide Pyramid Self-Report Questionnaire for Grades K-2 and Grades 3-8 was used to assess healthy food choices for breakfast, lunch, snack, and dinner (see Appendix E) (Healthy Kids Challenge, 2001). The students were asked to select the food they would usually eat for breakfast, lunch, dinner, and snacks from the survey. The nutrition survey was administered at four separate intervals over the three-year time period; in August 2001, May 2002, February 2004, and November 2004.

\[ H_1: \text{Participation in the nutrition program will improve participants’ healthy eating behaviors as reported by the students.} \]

An F test of univariate repeated measurement was used to determine if the students’ mean consumption across all food categories changed during the study period. This is due to the fact that the samples are dependent samples because the same subjects are used in each of the four samples. This is critical because “the use of dependent samples can have certain benefits . . . [one benefit is the fact that] . . . known sources of potential bias are controlled” (Agresti & Finlay, 1997, p. 229, para. 2). Using cohorts (or the same subjects) in each sample, “keeps many other
factors fixed that could affect the analysis” (Agresti & Finlay, 1997, p. 229, para. 2). The F test is used to test the null hypothesis that the population means of average daily servings in all food categories are the same for all four observations.

Table 12 shows the average daily servings of all students in the sample. It indicates the average daily number of servings in each category and the percent change in consumption, either positive or negative. It is important to note that the fats/oils/sweets food category is the only category that demonstrates improvement by decreasing average daily servings consumption. All other categories demonstrate improvement through increases in average daily serving consumption. Students had an average daily number of servings of 4.19 in fats/oils/sweets in the August 2001 survey. Consumption of fats/oils/sweets decreased to 2.69 servings in May 2002, which resulted in a 35.8 percent decrease in consumption which is shown by the parenthesis. The negative sign indicates a decrease in consumption of -35.8 percent (= [2.69-4.19]/4.19). The average daily serving of fats/oil/sweets in the February 2004 survey was 2.72 which is a 1.1 percent increase from that in May 2002. The average daily serving of fats/oils/sweets was 3.66 in November 2004 which was a 34.6 percent increase of over that in February 2004.
Table 12: Average Daily Servings of All Students (n=58)

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Fats/oils/sweets</td>
<td>4.19</td>
<td>2.69</td>
<td>2.72</td>
<td>3.66</td>
<td>4.18***</td>
</tr>
<tr>
<td>Milk group</td>
<td>2.26</td>
<td>3.21</td>
<td>3.33</td>
<td>3.45</td>
<td>5.37***</td>
</tr>
<tr>
<td>Meat group</td>
<td>2.43</td>
<td>2.90</td>
<td>3.47</td>
<td>3.91</td>
<td>4.85***</td>
</tr>
<tr>
<td>Vegetable group</td>
<td>1.43</td>
<td>1.95</td>
<td>2.33</td>
<td>2.38</td>
<td>3.89***</td>
</tr>
<tr>
<td>Fruit group</td>
<td>2.34</td>
<td>3.55</td>
<td>3.45</td>
<td>2.83</td>
<td>3.18**</td>
</tr>
<tr>
<td>Bread/cereal/rice/pasta</td>
<td>3.35</td>
<td>3.95</td>
<td>3.50</td>
<td>4.21</td>
<td>1.01</td>
</tr>
<tr>
<td>Combination group</td>
<td>0.75</td>
<td>0.69</td>
<td>0.37</td>
<td>0.73</td>
<td>2.92**</td>
</tr>
</tbody>
</table>

Note:  * p < 0.1; ** p <0.05; *** p <0.01.

The F test of univariate repeated measurement shows that students’ mean consumption of fats/oils/sweets changed during the study period. The change is statistically significant at the 0.01 level (F = 4.18, p <0.01). Over the study period, the daily servings of fats/oils/sweets declined by 12.7 percent (= [3.66 – 4.19]/4.19). A paired sample test on the daily serving averages of fats/oils/sweets in August 2001 and November 2004, for 81 first and second graders, again shows a statistically significant decline at the 0.05 level of significance. The paired sample test results indicate that the average daily servings of fats/oils/sweets were 4.64 in August 2001 and 3.52 in November 2004. The paired sample test results show a t value of 2.164 and a p of 0.033 for a sample size of 81. It is important to note that student sample numbers changed between the F test sample population and the t test sample population. This is due to the fact that 23 additional students took the August 2001 nutrition survey and the November 2004 nutrition survey but were absent for at least one of the surveys during 2002 and 2003.

The average daily servings of milk increased during the study period from 2.26 in August 2001 to 3.45 in November 2004, for a three-year increase of 52.7 percent (= [3.45 – 2.26]/2.26). The mean change during the study period is also statistically significant at the 0.01 level.
The average daily servings of meat increased during the study period from 2.43 in August 2001 to 3.91 in November 2004. This is an increase of 60.9 percent (=$\frac{3.91 - 2.43}{2.43}$) during the study period. The mean change over the study period is statistically significant at the 0.01 level.

The average daily servings of vegetables increased during the study period from 1.43 in August 2001 to 2.38 in November 2004. This is an increase of 66.4 percent (=$\frac{2.38 - 1.43}{1.43}$) during the study period. The mean change over the entire study period is statistically significant at the 0.01 level.

The daily serving consumption of fruit increased from August 2001 to May 2002, but subsequently declined. However, over the entire study period, the average daily servings of fruit increased 20.1 percent (=$\frac{2.83 - 2.34}{2.34}$). A two-sample test of the first and second graders who participated in the tests in August 2001 and November 2004 show that the mean difference is not statistically significant at the 0.05 level. Average daily servings were 2.60 in August 2001 and 2.94 in November 2004. The paired sample test results show $t$ value of .894 and a $p$ of 0.374 for a sample size of 81.

The daily consumption of breads/cereal/rice/pasta increased slightly from 3.35 in August 2001 to 4.21 in November 2004. Over the entire study period, the average daily servings of breads/cereal/rice/pasta increased 25.6 percent (=$\frac{4.21-3.35}{3.35}$). The mean change over the entire study period was not statistically significant.

The daily serving consumption of the combination group decreased slightly from August 2001 to November 2004. However, the combination group was not specifically addressed during analysis because it is essentially a composite group that includes the food combinations that
cannot be easily placed in a specific food group, such as pizza or a combination meat, vegetable and pasta casserole.

The results of the entire group of fifty-eight students indicate that students reported eating healthier from August 2001 to May 2002. Although the improvement eroded somewhat from May 2002 to February 2004 and again to November 2004, there was still improvement in healthy eating overall. Probably the most important erosion in student healthy eating behaviors was indicated by an increase in consumption of fats/oils/sweets between February 2004 and November 2004. In spite of that, students ate healthier during the entire testing period. Specifically, students ate more vegetables and fruits and less fats/oils/sweets during the study period even with the increase since May 2002. Students also consumed more milk and meat during the study period. This result could be age-related.

Results by Gender

Table 13 shows average daily servings of female students in the sample. The F test of univariate repeated measurement shows that female students’ mean consumption of fats/oils/sweets changed during the study period. The fats/oils/sweets consumption decreased by 32.9 percent from August 2001 to May 2002, and increased slightly by 3.8 percent between May 2002 and February 2004. Then the consumption level increased significantly by 58.3 percent in November 2004, which was largely responsible for the overall increase of 10.3 percent \((=\frac{4.29-3.89}{3.89})\) in the fats/oils/sweets consumption of females.

The average daily servings of milk for female students in the sample increased during the study period from 2.21 in August 2001 to 3.61 in November 2004, for a three-year increase of
63.4 percent (=\[3.61- 2.21\]/2.21). The mean change during the study period is also statistically significant at the 0.05 level.

Table 13: Average Daily Servings by Female Students (n=28)

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Fats/oils/sweets</td>
<td>3.89</td>
<td>2.61(-32.9%)</td>
<td>2.71(3.8%)</td>
<td>4.29(58.3%)</td>
<td>2.43*</td>
</tr>
<tr>
<td>Milk group</td>
<td>2.21</td>
<td>3.04(37.6%)</td>
<td>2.93(-3.6%)</td>
<td>3.61(23.2%)</td>
<td>3.04**</td>
</tr>
<tr>
<td>Meat group</td>
<td>1.96</td>
<td>3.14(60.2%)</td>
<td>3.46(10.2%)</td>
<td>4.14(19.7%)</td>
<td>4.33***</td>
</tr>
<tr>
<td>Vegetable group</td>
<td>1.14</td>
<td>1.96(71.9%)</td>
<td>2.46(25.5%)</td>
<td>2.61(6.1%)</td>
<td>3.99**</td>
</tr>
<tr>
<td>Fruit group</td>
<td>2.07</td>
<td>3.43(65.7%)</td>
<td>3.89(13.4%)</td>
<td>3.50(-10.0%)</td>
<td>3.56**</td>
</tr>
<tr>
<td>Bread/cereal/rice/pasta</td>
<td>2.71</td>
<td>4.32(59.4%)</td>
<td>3.43(-20.6%)</td>
<td>4.64(35.3%)</td>
<td>2.20*</td>
</tr>
<tr>
<td>Combination group</td>
<td>0.72</td>
<td>0.52(-27.8%)</td>
<td>0.45(-13.5%)</td>
<td>0.69(53.3%)</td>
<td>0.92</td>
</tr>
</tbody>
</table>

Note: * p < 0.1; ** p <0.05; *** p <0.01.

The average daily servings of meat increased during the study period from 1.96 in August 2001 to 4.14 in November 2004. This was a 111.2 percent increase (=\[4.14 – 1.96\]/1.96) during the study period for the female students in the sample. The mean change during the study period is statistically significant at the 0.01 level.

The average daily servings of vegetables for the female students in the sample increased during the study period from 1.14 in August 2001 to 2.61 in November 2004. This is a 128.9 percent increase (=\[2.61 – 1.14\]/1.14) during the study period. The mean change during the study period is statistically significant at the 0.05 level.

The average daily servings of fruit increased during the study period from 2.07 in August 2001 to 3.50 in November 2004. This was a 69.1 percent increase (=\[3.50-2.07\]/2.07) during the study period for the female students in the sample. The mean change during the study period is statistically significant at the 0.05 level.
The average daily servings of breads/cereal/rice/pasta increased for females during the study period from 2.71 in August 2001 to 4.64 in November 2004. This was a 71.2 percent increase ($=\frac{4.64 - 2.71}{2.71}$) during the study period for the female students. The mean change during the study period is statistically significant at the 0.1 level.

The results from female students indicate that they consumed more in all food categories except the “combination” foods during the study period, which perhaps reflects the fact that food consumption is age-related. During the study period, the consumption of meats and vegetables had a noticeable increase of 111.2 percent and 128.9 percent respectively. The consumption increase of milk and fruit was also noteworthy at around 60 to 70 percent respectively. In comparison, the consumption increase of fats/oils/sweets was 10.3 percent which, in this case, is not a positive result.

Table 14 shows average daily servings of male students in the sample. The F test of univariate repeated measurement shows that male students’ mean consumption of fats/oils/sweets changed during the study period. The fast/oils/sweets consumption decreased by 38.0 percent from August 2001 to May 2002, and by 1.4 percent between May 2002 and February 2004. The consumption increased by 12.5 percent from February to November 2004. Overall, the fats/oils/sweets consumption for males saw a decline during the entire study period by 31.3 percent ($=\frac{3.07 - 4.47}{4.47}$). The mean change during the study period is also statistically significant at the 0.05 level.
The average daily servings of milk for the male students in the sample increased from 2.30 in August 2001 to 3.30 in November 2004, for a three-year increase of 43.5 percent ($=\frac{3.30-2.30}{2.30}$). The mean change during the study period is also statistically significant at the 0.05 level.

The average daily servings of meat increased from 2.87 in August 2001 to 3.70 in November 2004. This is a three-year increase of 28.9 percent ($=\frac{3.70-2.87}{2.87}$) for the male students in the sample. Nevertheless, the mean change during the study period is not statistically significant at the 0.1 level.

The average daily servings of vegetables increased from 1.70 in August 2001 to 2.17 in November 2004. This is an increase of 27.6 percent ($=\frac{2.17-1.70}{1.70}$) during the study period for the male students in the sample. Nevertheless, the mean change during the study period is not statistically significant at the 0.1 level.

The average daily servings of fruit for the male students in the sample increased from 2.60 in August 2001 to 3.67 in May 2002, and declined to 3.03 in February 2004 and to 2.20 in November 2004. Overall, the fruit consumption decreased by 15.4 percent ($=\frac{2.20-2.60}{2.60}$).
Nevertheless, the mean change during the study period is not statistically significant at the 0.1 level.

The average daily servings of breads/cereal/rice/pasta for the male students decreased slightly from 3.93 in August 2001 to 3.80 in November 2004. This was a decrease of only 3.4 percent, which was not significant.

The results for male students show that, during the entire study period from August 2001 to November 2004, they ate less fats/oils/sweets and more milk products. They appeared to consumed more vegetables and meat products, just not at a statistically significant (0.1) level. In addition, for male students, their consumption of fruits decreased in February 2004 and November 2004 after demonstrating a substantial increase between August 2001 and May 2002.

Results by Grade

Table 15 shows the average daily servings of first graders in the sample and presents changes in consumption across food categories. The consumption of fats/oils/sweets declined by 19.9 percent from August 2001 to May 2002, and continued to decline by 52.2 percent in February 2004. The consumption then saw an increase by 48.6 percent in November 2004. Overall, however, the fats/oils/sweets consumption declined by 43.1 percent ($=\frac{2.72 - 4.78}{4.78}$) during the study period. The F test of univariate repeated measurement shows that first graders’ mean consumption of fats/oils/sweets changed during the study period. The mean change of this food category during the study period is statistically significant at the 0.01 level.
Table 15: Average Daily Servings of First Graders (n=18)

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Fats/oils/sweets</td>
<td>4.78</td>
<td>3.83(-19.9%)</td>
<td>1.83(-52.2%)</td>
<td>2.72(48.6%)</td>
<td>6.57***</td>
</tr>
<tr>
<td>Milk group</td>
<td>2.44</td>
<td>3.33(36.5%)</td>
<td>2.44(-26.7%)</td>
<td>3.00(23.0%)</td>
<td>1.46</td>
</tr>
<tr>
<td>Meat group</td>
<td>2.72</td>
<td>2.67(-1.8%)</td>
<td>2.72(1.9%)</td>
<td>3.44(26.5%)</td>
<td>0.74</td>
</tr>
<tr>
<td>Vegetable group</td>
<td>1.78</td>
<td>2.11(18.5%)</td>
<td>2.11(0.0%)</td>
<td>1.83(-13.3%)</td>
<td>0.26</td>
</tr>
<tr>
<td>Fruit group</td>
<td>2.33</td>
<td>2.94(26.2%)</td>
<td>4.11(39.8%)</td>
<td>2.22(-46.0%)</td>
<td>3.08**</td>
</tr>
<tr>
<td>Bread/cereal/rice/pasta</td>
<td>4.06</td>
<td>3.44(-15.3%)</td>
<td>3.78(9.9%)</td>
<td>2.89(-23.5%)</td>
<td>0.80</td>
</tr>
<tr>
<td>Combination group</td>
<td>1.16</td>
<td>1.16(0.0%)</td>
<td>0.53(-54.3%)</td>
<td>0.79(49.1%)</td>
<td>2.12</td>
</tr>
</tbody>
</table>

Note: * p < 0.1; ** p <0.05; *** p <0.01.

The average daily servings of milk for the first graders in the sample increased from 2.44 in August 2001 to 3.00 in November 2004, for a three-year increase of 22.9 percent (=\[3.00-2.44\]/2.44). Nevertheless, the mean change during the study period is not statistically significant at the 0.1 level.

The average daily servings of meats increased from 2.72 in August 2001 to 3.44 in November 2004. This is a 26.5 percent increase (=\[3.44-2.72\]/2.72) during the study period for the first graders in the sample. Nevertheless, the mean change during the study period is not statistically significant at the 0.1 level.

The average daily servings of vegetables slightly increased from 1.78 in August 2001 to 1.83 in November 2004. This is a 2.8 percent increase (=\[1.83-1.78\]/1.78) during the study period. Nevertheless, the mean change during the study period is not statistically significant at the 0.1 level.

The average daily servings of fruit for the first graders in the sample increased from 2.33 in August 2001 to 2.94 in May 2002, and then to 4.11 in February 2004, before dropping 46.0 percent to 2.22 in November 2004. The mean change during the study period is statistically significant at the 0.05 level.
The results from the first graders show that, during the entire study period from August 2001 to November 2004, they ate less fats/oils/sweets. In addition, they may have consumed more milk, vegetables, and meat products. Their consumption of fruit fluctuated more than their consumption of other foods. Please note that these findings are based on a small sample of 18 students in this grade group.

Table 16 shows the average daily servings of second graders in the sample and presents changes in consumption across food categories. The F test of univariate repeated measurement shows that second graders’ mean consumption of fats/oils/sweets changed during the study period. The consumption of fats/oils/sweets declined by 44.5 percent from August 2001 to May 2002, and increased to by 43.6 percent in February 2004 and by 30.4 percent in November 2004. Overall, the fats/oils/sweets consumption increased by 3.8 percent (=[4.08 − 3.93]/3.93) during the study period. The mean change of this food category during the study period is statistically significant at the 0.05 level.

The average daily servings of milk increased from 2.18 in August 2001 to 3.65 in November 2004, for a three-year increase of 67.4 percent for the second graders in the sample. The mean change during the study period is statistically significant at the 0.01 level.

Table 16: Average Daily Servings of Second Graders (n=40)

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</thead>
<tbody>
<tr>
<td>Fats/oils/sweets</td>
<td>3.93</td>
<td>2.18(-44.5%)</td>
<td>3.13(43.6%)</td>
<td>4.08(30.4%)</td>
<td>3.70**</td>
</tr>
<tr>
<td>Milk group</td>
<td>2.18</td>
<td>3.15(44.5%)</td>
<td>3.73(18.4%)</td>
<td>3.65(-2.1%)</td>
<td>5.88***</td>
</tr>
<tr>
<td>Meat group</td>
<td>2.30</td>
<td>3.0(30.4%)</td>
<td>3.80(26.7%)</td>
<td>4.13(8.7%)</td>
<td>4.68***</td>
</tr>
<tr>
<td>Vegetable group</td>
<td>1.28</td>
<td>1.88(46.9%)</td>
<td>2.43(29.3%)</td>
<td>2.63(8.2%)</td>
<td>4.71***</td>
</tr>
<tr>
<td>Fruit group</td>
<td>2.35</td>
<td>3.83(63.0%)</td>
<td>3.15(-17.8%)</td>
<td>3.10(-1.6%)</td>
<td>2.29*</td>
</tr>
<tr>
<td>Bread/cereal/rice/pasta</td>
<td>3.02</td>
<td>4.18(38.4%)</td>
<td>3.30(-21.1%)</td>
<td>4.80(45.5%)</td>
<td>2.50*</td>
</tr>
<tr>
<td>Combination group</td>
<td>0.55</td>
<td>0.48(-12.7%)</td>
<td>0.3(-37.5%)</td>
<td>0.7(133.3%)</td>
<td>2.14*</td>
</tr>
</tbody>
</table>

Note: * p < 0.1; ** p <0.05; *** p <0.01.
The average daily servings of meats increased from 2.30 in August 2001 to 4.13 in November 2004. This was a 79.6 percent (=(4.13-2.30)/2.30) increase during the study period for the second graders in the sample. The mean change during the study period is statistically significant at the 0.01 level.

The average daily servings of vegetables increased continuously from 1.28 in August 2001 to 1.88 in May 2002, to 2.43 in February 2004, and to 2.63 in November 2004. This was a 105.5 percent (=(2.63-1.28)/1.28) increase during the entire study period. The mean change during the study period is also statistically significant at the 0.01 level.

The average daily servings of fruit for the second graders increased from 2.35 in August 2001 to 3.83 in May 2002, and then dropped to 3.15 in February 2004, and 3.10 in November 2004. The mean change during the study period is statistically significant at the 0.1 level.

The results indicate that the second graders drank more in milk and ate more meats and vegetables. The consumption for fats/oils/sweets and fruit fluctuated during the study period so a pattern of consumption is more difficult to establish.

In this research study, it was hypothesized that, participation in the nutrition education program would improve participants’ healthy eating behaviors as reported by the students (Hypothesis 1). The results of the entire group of 58 student participants indicate that, overall, the students reported eating healthier from August 2001 to November 2004. Although the improvement eroded after May 2002 (particularly in fats/oils/sweets), there was still improvement in healthy eating overall. Students ate healthier during the entire testing period. More specifically, students ate more vegetables and fruit and less fats/oils/sweets during the study period, although the fats/oils/sweets consumption increased since May 2002. Students also consumed more milk and meat during the study period, which may be age-related.
The results on the female students (n=28) indicate that they consumed more in all food categories except the “combination” foods during the study period, which perhaps reflects the fact that food consumption is age-related. During the study period, their consumption of meats and vegetables had a noticeable increase of 111.2 percent and 128.9 percent respectively. Their consumption increase of milk and fruit was also significant at around 60 to 70 percent. In comparison, the consumption increase of fat/oil/sweet was 10.3 percent for females. During the entire study period from August 2001 to November 2004, male students (n=30) ate less fats/oils/sweets and more milk products. They may have consumed more vegetables and meat products, but not at significant levels.

The results indicate that, during the entire study period from August 2001 to November 2004, the first graders (n=18) ate less fats/oils/sweets at the 0.01 level of significance. They might have also consumed more milk, vegetables, and meat products but it was not significant. Their consumption of fruit fluctuated more than their consumption of other foods. The results also indicate that the second graders (n=40) drank more milk and ate more meats and vegetables. Their consumption for fats/oils/sweets and fruit fluctuated during the study period so a pattern of consumption is more difficult to establish for this group.

Based on the results of this study, participating students did, indeed, demonstrate positive changes in eating behaviors. The results from the Healthy Kids Challenge Eating Nutrition Skills Behavior Assessment Survey (see Appendix E), reflect changes in consumption of fats/oils/sweets, meat, milk, vegetables and fruit indicated the following:

- Average daily servings of fats/oils/sweets declined during the study period at the 0.01 level of significance;
• Average daily servings of milk increased during the study period at the 0.01 level of significance;

• Average daily servings of meat increased during the study period at the 0.01 level of significance;

• Average daily servings of vegetables increased during the study period at the 0.05 level of significance; and

• Average daily servings of fruit increased during the study period at the 0.05 level of significance.

As a result, Hypothesis 1 is accepted.

BMI Outcome Results

A design of repeated measures was used in which program participants’ BMIs were observed over time during the period of program intervention. In this design, BMI data were gathered five times - in August 2001, May 2002, August 2002, August 2003, and October 2004. Of the 560 students, 90 had their BMIs collected all five times during the study period. As a result, these 90 students were included in the study. The sample excludes new students to ensure the elimination of possible bias as result of changes of the sampling frame.

Hypothesis Testing—BMI

Hypothesis 2: Participation in the nutrition program will result in a decrease in the proportion of students with BMI percentile scores in the “overweight” (combining overweight and at-risk for overweight) range.
For this study, the measure of program effect is BMI proportion using the McNemar test of comparing dependent proportions (Agresti, A., & Finlay, B., 1997). This is due to the fact that although BMI is an interval variable and it appears that its means can be calculated and compared, and that statistical tests can be performed to analyze the mean difference during different time periods, it would be very misleading. This is because results from the tests on mean difference would not be accurate. The reason for this is that for BMI, a change in mean is sensitive to age. A larger BMI of a subject doesn’t necessarily indicate that his or her BMI is deteriorating over time. By the same token, a smaller BMI also doesn’t necessarily indicate that the BMI is getting better over time. On the other hand, the use of BMI proportions is controlled by age which means that the same BMI value can be classified as “normal” for the ten year old group, but “overweight” for the seven year old group. As a result, BMI proportions are analyzed in this study using the McNemar test for proportion difference (Agresti & Finlay, 1997).

Table 17 illustrates changes in BMI proportions over time for the 90 students. The statistics in the table indicate the proportions of BMI scores in each category. For example, the 8.9 percent in the “overweight” category in August 2001 means that 8.9 percent of the 90 students in the sample were overweight at that time. A larger proportion statistic indicates a further deterioration for “overweight,” “at-risk for overweight,” and “underweight” categories, while a larger “normal” category points out an improvement.
The “overweight” proportion declined slightly from 8.9 percent in August 2001 to 6.7 percent in October 2004, although it increased to 10 percent in August 2002. The “at-risk for overweight” category also saw a decline from 15.6 percent in August 2001 to 10.0 percent in October 2004. The combined categories of “overweight” and “at-risk for overweight” showed a steady decline, from 24.5 percent (8.9% + 15.6%) in August 2001 to 16.7 percent (6.7% + 10%) in August 2003 and October 2004, for a drop of 7.8 percent or 7 students. Table 18 displays the BMI proportion change for a category that combines the “overweight” and “at-risk for overweight” (see Table 18).

Table 17: BMI Proportion change for all Students (n=90)

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<tbody>
<tr>
<td>Overweight</td>
<td>8.9%</td>
<td>6.7%</td>
<td>10.0%</td>
<td>6.7%</td>
<td>6.7%</td>
</tr>
<tr>
<td>At-risk for overweight</td>
<td>15.6%</td>
<td>13.3%</td>
<td>8.9%</td>
<td>10.0%</td>
<td>10.0%</td>
</tr>
<tr>
<td>Underweight</td>
<td>5.6%</td>
<td>4.4%</td>
<td>16.7%</td>
<td>8.9%</td>
<td>10.0%</td>
</tr>
<tr>
<td>Normal</td>
<td>70.0%</td>
<td>75.6%</td>
<td>64.4%</td>
<td>74.4%</td>
<td>73.3%</td>
</tr>
</tbody>
</table>

As indicated earlier, as the measure of program effect is BMI proportion, the McNemar test of comparing dependent proportions was applied. The results indicated that a change in the “overweight/at-risk for overweight” combined categories was made between August, 2001 and
October 2004. With a normal distribution, the $Z$ is: $Z = \frac{(11-3)}{(11+3)^{1/2}} = \frac{9}{3.742} = 2.405$.

These results show that a change in the “overweight/at-risk for overweight” combined categories was made between August 2001 and October 2004. The $p$ (one-tailed) with normal distribution is 0.008.

These results provide evidence supporting the research hypothesis that participation in the nutrition education program would result in a decline in the proportion of the “overweight/at-risk for overweight” category between August 2001 and October 2004. Specifically, based on the sample proportions, the results show that the population proportion of “overweight/at-risk for overweight” did indeed decrease from August 2001 to October 2004. This result is statistically significant at the 0.1 level (see Figure 11).

![Figure 11: BMI Proportion Changes for “Overweight” and “At-risk for Overweight”](image)

The second finding is the increase in “underweight” students from 5.6 percent in August 2001 to 10.0 percent three years later. Again, the McNemar test of comparing dependent
proportions was applied. With a normal distribution, the $Z$ is: $Z = \frac{(2-13)}{(2+13)^{1/2}} = -11/3.873 = -2.840$. The results show that a change in the “underweight” category was made between August 2001 and October 2004. The $p$ (two-tailed) with normal distribution is 0.0046 and the $p$ (two-tailed) with binomial distribution is 0.007. The “underweight” category experienced a large increase in August 2002, from 4.4 percent of the previous spring (May 2002) to 16.7 percent in the summer of 2002. The McNemar test shows that this increase is statistically significant at the 0.01 level (Agresti, A., & Finlay, B., 1997). The number of “underweight” students increased from 4 to 15 during that period. Although the number declined to 8 (or 8.9 percent) in August 2003 and to 9 (or 10.0 percent) in October 2004, this increase is still significant enough to merit attention.

Last, the “normal” category increased very slightly from 70.0 percent in August 2001 to 73.3 percent in October 2004. The category experienced a significant drop from 75.6 percent in May 2002 to 64.4 percent in the August of the same year. The decline appeared to be caused by the increase in the number of “underweight” students during the same period. Nevertheless, an analysis of individual student’s BMI would be needed to determine the validity of this causality. The “normal” category seemed to stabilize after the summer 2002 to be around 74 percent in the summer 2003 and the fall 2004.

**Results by Gender**

Table 19 shows the BMI proportion changes for male students during the study period. The results show a decline in the number of “overweight” male students during the period, with the exception of a slight increase in summer 2002. The number of “at-risk” male students fluctuated little during the study period, with a slight increase in May 2002 and a slight decrease
in October 2004 for a virtual unchanged result (9.6 percent) during the entire study period.

Nevertheless, the “underweight” category experienced a significant increase from May to August 2002. The number of “underweight” male students increased from 3 in May 2002 (or 5.8 percent) to 9 in August (or 17.3 percent), which may result in a noteworthy decline in the “normal” category from May 2002 to August 2002. Finally, the number of male students in the “normal” category had changed little from 36 (or 69.2 percent) in August 2001 to 37 in October 2004 (71.2 percent).

Table 19: BMI Proportion changes for Male Students (n= 52)

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<tbody>
<tr>
<td>Overweight</td>
<td>13.5%</td>
<td>9.6%</td>
<td>11.5%</td>
<td>7.7%</td>
<td>9.6%</td>
</tr>
<tr>
<td>At-risk for</td>
<td>9.6%</td>
<td>13.5%</td>
<td>11.5%</td>
<td>13.5%</td>
<td>9.6%</td>
</tr>
<tr>
<td>overweight</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underweight</td>
<td>7.7%</td>
<td>5.8%</td>
<td>17.3%</td>
<td>5.8%</td>
<td>9.6%</td>
</tr>
<tr>
<td>Normal</td>
<td>69.2%</td>
<td>71.2%</td>
<td>59.6%</td>
<td>73.1%</td>
<td>71%</td>
</tr>
</tbody>
</table>

For female students (Table 20), there was no change in the “overweight” category from August 2001 to October 2004, with a slight increase in August 2002 and a slight decrease in August 2003. However, there was a trend of decline in the “at-risk for overweight” category during the most of the study period, which lead to a significant decline of “at-risk for overweight” female students from 9 (or 23.7 percent) to 4 (or 10.5 percent). The combined “overweight” and “at-risk for overweight” categories showed a steady decline from 26.3 percent (=2.6% + 23.7%) in August 2001, to 15.8 percent in May 2002, 13.2 percent in August 2002, 10.6 percent in August 2003, and 13.1 percent in October 2004.
Similarly to the male students, the female students also saw a large increase in the “underweight” category in summer 2002. The number of “underweight” female students increased from 1 (or 2.6%) to 6 (or 15.8%) over that summer.

Table 20: BMI Proportion Changes for Female Students (n=38)

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<tbody>
<tr>
<td>Overweight</td>
<td>2.6%</td>
<td>2.6%</td>
<td>7.9%</td>
<td>5.3%</td>
<td>2.6%</td>
</tr>
<tr>
<td>At-risk for overweight</td>
<td>23.7%</td>
<td>13.2%</td>
<td>5.3%</td>
<td>5.3%</td>
<td>10.5%</td>
</tr>
<tr>
<td>Underweight</td>
<td>2.6%</td>
<td>2.6%</td>
<td>15.8%</td>
<td>13.2%</td>
<td>10.5%</td>
</tr>
<tr>
<td>Normal</td>
<td>71.1%</td>
<td>81.6%</td>
<td>71.1%</td>
<td>76.3%</td>
<td>76.3%</td>
</tr>
</tbody>
</table>

Results by Age

The following section presents BMI proportion changes by student age. A student’s age is classified and presented by his or her year of birth (i.e. 1993, 1994, 1995 . . .). Year of birth can be easily converted to nominal student age (i.e. 7-year old, 8-year old, 9-year old . . .). The use of year of birth avoids the arbitrary assignment of a student’s nominal age at a particular time, so it is a reliable measure of student age. Table 18 shows BMI changes for students born in 1993 (there was only one student born in 1992 so the sample is too small for analysis). This group has a small sample, so any results should be interpreted with caution. Of the 13 students born in 1993, there was a slight decline in the number of “at-risk for overweight” students from 3 in August 2001 to 1 in October 2004. Both “at-risk for overweight” and “underweight” groups saw an increase in August 2002 over May 2002, which may have resulted in a significant decline in the “normal” category from 11 students (or 84.6%) in May 2002 to 6 (46.2%) in August 2002.
Nevertheless, the number of “normal” students had virtually no change from the beginning to the end of the study period, from 10 in August 2001 to 9 in October 2004 (see Table 21).

Table 21: BMI Proportion changes for Students born in 1993 (n=13)

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<tbody>
<tr>
<td>Overweight</td>
<td>0%</td>
<td>0%</td>
<td>7.7%</td>
<td>15.4%</td>
<td>7.7%</td>
</tr>
<tr>
<td>At-risk for overweight</td>
<td>23.1%</td>
<td>15.4%</td>
<td>23.1%</td>
<td>7.7%</td>
<td>7.7%</td>
</tr>
<tr>
<td>Underweight</td>
<td>0%</td>
<td>0%</td>
<td>23.1%</td>
<td>7.7%</td>
<td>15.4%</td>
</tr>
<tr>
<td>Normal</td>
<td>76.9%</td>
<td>84.6%</td>
<td>46.2%</td>
<td>69.2%</td>
<td>69.2%</td>
</tr>
</tbody>
</table>

Table 22 shows BMI changes for students born in 1994. There was a decline in the number of “overweight” students after August 2002 from 13.6 percent (5) to 5.4 percent (2) in August 2003 and October 2004. Another finding was the increase in the number of “underweight” students from 2.7 percent (1) in May 2002 to 16.2 percent (6) in August 2002. The number of “normal” students changed very little during the study period.

Table 22: BMI Proportion Changes for Students born in 1994 (n=37)

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</thead>
<tbody>
<tr>
<td>Overweight</td>
<td>10.8%</td>
<td>10.8%</td>
<td>13.6%</td>
<td>5.4%</td>
<td>5.4%</td>
</tr>
<tr>
<td>At-risk for overweight</td>
<td>8.1%</td>
<td>10.8%</td>
<td>5.4%</td>
<td>10.8%</td>
<td>10.8%</td>
</tr>
<tr>
<td>Underweight</td>
<td>8.1%</td>
<td>2.7%</td>
<td>16.2%</td>
<td>5.4%</td>
<td>8.1%</td>
</tr>
<tr>
<td>Normal</td>
<td>73.0%</td>
<td>75.7%</td>
<td>64.9%</td>
<td>78.4%</td>
<td>75.7%</td>
</tr>
</tbody>
</table>

BMI changes for 1995-born students are demonstrated in Table 23. No significant fluctuation was detected for the “overweight” category during the entire study period. There was small decline in the “at-risk for overweight” students from 22.2 percent (6) in August 2001 to
14.8 percent (4) in October 2004. There was a small but visible increase in the “underweight” category at the beginning of the study period from August 2001 (3.7 percent) to May 2002 (7.4 percent), and there has been no significant fluctuation since then. The number of the “normal” students increased in May 2002 over the previous year. Of interest it’s the fact that it is the only group in the sample that does not show a decline in the “normal” category during the period from May 2002 to August 2003.

Table 23: BMI Proportion changes for Students Born in 1995 (n=27)

<table>
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<tbody>
<tr>
<td>Overweight</td>
<td>14.8%</td>
<td>7.4%</td>
<td>11.1%</td>
<td>7.4%</td>
<td>11.1%</td>
</tr>
<tr>
<td>At-risk for overweight</td>
<td>22.2%</td>
<td>14.8%</td>
<td>11.1%</td>
<td>14.8%</td>
<td>14.8%</td>
</tr>
<tr>
<td>Underweight</td>
<td>3.7%</td>
<td>7.4%</td>
<td>7.4%</td>
<td>11.1%</td>
<td>7.4%</td>
</tr>
<tr>
<td>Normal</td>
<td>59.3%</td>
<td>70.4%</td>
<td>70.4%</td>
<td>66.7%</td>
<td>66.7%</td>
</tr>
</tbody>
</table>

Table 24 shows BMI changes for students born in 1996. There were no cases of “overweight” students in this group during the entire study period. The “at-risk for overweight” category declined to zero after the observation of May 2002 (a 16.7 percent decline).

Nevertheless, at the same time, the number of “underweight” students increased from 1 (or 8.3 percent) in May 2002 to 4 (33.3 percent) in August 2002. There was no clear pattern of change for the “normal” category.
The number of underweight students increased significantly during the summer 2002. The percentage of underweight students increased from 4.4 percent in May 2002 to 16.7 percent in summer 2002, then the percentage declined to 8.9 percent in summer 2003 and 10.0 percent in fall 2004. This increase may reflect the natural progress of children’s bodies. Or it may reflect a significant change in eating behaviors due to lack of access to free and reduced school breakfast and lunch programs. It is even possible that the hot summer weather in Florida may have resulted in changes to students’ food intake making them “summer lean,” or that increases in activity over the summer affected BMI. There is also the possibility that lack of school breakfasts and lunches may have had some impact.

The percentage of students in the “normal” category changed little from the beginning to the end of the study period. Seventy (70) percent of the students in this sample were in the normal weight category in August 2001 and 73.3 percent were in the normal weight category in October 2004. Nevertheless, the percentage of students in the normal weight category experienced a significant drop from 75.6 percent in May 2002 to 64.4 percent in the August of the same year. The “normal” category seemed to stabilize after the summer 2002 to be around 74 percent in the summer 2003 and the fall 2004.

Table 24: BMI Proportion Changes for Students Born in 1996 (n=12)

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</thead>
<tbody>
<tr>
<td>Overweight</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>At-risk for</td>
<td>16.7%</td>
<td>16.7%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>overweight</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underweight</td>
<td>8.3%</td>
<td>8.3%</td>
<td>33.3%</td>
<td>16.7%</td>
<td>16.7%</td>
</tr>
<tr>
<td>Normal</td>
<td>75.0%</td>
<td>75.0%</td>
<td>66.7%</td>
<td>83.3%</td>
<td>83.3%</td>
</tr>
</tbody>
</table>
There is a possibility that the decline in the normal category over the summer 2002 was caused by an increase in the number of “underweight” students during that same period. Nevertheless, an analysis of individual student’s BMI would be needed to determine the validity of this causality statement. An analysis of individual students’ BMI should confirm or disavow the statement that weight loss resulted in movement from the “normal” category to the “underweight” category. Movement into the “underweight” category could mean that young children are not getting their minimum nutritional needs met. Again, this could cause one to speculate that it might have resulted from lack of participation in the school breakfast and lunch program. If this is the case, it could result in long-term consequences to at-risk students, both physically and mentally. More information on summer eating patterns, including access to healthy and nutritious meals may provide more insight into these hypotheses.

There was a slight improvement in the “overweight” category for the male students over the study period, with the exception of a slight increase in summer 2002. The number of “overweight” male students declined from 7 in August 2001 to 5 in October 2004.

Female students had a trend of decline in the “at-risk for overweight” category during the most time of the study period, which leads to a significant decline of “at-risk for overweight” female students from 23.7 percent at the beginning to 10.5 percent at the end of the study period. The combined “overweight” and “at-risk for overweight” categories for the female students showed a steady decline from 26.3 percent in August 2001, to 15.8 percent in May 2002, 13.2 percent in August 2002, 10.6 percent in August 2003, and 13.1 percent in October 2004. For the students born in 1993, there was a decline in “at-risk for overweight” during the study period. The “underweight” category demonstrated an increase in August 2002 over May 2002,
which may have resulted in a significant decline in the “normal” category during that same period.

For students born in 1994, the number of overweight students declined after August 2002. Also, the number of underweight students increased in August 2002. The number of “normal” students changed very little during the study period.

For students born in 1995, there was no significant fluctuation detected for the “overweight” category during the entire study period. There was small decline in the “at-risk for overweight” students from August 2001 to October 2004. There was also a small but visible increase in the “underweight” category at the beginning of the study period on August 2001 to May 2002, and there had been no significant fluctuation since then. The number of the normal students increased in May 2002 from the previous year. Interestingly, it is the only group in the sample that does not show a decline in the “normal” category during May 2002 to August 2003. For students born in 1996, the “at-risk for overweight” category decreased to zero after May 2002. Nevertheless, at the same time the number of “underweight” students increased. There was no clear pattern of change for the “normal” category.

In this research study it was hypothesized that participation in the nutrition program would decrease the percentage of students with BMI percentile scores in the “overweight” (combining overweight and at-risk for overweight) range (Hypothesis 2). There is evidence that the nutrition education program may have reduced the number of overweight and at-risk for overweight students in the elementary school, since the percentage of overweight and at-risk for overweight students decreased by 7.8 percent during the study period and this result is statistically significant at the 0.1 level. In addition, given that there were about 560 registered students in the school database, a 7.8 percent improvement may suggest that about (7.8% × 560
44 students may have moved out of the “overweight or at-risk for overweight” categories during the time period of this evaluation. It is clear that, based on the study results; there was a decrease in the percentage of students in the overweight categories, therefore, Hypothesis 2 is accepted.
CHAPTER FIVE: DISCUSSION

Nutrition Education in the Schools

*Theory, Program, and Results*

The focus of this research study is to assess the impact of an in-school nutrition education program on the participating students in an elementary school over the three-year time period of the program, from 2001 to 2004. The purpose of this longitudinal study is to evaluate the effectiveness of an elementary school nutrition program on: 1) reported healthy eating behaviors; and 2) the percentage of students in the normal Body Mass Index (BMI) percentile range. The goals of this study are to determine whether or not the program resulted in improved food choices and eating behaviors in the participating students, and in a reduction in the percentage of students in the at-risk for overweight category (BMI ≥ 85%) and overweight category (BMI ≥ 95%), and an increase in the percentage of students in the normal (BMI ≥ 5% - 84.999%) category.

This study seeks to identify specific theories that support social, cognitive, behavioral, and environmental approaches to the development of healthy eating behaviors and a subsequent increase in the percentage of children with normal BMIs. It is distinctive from other studies given that, from the outset, it focuses on the importance of the involvement of teachers and administrators, students, and parents as key stakeholders in the change process. This study provides the opportunity to assess the impact of a program that makes use of age appropriate curricula that have been developed to be used as part of the regular school curriculum and that is applied consistently across grade levels. It is a multi-dimensionally designed program that is based in the recognition that for behavioral changes to become permanent, they require support
from the entire school environment. The study also recognizes that, to be enduring, changes in eating behaviors must be sustained over a longer period of time. Short-term studies, although important in their ability to demonstrate the relationship between nutrition education and changes in eating behavior, fail to demonstrate long-term results.

**Theory**

A review of literature has indicated that changes in the American diet, and environmental conditions affecting activity levels, have had a major bearing on the increasing numbers of children and youth who are at-risk for overweight and obesity. For example, from 1970-1996, the availability of fruits and vegetables has increased only slightly, but fat increased by 25% and total daily calorie intake increased by 500%. In addition milk consumption has been reduced while soft drink consumption has increased (Local strategies to increase healthy eating and physical activity, 2003). In addition, many societal changes such as both parents working outside the home, longer work hours by both parents, changes in the school food environment, and more meals eaten outside the home have affected families and how they eat (Koplan, Liverman & Kraak, 2005). Environmental factors, such as urban sprawl, have also increased the risk for being overweight or obese (Lopez, 2004). Finally, there have been dramatic changes in social and physical environments over the last couple of decades, “while genetics and physiology have remained largely unchanged” (The Obesity Epidemic in Florida, 2001, p. 5). One result of these societal and environmental changes is that an increasing number of children are becoming obese at an alarming rate. Programs to address childhood obesity socially, environmentally and behaviorally are critical to the current and future health of our children.
Schools represent a unique opportunity to educate children about good nutrition and its relationship to life-long health. Children can spend anywhere from six to ten hours per day in the school environment. This is particularly true of the most at-risk populations—the economically disadvantaged and minority children and youth who make up the majority of before school and after school day care programs. Empirical studies strongly support the application of nutrition education programming within the context of the school setting. For example, Dietz and Gortmaker (2001) indicated that schools provide a unique opportunity to create and sustain behavioral changes in a large majority of children because every child must be enrolled in and attend school for a period of at least ten years. This means that nutrition education in the school environment provides an optimal opportunity to affect positive behavioral changes in food consumption and provide the supports necessary to sustain that change over time.

After an intensive review of theoretical literature, Social Cognitive Theory was identified as having the best explanation for the efficacy of the nutrition program in this study. This is due to the fact that Social Cognitive Theory provides a framework that not only identifies predictive factors relating to health behaviors, but also supports a working, programmatic framework within which positive behavioral changes can occur. Social Cognitive Theory also focuses on the fact that behavior and learning occur within the social context. It emphasizes the importance of cognition and its role in relation to both behavior and the environment. It also emphasizes the importance of the concept of self-efficacy in creating long-term behavioral changes.

Bandura (1977) identified three key assumptions that he believed were essential to how people cognitively respond to their experiences within the environmental, social context and how their thoughts influence behavior. He identified three key reciprocal interactions, behavior/environmental, environmental/personal, and personal/behavior. They are dynamic
relationships and therefore reflect the varying strengths of the influences affecting each combination of the interactions. He termed these “triadic relationships” (Bandura, 1977). According to Bandura (Bandura, 1993, pp. 139-144), teacher self-efficacy, collective school self-efficacy, parent self-efficacy, and student self-efficacy are also critical components of a successful school health program. The elementary school in this study reflects the use of those four focus areas in the development of its nutrition activities and curricula.

**Program Model**

Several researchers support specific program intervention models as providing the best chance for success. These models reflect the underlying assumptions of Social Cognitive Theory. Perez-Rodrigo and Aranceta (2003) identified some primary interactions between actors and environmental challenges in school-based nutrition education programs that included direct interactions between teachers and administrators, students and families, with an indirect association to the social environment. They indicated that a nutrition program that addresses the interactions between teachers and administrators, students and families, within the context of the environment, has the greatest potential for success.

Research literature also reflects numerous studies that support the use of the school environment to implement behavioral change strategies and the use of social cognitive theory in the development of program theory. It provides a basis for understanding the cause and effect relationship between specific program components and approaches, and resultant changes in eating behaviors and BMI. Multiple studies, although short-term, have explored the relationship between curriculum, program activities, and sustained programmatic interventions, and the environmental, cognitive, and behavioral interactions that are necessary to support long-term
changes in nutritional consumption of children. Most importantly, the study program was created based on cognitive behavioral intervention theory. The literature and empirical research is very clear that cognitive/behavioral interventions along with continuous reinforcement will result in behavioral change.

The nutrition program in this study addressed children’s health within the school setting and used an environmental perspective to ensure that cultural changes not only went hand-in-hand with individual behavioral changes, but also provided environmental support for those changes. It used a combination of curriculum components that focus on nutrition, activities that educate, reward and encourage healthy eating behaviors, and school culture-related events and activities that encourage participation and “buy-in” of staff, students and families. Those program components reflect underlying cognitive/behavioral theory, particularly social cognitive theory which recognizes the importance of environment in behavioral change. According to the elementary school administration and staff, there was explicit recognition that, to influence changes in nutrition consumption behavior, it was necessary to develop a multi-dimensional approach to program implementation.

The school nutrition program theory reflected the following relationships:

- Administration, teachers, staff, and students participate in school activities on a daily (morning announcements, healthy tip for the day), weekly (weekly healthy lunch menu distributed), and quarterly (family nights and teacher appreciation healthy activities);
- In class activities that focus on nutrition and healthy eating on a daily (CHEW math problem), weekly (nutrition related activities, new healthy recipes, “walking through the pyramid”), and monthly (nutrition and healthy eating information sheets, water facts);
• Family involvement activities that focus on knowledge of nutrition and application of that knowledge in monthly (nutrition information fact sheets, newsletter tips for healthy recipes and healthy snack alternatives), quarterly (family nights), and yearly (healthy school celebration event); and
• A system of rewards and behavioral reinforcements including daily (tokens for bringing healthy lunch to school or eating healthy selections from the cafeteria), weekly (reward tokens for drinking water regularly and carrying a water bottle to class), and yearly (healthy school celebration with individual, class, school and family recognition of healthy eating behaviors sustained over the school year).

There is a strong relationship between supportive theories of human behavior, practice theory, and the nutrition education program. Theory research supports the potential success of the nutrition education and its resultant impact on healthy eating behaviors and an increase in the percentage of students with normal BMI scores.

Results

Hypothesis 1: Participation in the nutrition program will improve participants’ healthy eating behaviors as reported by the students.

Hypothesis 1 is accepted.

Based on the results of this study, participating students reported positive changes in their eating behaviors. The results from the Healthy Kids Challenge Nutrition Skills Behavior Assessment Survey (see Appendix E), reflected significant changes in consumption of
fats/oils/sweets, meat, milk, and vegetables, and some changes in consumption of fruits and bread/cereal/rice/pasta.

It is important to note that a combination category is part of the nutrition survey. This category was designed to include such things as pizza—a food that could be placed in several different categories. This was an attempt to provide the children with a choice option that made sense to them. Since this category has severe limitations with regard to determining exactly which food group is being identified in any one selection, it has been largely disregarded in the results analysis.

It is also important to recognize that to improve healthy eating behaviors, the consumption of fats/oils/sweets needed to be reduced over time. This is a reverse in direction from the healthy eating behavioral changes desired in milk, meats, vegetables, fruits, and grains. Improvement in those areas is demonstrated by an increase in the average number of daily servings over time.

When one analyzes the average daily servings over time in each food category it is apparent there were some “rebound effects” in self-reported eating behaviors from year-to-year. For example, the consumption of fats/oils/sweets dropped dramatically between August 2001 and May 2002, and then gradually increased over the next two years. The final number of average daily servings in October 2004 was still significantly \((p = 0.01)\) lower than in 2001. Conversely, milk, meat, fruit, and vegetable consumption gradually increased over the three year study period.

This leads one to suppose that one area for continued intense focus for a nutrition program should be the fats/oils/sweets consumption issue. It makes sense that, with the societal emphasis on fast food marketing and consumption and the messages promoting high fat, high
sugar foods by food producers and the fast food industry through various media, including
television, movies, and videos, the necessity of countering those messages becomes even more
important in the nutrition education program context. This study appears to reflect the need for
continued programmatic focus and intensity regarding fats/oils/sweets.

There were also some interesting results based on gender. The females in the study
showed an initial decrease in fats/oils/sweets consumption between August 2001 and May 2002,
then a slight increase in February 2004. A cause for concern, however, is that between February
2004 and November 2004, there was a dramatic increase in fats/oils/sweets consumption
significant at the 0.1 level. This is critical information, since fats/oils/sweets is the one category
where a decline in average daily consumption is desirable.

The female students also demonstrated an increase in average daily consumption of
breads/cereal/rice/pasta at the 0.1 level of significance while the males demonstrated a slight
decrease. The result is that over all, there was a slight increase in breads/cereal/rice/pasta
consumption across the entire study population that is tempered by the fact that the increase was
specifically due to the self-reported consumption behaviors of the female students. Consumption
gradually increased in every other food group, which is a good sign that many of the program
goals were being met with regard to the female students.

Males in the study were able to significantly reduce their fats/oils/sweets consumption at
the 0.05 level between August 2001 and November 2004. There was a slight rebound between
February 2004 and November 2004. Males also increased their milk consumption, but held fairly
steady in their average daily consumption of the other food groups. The study males were solely
responsible for the reduction in average daily servings of fats/oils/sweets in the study population.
Finally, first graders significantly reduced their daily average consumption of fats/oils/sweets from August 2001 to November 2004, at the 0.01 level. Second graders showed a slight increase in the daily average consumption of fats/oils/sweets between August 2001 and November 2004. However, it is also important to note that those average daily consumption levels varied from year to year. Second graders showed increases in food consumption categories, other than fats/oils/sweets, over the study period. First graders showed positive food consumption changes in every category except fruit.

The results from the Healthy Kids Challenge Eating Nutrition Skills Behavior Assessment Survey seem to suggest that repetitive behavioral practice and application of the nutrition concepts taught in the elementary school nutrition program was a critical component of the entire program. It appears that to counteract the effects of societal messages about fast food, sodas, and sweets, continual personal, behavioral, environmental, and cultural emphasis on healthy eating and good nutrition must be continually integrated into the daily lives of the students participating in the program.

Hypothesis 2: Participation in the nutrition program will result in a decrease in the proportion of students with BMI percentile scores in the “overweight” (combining overweight and at-risk for overweight) range.

Hypothesis 2 is accepted.

A design of repeated measures was used analyze body mass index (BMI) percentile range results. Participants’ BMIs were observed over the period of program intervention. In this design, BMI data were gathered five times—in August 2001, May 2002, August 2002, August 2003, and October 2004. Of the 560 students, 90 had their BMIs collected all five times during the study period. As a result, all 90 students in this cohort group were included in the study.
BMI proportion using the McNemar test of comparing dependent proportions (Agresti, A., & Finlay, B., 1997) was used for this study as a long-term measure of program effect. Based on the McNemar test, the cohort group demonstrated a decline in the percentage proportion of students in the overweight and at-risk for overweight categories between August 2001 and October 2004.

These results provide evidence that the proportion of “overweight/at-risk for overweight” in August 2001 is not the same as the proportion of “overweight/at-risk for overweight” in October 2004. Specifically, based on the sample proportions, it appears that the population proportion of “overweight/at-risk for overweight” decreased from August 2001 to October 2004. This result is statistically significant at the 0.1 level. One interesting observation is that there was a decline in the number of overweight and at-risk for overweight for the study males while the study females showed no decline in numbers. Most importantly, the hypothesis that there would be an increase in the percentage of students with normal BMI scores was achieved.

From a program effectiveness standpoint, it appears that the nutrition education program, with its four dimensional approach, has had a positive impact on the nutrition consumption behaviors and on the number of students with normal BMI scores. These results are in direct contrast to current national trends. According to the Centers for Disease Control and Prevention (Prevalence of overweight among children and adolescents: United States 2003-2004, 2005), overweight rates rose from 16.3% to 18.8% for children between the ages of six and eleven. During that same time period, the students in the nutrition study decreased the percentage of students in the overweight category from 8.9% to 6.7%. This is in direct opposition to national trends during the same time period!
Limitations of the Study

There are several limitations to this study that directly affected the analysis. They are mostly due to the fact that pre-existing datasets, with specific limitations, were used for study purposes. One of the most compelling reasons for this is the fact that across the entire United States, it is hard, if not impossible, to access student information in ways that will ensure complete confidentiality, particularly information that covers a longer time period. The data sets for this study were supplied in such a way that all student identifiers had been eliminated. That meant, however, that it has been impossible to alter the data by adding additional information to it. As a result, several limitations were caused by the fact that this study used secondary data. It is important to note that the issue of restricted access to student information limits school-related research, which is one of the major reasons why this study is so important.

Demographic Data

The only demographic data included in the data sets were gender and grade for the nutrition survey and gender, grade and date of birth for the BMI data set. General school demographic data regarding race was unavailable except in aggregate form on the school district website as were school population numbers and free and reduced lunch information. That information could not be matched to the students in the two data sets. As a result, it could only be used to provide student race and economic information for the entire school population.

Independence of Data Sets

The nutrition consumption data set and the BMI data set could not be connected through student identifiers because those had been removed. That suggests that although one can assume,
since the nutrition cohort group and the BMI cohort group were both in attendance at the elementary school during the three-year time period of the study and there were in all probability some common subjects, there existed an inability to directly assess the relationship of one dataset to the other. That means that although a measure of dietary consumption changes can be viewed as a shorter-term or intermediate measure, and it seems reasonable that changes in dietary behavior could result in changes in body mass index scores, there is no way to connect the results from that measure to BMI results which could then be viewed as a longer-term measure. Therefore, program effect has been assessed independently for both measures.

**Sample Size**

Both data sets were restricted to the elementary school data provided in each set. As a result students who either moved out of or into the school could not be counted as part of the student participant sample covering the three-year time period. In addition, students who did not complete the assessments (who were either not in school those days or were unable to participate for some reason) were not included in the study. Finally, those students who graduated to middle school prior to the end of the study could also not be counted in the study group which meant that, in actuality, only first and second graders comprised the study sample population. This resulted in a small sample size of 58 students in the nutrition survey cohort and 90 students in the BMI cohort.

**Food Consumption Levels**

One of the factors that may limit the results of the nutrition consumption survey is the potential relationship between growth and daily serving consumption. The possible changes in
the amount of food consumed by the students as they naturally grew larger could have affected results. The first and second graders in August 2001 were fourth and fifth graders in October and November 2004 and were correspondingly larger and taller (2000 CDC Growth Charts, 2000).

**Physical Activity**

Another limitation to the study was the fact that although physical activity was encouraged, there was no measure of physical activity provided. This issue has been faced in other nutrition studies—ones that simply look at food consumption without being able to take into consideration possible increases or decreases in physical activity. For purposes of this study, however, there is simply no available data that can be used to assess the contribution of physical activity to the study results.

**Environmental**

Finally, the study is limited by the fact that there are many environmental factors that could not be controlled for. This is particularly true of societal factors such as ongoing advertising regarding fast food restaurants, foods that contain excessive fats, oils and sugars, and the portion sizes provided at local restaurants and eateries. These intervening factors potentially may have had a negative impact on program results. In addition, since children are subject to the kinds and amounts of different foods served in the home, familial eating patterns and behaviors could have had a substantive impact on study results. It was anticipated that the inclusion of parents and family members in the educational components of the nutrition education program would mitigate any negative impact by positively influencing familial eating behaviors.
Implications of the Study

Implications for Theory and Practice

This study provides evidence of the importance of the use of theories of behavior and research that documents effective programs in the development and implementation of quality nutrition education programs in the school setting. The use of cognitive/behavioral theories, such as Social Cognitive Theory, provides understanding of the necessary interaction between environment, cognition, and behavior. Well supported theories provide the necessary rationale for program development, implementation, and results.

Bandura’s (1965, 1995, 1996, 1998, & 2005) Social Cognitive Theory provides an exceptionally fitting explanation for the necessary components of a cognitive/behavioral intervention such as the school nutrition program. It provides the underlying philosophy necessary to direct the development of such programs. The dynamic interaction between personal cognitive factors, environmental factors and personal behaviors, as explained by Social Cognitive Theory, are particularly applicable to nutrition education programs and an in-school emphasis on the knowledge and application of healthy eating behaviors. This is due, in part, to the fact that Social Cognitive Theory takes into consideration the individual, the social context or culture, and the power of “collective enablement” (Bandura, 1998, p. 23). It also emphasizes the importance of self-efficacy in the context of environment, cognition, and behavioral change.

A second critical area in program development is the use of knowledge gained from other programs, as substantiated by existing empirical studies. For instance, theoretical literature provides information on numerous studies that support the use of the school environment to implement behavioral change strategies and the use of social cognitive theory in the development
of program theory. In addition, it provides a basis for understanding cause and effect relationships between specific program components and approaches, and resultant changes in eating behaviors and BMI.

Multiple studies, although short-term, have explored the relationship between curriculum, program activities and sustained programmatic interventions, and the environmental, cognitive, and behavioral interactions that are necessary to support long-term changes in nutritional consumption of children. Since this study program was developed based on current theory and practice literature, it has been able to adopt many successful components of those short-term studies into its curricula. In addition, the longitudinal nature of this study may be able to provide a “next step” in the development of in-school nutrition education and health promotion programming.

Lastly, this study program was developed based on cognitive behavioral intervention theory. The literature and empirical research is very clear that cognitive/behavioral interventions, along with continuous reinforcement schedules, will result in behavioral change. Accordingly this study has the potential to provide useful information in the development of future programs. It should add to the empirical literature and thereby provide the basis for further understanding of what constitutes a “best practice” in school-based nutrition programs. It should be able to provide the health promotion field with an example of the application of theory to the program development process and the necessary systemic dimensions and focus areas needed for effective programming.
Implications for Policy and Program Development

Why Schools?

This study has provided extensive information regarding the importance of in-school nutrition education and health promotion programs. It clearly supports the idea that schools are uniquely suited to providing the individual, group context and environment necessary to truly educate and assist positive behavioral changes in children and youth. It also emphasizes the importance of the relationship between nutrition education and behavior change within the school setting. Most importantly, it lays the ground work for the development of key components for a successful school nutrition education program including the four dimensions: administrative commitment and support; teacher staff education and involvement; student education and involvement; and parent/family education and involvement. The use of these dimensions to structure and integrate the program focus areas was vital to its success. They were instrumental in the effort to encourage a substantial paradigm shift in attitudes, beliefs, and behaviors concerning nutrition, health, and academic performance as demonstrated by a substantial cultural change at the school over the three years of the program.

This study provides an explanation as to the reason why schools can provide an optimal opportunity for children to receive nutrition education and to apply that knowledge through practice in making positive, nutritious food choices. The relationship between nutrition education and behavior change, if used in the development of school-based programs, should result in long lasting positive effects on the diets of America’s children.
Components of Effective Programs

It is expected that this study will add to a general understanding of what constitutes an effective in-school program. As clearly indicated in the literature review, there are some very necessary components that should be included in the development of in-school nutrition programs. It is evident that the study program included one of the most critical requirements for a successful nutrition education program, that there be at least one person who is utterly committed to the creation, development, implementation, and success of the program. In this study, the principal and the program coordinator worked closely together to ensure program success. They were fully committed to, and supportive of, the cultural changes that would be necessary to ensure positive results. The level of commitment made by those two individuals provided the necessary impetus and energy with which to attract participation from other adults, specifically staff, teachers and parents, a necessary program element if the end result were to be significant behavioral changes in children.

This study also reinforces the theoretical assertion that a nutrition education/health promotion program model should include a social cognitive approach that incorporates the interaction between knowledge, attitude, and behavior into the context of the program, itself. It also validates the importance of self-efficacy, the “can do” piece that reflects the belief of each child that he or she can make healthy food choices. Self-efficacy cannot be under estimated when assessing knowledge, attitude, and behavior because its impact on attitude is paramount in one’s ability to initiate and sustain behavioral changes.

Program components such as age-appropriate curricula, continuous social support so that the program had consistent cultural reinforcement throughout the school environment, and planned activities that engaged all four dimensional areas of the program model including
administration, staff/teachers, students and families were crucial to program success because they reflected a transformation in overall school culture. The study program model addressed children’s health within the school setting and used an environmental perspective to ensure that cultural changes not only went hand-in-hand with individual behavioral changes, but also provided environmental support for those changes. As a result, the combination of curriculum components that focused on nutrition, on activities that educated, rewarded and encouraged healthy eating behaviors, and on school events and activities that encouraged participation and “buy-in” from teachers and staff, students and families constituted a highly effective approach to instigating behavioral changes in the target students.

When assessed within the context of social cognitive theory, the use of four clearly identified dimensions for the program which included administrative commitment and support, teacher/staff education and involvement, student education and involvement, and parent/family education and involvement, unmistakably contributed to the program’s success. This is due to the fact that the interaction between cognition, behavior, and environment required the systemic inclusion of those individuals whose participation in each component of the program would most significantly contribute to the sustained behavioral changes necessary for long-term improvement in nutrition consumption and BMI rankings.

From a systems perspective the continuous positive interactions between the four dimensions were reflected in the multiple group interventions designed to educate staff, students and parents, and to establish a collective environment where learning could lead to behavioral changes. When everyone “bought in” to the idea that teaching, learning and practicing good nutrition is an important part of learning within the school setting, the resulting systemic changes
were reflected in an even more critical change in school culture - one that was exceedingly supportive of good nutrition and healthy eating behaviors.

In addition to the four program dimensions, the program model also included four focus areas for nutrition intervention that were consistently sustained over the entire three year period. They comprised in-school activities involving administrators, teachers, staff, students and parents, in-class activities and curriculum development that included teachers and students, nutrition education information flyers and activities that involved parents and families in the nutrition program, and in-school and in-class recognition programs that rewarded students, teachers, staff and administrators for participation in the program. These program focus areas provided the necessary programmatic emphasis on consistent reinforcement across dimensions of the nutrition education principles that would achieve results.

The systemic approach of the nutrition education program, with its four dimensions and focus areas, has the model flexibility to enable its application in a variety of school milieus, including those that address the needs of largely racial and ethnic minority children and children and their families who are economically disadvantaged. It has the ability to address the nutritional/behavioral needs of the students within the context of their families and their school setting. This is due in large part to the fact that each program activity, whether in-school, in-class or at-home, can be adjusted to meet the unique personal, familial and cultural needs of the target school population. In other words, as long as the basic four dimensions and focus areas are incorporated into, and addressed by, the program in some manner, specific modules and activities can be modified to become increasingly effective when dealing with the needs of area specific target populations.
The systemic approach and flexibility of the study program will provide additional ideas with regard to ways in which specific program components can be adjusted to meet the needs of a variety of students with different racial, economic, and cultural backgrounds. By its very nature, the program model is easily adapted to local school environments because it includes the ability to redesign program activities and education modules to include local customs, and ethnic food preferences. It allows the opportunity for program administrators to have staff, teachers, and parents participate in the development of curricula that fully incorporates the effects of local racial, cultural, and economic status on the students and their families. Curriculum modifications can easily reflect knowledge of those specific requirements and their importance in empowering students and their families to make long lasting behavioral changes. This, in turn, should create the “buy in” necessary for comprehensive participation across dimensions. This model has the inherent flexibility to be used in a variety of school settings because it can be adapted to educate variety of children representing multiple races, cultures and economic backgrounds.

In addition to the school environment, this model has the potential to be applied across almost all public affairs disciplines, from public administration and non profit management to social work. The model, with its four dimensions and focus areas can be applied within almost any social context or setting and be used to address a variety of behavioral changes. The flexibility of the model can allow it to be used to create an environment where: 1) behavioral change concepts can be taught; 2) their application and adoption can be supported; 3) the behavioral changes can be incorporated into the larger social environment; and 4) cultural supports can be created that are necessary to sustain the new behavior over time.

The model, itself, can be applied to almost any change process that occurs within the social/cultural environment. It reflects the understanding that long lasting behavioral changes
require educating the individual regarding the need for behavioral changes and the importance of those changes, the ways in which behaviors can be modified to incorporate the desired changes, and how to sustain those behavioral changes once they have been implemented. It also reflects a clear understanding of the considerable impact of the social and structural environment on the individual behavioral change process. It incorporates the systemic understanding that each person changes his or her behavior within the context of one’s family and within the larger racial, social, ethnic, and cultural community, whether a school or a locality. The results of this study suggest that the application of this model, across social disciplines, has the potential to enhance and support behavioral changes over the long-term. It has implications for all social sciences and public affairs disciplines.

Local, State, and National Policies

While this study provides an excellent template for the development of an in-school nutrition program that can be replicated across schools and school districts nationally, there are political influences that also work against its implementation. This is, in part, due to the funding shortage in education across the United States. Often legislators mandate curriculum changes in the schools but fail to provide funding support to implement those changes. As a result, one of the greatest barriers to the development of this type of program in the schools is that it may become just another task to accomplish in the course of the school day, and may even appear to be in direct conflict with school priorities such as academic achievement. In essence, it can become and “unfunded mandate” that has legislative support, but practically speaking cannot be implemented because of a lack of funds.
It is important to address the gap between good legislative intentions and their application of school health promotion programs. As a result, there is a great need for more longitudinal studies that not only address children’s health and health promotion programs but also link good health and academics. Hopefully, the information gained in those studies will provide additional support for not only the development of in-school health promotion programs such as the school nutrition program in this study, but also for the funding necessary to actually implement such programs. In addition, although there are many educational organizations that are strongly supportive of health promotion programs in the school setting, they appear to have relatively little impact on the execution of health promotion programs across entire schools districts. Instead, there appears to be some limited success regarding the implementation of in-school programs. They tend to develop in one school at a time. Again, those schools tend to have at least one individual who is committed to the creation, development, and success of the program such as a parent, teacher, or administrator.

On a state and national level, there are multiple organizations seeking to support the development of in-school health promotion programs beginning with the Centers for Disease Control and Prevention, and the Coordinated School Health Model. Other organizations are actively promoting health promotion programs, in the school setting, across the country including the National School Board Association, the California Center for Public Health Advocacy, Action for Healthy Kids, the American Dietetic Association, the American Heart Association, state health departments and the federal Department of Health and Human Services, to name a few.

Without funds to support the implementation of new programs, however, the likelihood of broad adoption of health promotion programs is very unlikely even if research into the
relationship between nutrition and academic performance continues to provide supportive
documentation of that relationship. The resources necessary to develop appropriate and
successful in-school nutrition programs are sadly lacking. The majority of school districts are
resource poor and as a result, unless state and federal legislatures provide funding for the
development of health promotion programs in the schools, it will probably not happen on any
significant scale. Local, state, and national policies must drive the development of in-school
health promotion programs, but without funding attached to those policies, the ability of schools
and school districts to introduce effective programs will be severely limited.

Implications for Research

The rapid upward trend in childhood obesity over the last couple of decades is a growing
phenomenon across the United States. The importance of identifying and documenting programs
that have the potential to intervene in, and potentially redirect, this trend cannot be understated.
Overweight children are already exhibiting symptoms of serious diseases, such as type 2
diabetes, that have historically only affected older adult populations. Unless, interventions are
developed that have the ability to successfully reduce childhood obesity, the future economic
ramifications, alone, will be catastrophic to an already overloaded health care system in the
United States. Research into childhood obesity and successful intervention methods has become
an extremely high priority in medical and health related research.

Longitudinal Studies

There is an enormous need for more longitudinal studies, using cohort groups, which can
assess the impact of nutrition education and health promotion programs. The importance of these
studies cannot be underestimated as to their importance in providing new information concerning the impact of those types of programs on childhood obesity. There have been many short-term studies examining the effects of nutrition education programs on childhood obesity, but only a few that look at long-term results, using repeated measures, to determine whether or not the results can be sustained over time.

A possible next step could be to design a research study to evaluate the results of program interventions targeting childhood obesity using Structured Equation Modeling. Structured Equation Modeling can be used to explore the interactive affects of nutrition consumption, physical activity, and BMI. It could be used to assess interactive effects using a cross lagged model as part of a time series analysis. The use of this confirmatory statistic has the potential to contribute to both theoretical and applied literature by addressing the cause and effect relationships between behavior (nutrition consumption and physical activity), cognition (knowledge and perception), environment (social/cultural context), and changes in BMI as addressed in childhood obesity prevention programs.

**At-risk Population Studies**

There have been a few obesity prevention studies, such as the Pathways Study of American Indian School Children, that have assessed the results of school-based obesity prevention programs designed specifically for minorities. A few previous studies that have assessed the BMI percentile rankings of African American and Hispanic children consistently show that they are disproportionately represented in the overweight and at-risk for overweight categories.
Specific studies need to be designed that look at the barriers to normal body weight that affect minority populations including environmental, economic, racial, cultural, as well as barriers to accessing high nutrient and low fat foods. The interaction between society as a whole, and local communities representing a variety of cultures, that include families and children, is complicated. If we are to truly intervene in the escalating childhood obesity rates in children who are part of at-risk populations, we must seek to design further research studies that identify successful methods for positive intervention in the hope that they will result in a subsequent reduction in childhood obesity rates across at-risk populations, and across the United States. The program model used in this study may provide one such template for an intervention method that can be adapted to address the unique needs of specific at-risk populations.

Political/Social/Environmental Studies

There is also a substantial need for research studies that take into account the greater public health environment. There are few studies that explore the relationship between public health agencies and organizations and their impact, or lack thereof, on childhood obesity. In addition, future research needs to explore the effectiveness of the working relationships between governmental organizations such as public health departments, health clinics, and school districts, and to assess their ability to respond in a coordinated, comprehensive manner to a public health crisis such as the dramatically increasing childhood obesity rates. This could be done at local, state, and national levels.
Economic Studies

A critical area for future research is based in the need for a comprehensive assessment of the economic impact resulting from the development of in-school health promotion programs. As stated earlier, schools provide an optimum environment for children to learn about healthy eating behaviors and one in which behavioral change supports can be consistently applied. If state and federal policy makers are going to truly try to implement school-based obesity prevention policies, they are going to require information, based on empirical research, which provides cost benefit analyses of the fiscal impacts of in-school health promotion programs on local school districts and state departments of education, particularly in relation to desired obesity prevention outcomes.

Wide spread implementation of school health promotion programs is going to require the key involvement of many of the segments of our society. It is simply not just an individual child issue, a family issue, or a school issue. It is a multifaceted issue facing every member of our society, including our most vulnerable, our children. It is expected that this research study will provide some direction and encouragement to those who are struggling to develop intervention programs that actually result in a reduction in the high percentage of children who are obese. Often, it is the small programs, with limited funding support, that may have the opportunity to provide the most insightful direction into research on best practices in health promotion programs.

It is anticipated this study will provide sufficient information to stimulate further research into successful child health promotion programs and the most effective interventions to address childhood obesity with all its negative ramifications. The implementation of effective childhood health promotion programs could result in substantive reductions in the medical, social, and
economic consequences of childhood obesity and an increase in personal health and quality of life for all our children.
Enrollment 560 students

Staffing 100 teachers/staff

Ethnicity
- 70% White
- 13% Hispanic
- 11% Black
- 06% Other Races
- 25% Free and Reduced Lunch Students
- 30% Mobility Rate
HOW WE GOT STARTED AND WHAT WE’VE DONE:

SAC discussions
District discussions
Continued to attend conferences—Harvard
Received funding
School and Community involvement 2001-2002

Installed water fountains
Gave water bottles to students and staff
Pre and Post assessments on knowledge of the food pyramid (In school and at home)

Began CHEW curriculum Changing Habits for Everyone’s Well being
   Formed teacher writing team
   Each student started the day with a math/health problem of the day

Kick-off September 5, 2001 with Marcus Conyers (national speaker on the brain and learning) and Healthy Kids Challenge (started by Cooking Light Mag)
Walk Through the Pyramid—supplies donated by Whole Foods

Brain Gym presentation for parents

Healthy menu selections in monthly newsletter

Cooking in the classrooms for children with education about the brain

Holiday giveaways for children and parents—books and lunch bags

End of the year gift for families—Kids Discover Brain mag

Healthy snacks before and during FCAT testing (grades 3-5 for 4 days)

Parent walking groups formed—4 afternoons per week

Faculty and Staff participate in Walk the Talk

Community presentations

Attended conferences
   Learning in the Garden of Good and Evil—February (10 participants)
   Hearts and Minds—April (3 participants)
   Learning and the Brain—May (8 participants)

General Elementary School Information:
Student population  575
Faculty and staff  100
Elementary School Nutrition Program

Grant Proposal

Goals of the Elementary School Nutrition Grant as stated in the proposal:

1. Improve student behavior and learning environment in classroom
2. Improve student test scores
3. Reduce school absenteeism due to illness
4. Produce children who have internalized and used sound thinking to make life choices regarding nutrition and exercise
5. Increase the number of adults and children who exercise regularly (5x per week for a minimum of ~ hour each time)

Project changes and outcomes as stated in the proposal:

1. Change the nutritional content of school breakfasts and lunches to include food which are nutritionally sound and which aid students in learning
2. Change the curriculum taught in elementary and secondary schools to include real-life mathematics and critical thinking which supports good nutrition and exercise' choices
3. Make the provision of brain-healthy snacks and water a part of basic school curriculum
4. Increase the number of adults and children who exercise regularly (5x – 1/2 hour each time)
5. Serve as model for expansion of these principles to other districts

Preliminary timetable for implementation in the Fall of 2001:

August 10 Meet the Teacher Day - Information available to School families. Foundation representatives, parents, university students could all be possibilities to be on hand to answer questions.

August 13 First day of school August 23-26 Families complete 4 day "eating diary"

August 27 Diaries due back to school - children will receive something small (pencil or similar) when returning diary on time

September 5 Kick-off day!! Marcus Conyers in AM for children and PM for parents. Representatives from Cooking Light Magazine also possible

September 6 Healthy Brain Expo at local high school - _________will plan on paying for each faculty member to attend

What are we going to do now? Next Steps:
Have Food Diary ready for the fall -

Explore university student involvement

Program Coordinator will research info from Cooking Light to see if there is a diary already available

Update the elementary school website to include nutrition info ready for the fall, principal has contacted webmaster already
**Project Goals Stated in Grant**

Our goal is to make significant changes in the health and performance of students, families, and staff by implementing current research on the brain and nutrition. This research shows that children are better able to learn and perform when they have proper nutrition, hydration, exercise, and snacks. Research also shows that incorporating education concerning nutrition and exercise into a school produces better learners with less absenteeism, healthier staff, and promotes long-term health benefits for families of the students who receive this education. The grant seeks funds over a three year period to:

- Provide consultants to train teachers, students, and families about current research regarding nutrition and exercise and the effects of healthy habits on a child’s capacity to learn and perform.
- Provide a math curriculum which uses real-world applications to teach mathematical principles.
- Provide nutrition consultation to revise the meals at School to provide healthier meal choices.
- Fund the revisions to the meal menus and brain-healthy snack for all children.
- Increase water availability to all students and staff to optimize performance and learning.
- Provide specific opportunities for children, families, and staff to incorporate the principles into real life.
- Fund a part-time staff position to administer the program. Coordinate the efforts at the state and local level, and coordinate the evaluation of the project.
Recipe for Successful Implementation of Brain-Based Nutrition Program

Checklist for Success:
- Supportive school administration
- Supportive School Advisory Council
- Staff buy-in (don’t forget it might take time)
- Food service buy-in
- Community support (remember, not always with $)
- Dedicated staff/non-staff person
- Student involvement and excitement (way to “hook” parents)
- Don’t be afraid to ask
- Flexibility

THINK OUTSIDE THE BOX!

Websites:

Brain Research
- [www.learningbrain.com](http://www.learningbrain.com)
- [www.brainconnection.com](http://www.brainconnection.com)
- [www.dana.org](http://www.dana.org)
- [www.thebrainstore.com](http://www.thebrainstore.com)

Nutrition
- [www.healthykidstoday.org](http://www.healthykidstoday.org)
- [www.dole5aday.com](http://www.dole5aday.com)
- [www.5aday.com](http://www.5aday.com)
- [www.healthykidschallenge.com](http://www.healthykidschallenge.com)
- [www.kidshealth.org](http://www.kidshealth.org)
- [www.americaonthemove.org](http://www.americaonthemove.org)
- [www.fitnessfinders.net](http://www.fitnessfinders.net)
- [www.americanfitness.net](http://www.americanfitness.net)
- [www.humankinetics.com](http://www.humankinetics.com)

Funding/Community Involvement
- [www.fdncenter.org](http://www.fdncenter.org)
- [www.tgci.com](http://www.tgci.com)
- [www.geyf.org](http://www.geyf.org)
- [www.gif.org](http://www.gif.org)
- [www.hhs.gov/grantsnet/](http://www.hhs.gov/grantsnet/)
- [www.cdc.gov/funding.htm](http://www.cdc.gov/funding.htm)
STARTING A BRAIN-BASED NUTRITION PROGRAM
CHECK LIST FOR SUCCESS

1. Supportive School Administration
2. Supported by School Advisory Committee
3. Staff Buy-in – might take time
4. Food Services Buy-in
5. Community support – remember, not always with dollars($)
6. Staff person or non-staff person to follow up with ideas
7. Student involvement and excitement – way to “hook” parents
8. Don’t be afraid to ask
9. Flexibility

10. Thinking outside the box!!!!!

Always remember – Don’t bite off more than you can chew! Change takes time and is usually slow! Start with one project and then add to that as you are more comfortable.

WHAT PRINCIPALS CAN DO
Here’s How

There are a number of practical steps that principals can take to promote both the knowledge and quality of nutritious food in their schools:

1. Arrange for tasting parties in the cafeteria and classrooms;
2. Invite food service personnel, nutritionists, and community members to educate students about nutritious, multicultural foods
3. Increase staff awareness of USDA food program
4. Initiate theme days in the cafeteria that focus on foods of different cultures, supported by classroom education
5. Let students experience a formal dining experience, with tablecloths and invited guests
6. Develop a school garden of edible plants
7. Support nutrition education programs for staff and parents
8. Develop a school nutrition committee and policy
Starting a Brain-Based Nutrition Program at Your School

Brain Research
www.learningbrain.com
www.brainconnection.com
www.dana.org
www.thebrainstore.com

Nutrition
www.dole5aday.com
www.5aday.com
www.nutritionexplorations.org
www.kidshealth.org
www.nutritionforkids.com
www.healthykidschallenge.com

Funding/ Community Involvement
www.fdncenter.org
www.tgci.com
www.gcvf.org
www.gih.org
www.hhs.gov/grantsnet/
www.cdc.gov/funding.htm
APPENDIX B: IN-SCHOOL ACTIVITIES
CHEW
Changing Habits for Everyone's Well-being

1. What did you learn about eating well?
   to be healthy
   you must eat well

2. Why do we need to eat healthy?
   not to get sick

3. Name 5 fruits and vegetables.
   plum
   grapes
   bananas
   lemon
   apple
   onions
   tomato
   cabbage
   carrots
   leek

4. Which fruits and vegetables do you like best and why?
   grapes
   green beans
   to be healthy
   they taste good

5. Why do we need to drink water?
   to keep hydrated

6. What did you like best about the Brain book you got?
   The brain is like a computer
7. Why is the brain so important?
   To move your body

8. Is white sugar better for you than brown sugar? Why?
   Brown sugar is better for you because it is less processed.

9. How important is exercise? Why?
   To make your muscle to get stronger.

10. Draw the food pyramid.

Yogurt

Milk

Vegetables

Meat, poultry, fish

Fruit

Bread, cereal, rice, and pasta
CHEW
Changing Habits for Everyone’s Well-being

1. What did you learn about eating well?
   - Eat healthy food, not junk food.

2. Why do we need to eat healthy?
   - So we won’t get fat, belly need to eat healthy to grow, we need it to help us stay strong.

3. Name 5 fruits and vegetables.
   - 1. Bananas
   - 2. Carrots
   - 3. Broccoli
   - 4. Spinach
   - 5. Apples

4. Which fruits and vegetables do you like best and why?
   - Apples, healthy, sweet. Spinach makes me strong.

5. Why do we need to drink water?
   - We need water because we get thirsty and we don’t get water we start to die.

6. What did you like best about the Brain book you got?
   - I like learning.
7. Why is the brain so important?

8. Is white sugar better for you than brown sugar? Why?

Brown sugar tastes better than white.

9. How important is exercise? Why?

the heart is go very very very fast. Make us strong.

10. Draw the food pyramid.
CHEW
Changing Habits for Everyone’s Well-being

1. What did you learn about eating well?
   It keeps you strong and healthy

2. Why do we need to eat healthy?
   So our bodies work right and we don’t get sick

3. Name 5 fruits and vegetables.
   1. Corn
   2. Apples
   3. Raisins
   4. Carrots
   5. Lettuce

4. Which fruits and vegetables do you like best and why?
   Green Apples – They taste good

5. Why do we need to drink water?
   Stay healthy. Water flushes our system

6. What did you like best about the Brain book you got?
   Pictures

175
7. Why is the brain so important?

    If we didn’t have a brain we couldn’t move or live.

8. Is white sugar better for you than brown sugar? Why?

    No - not sure why.

9. How important is exercise? Why?

    Very important keeps our muscles strong.

10. Draw the food pyramid.
CHEW
Changing Habits for Everyone's Well-being

1. What did you learn about eating well? 
   You could be strong.

2. Why do we need to eat healthy? 
   Then you can not be sick.

3. Name 5 fruits and vegetables. 
   Peach, pear, banana, carrot, broccoli.

4. Which fruits and vegetables do you like best and why? 
   Greens because they taste good.

5. Why do we need to drink water? 
   It helps your body to keep healthy.

6. What did you like best about the Brain book you got? 
   Baby bear.
7. Why is the brain so important? 

8. Is white sugar better for you than brown sugar? Why? 

9. How important is exercise? Why? 

10. Draw the food pyramid.
CHEW
Changing Habits for Everyone’s Well-being

1. What did you learn about eating well?
   To make you healthy

2. Why do we need to eat healthy?
   To make you strong

3. Name 5 fruits and vegetables.
   Orange, banana, pineapple, potato, lettuce

4. Which fruits and vegetables do you like best and why?
   Potato because I like to eat potato
   Strawberry, it is my best fruit because it is sweet

5. Why do we need to drink water?
   To make you stay in good health

6. What did you like best about the Brain book you got?
   I didn’t like the heart
7. Why is the brain so important?

To make you think

8. Is white sugar better for you than brown sugar? Why?

Brown sugar is better because there don’t have much sugar

9. How important is exercise? Why?

Exercise makes you strong

10. Draw the food pyramid.

[Hand-drawn food pyramid with labels like oil, meat, fish, bread]
CHEW
Changing Habits for Everyone's Well-being

1. What did you learn about eating well?
   
2. Why do we need to eat healthy?
   
3. Name 5 fruits and vegetables.
   1. apple
   2. orange
   3. banana
   4. pineapple
   5. strawberry

4. Which fruits and vegetables do you like best and why?
   apple and more

5. Why do we need to drink water?
   to make you brain work

6. What did you like best about the Brain book you got?
   brain
7. Why is the brain so important?

   to make you thing

8. Is white sugar better for you than brown sugar? Why?

   brown sugar is better
   because there don't have much sugar

9. How important is exercise? Why?

   make you strong

10. Draw the food pyramid.

    [Diagram of a food pyramid]

    Oil
    Dairy/meat
    Fruit/vegetables
    Bread
CHEW
Changing Habits for Everyone's Well-being

1. What did you learn about eating well?
   - It makes you healthy

2. Why do we need to eat healthy?
   - It makes my bone strong

3. Name 5 fruits and vegetables.
   1. apple
   2. banana
   3. orange
   4. grapes
   5. pineapple

4. Which fruits and vegetables do you like best and why?
   - Orange - it's sweet
   - Broccoli - I like it with cheese

5. Why do we need to drink water?
   - It pumps your blood up to the brain

6. What did you like best about the Brain book you got?
   - Pictures
7. Why is the brain so important?

8. Is white sugar better for you than brown sugar? Why?

Brown sugar - white sugar is bleached

9. How important is exercise? Why?

Important because it makes your heart pump faster

10. Draw the food pyramid.

- Milky yogurt
- Cheese
- Vegetables
- Bread and rice
- Pasta
- 2-3 servings
- 2-4 servings
- 6-11 servings

- Fat and oils
- Meat, eggs, dry beans, nuts
- Fruit
### Fielder's Fabulous 4th Grader's Menu for Week Oct. 21-25, 2002

**Let's go International!**

<table>
<thead>
<tr>
<th>Monday - Japanese</th>
<th>Tuesday - Mexican</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shrimp or chicken fried rice</td>
<td>Soft beef taco</td>
</tr>
<tr>
<td>Sautéed veggies: broccoli and carrots</td>
<td>Baked potato with butter/sour</td>
</tr>
<tr>
<td>Berries/pineapple</td>
<td>Salad (lettuce, cucumbers, tomato, carrots)</td>
</tr>
<tr>
<td>cream</td>
<td>w/dressing</td>
</tr>
<tr>
<td>Biscotties (spelling???)</td>
<td>oranges/pineapple</td>
</tr>
<tr>
<td></td>
<td>Jell-O/cinnamon crisps</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wednesday - American</th>
<th>Thursday - Hawaiian Luau</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over fried chicken or Bulldog burger</td>
<td>Pineapple glazed chicken or grilled fish or shrimp</td>
</tr>
<tr>
<td>French fries or potato wedges</td>
<td>Corn or tossed salad</td>
</tr>
<tr>
<td>Lettuce or green beans</td>
<td>Shredded coconut or pineapple</td>
</tr>
<tr>
<td>Apple or pineapple</td>
<td>Hawaiian (sweet) roll</td>
</tr>
<tr>
<td>Garlic roll</td>
<td>Gelato' or lemon custard</td>
</tr>
<tr>
<td>Cookies</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Friday - Californian</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn dog</td>
</tr>
<tr>
<td>Mac n cheese</td>
</tr>
<tr>
<td>Salad</td>
</tr>
<tr>
<td>Green grapes/watermelon</td>
</tr>
<tr>
<td>Pumpkin pie</td>
</tr>
</tbody>
</table>

*Sample of weeklong menus that a fourth grade class came up with. Cafeteria Manager uses the children's selections for that week.*
WATER FACTS

We all know that water is important, but have you ever seen it spelled out for you like this before:

- 67% of the human body is water. It is almost impossible to drink too much water.

- 75% of Americans are chronically dehydrated. This likely applies to an even higher percentage of entire world population.

- 37% of Americans have a thirst mechanism so weak, it is often mistaken for hunger.

- Lack of water is the #1 cause of daytime fatigue.

- Even MILD dehydration will slow down one’s metabolism as much as 3%.

- A mere 2% drop in body water can trigger: fuzzy short-term memory, trouble with basic math, and difficulty focusing on the computer screen, or on a printed page.

- Preliminary research indicates that 8 – 10 glasses of water daily could significantly ease arthritis, back, and joint pain for up to 80% of sufferers.

- In a University of Washington study, just one glass of water, instead of food, stopped midnight hunger pangs for almost 100% of the dieters studied.

- Drinking just 5 glasses of water daily decreases the risk of breast cancer by 79%, and a person is 50% less likely to develop bladder cancer. In Dr. Batmanghelidj’s book, Your Body’s Many Cries for Water, “Dr. B” argues that water activates you body’s systems, and the lack of it causes a variety of thirst responses that we call disease.”
LUNCH SURVEY

We are trying to improve our school lunches by making them more nutritious and appetizing. Please give us your opinion by answering these questions.

Circle the letter of your choice.

1. How often do you buy the school lunches?
   A. 5 times a week
   B. 3-4 times a week
   C. 1-2 times a week
   D. 1-3 times a month
   E. Never

2. Would you rather have raw vegetables or cooked vegetables?
   A. Raw
   B. Cooked

3. How do you like your vegetables prepared?
   A. Mixed (example: com, canots, and peas together)
   B. Separate (example: canots alone)

4. Do you like salad?
   A. Yes
   B. No

5. Check off the vegetables you like. You may check as many as you like.
   Broccoli ____
   Carrots ____
Cauliflower _____
Celery _____
Corn _____
Cucumbers ______
Lettuce _____
Peas _____
Other __________ (fill in the blank)

6. Do you like to dip your vegetables in dressing?
   A. Yes
   B. No

7. If so, check off the dressings that you like.
   Ranch _____  Blue cheese _____  Italian _____

8. Do you like canned fruit or fresh fruit?
   A. Canned
   B. Fresh

9. Check all the fruits you like.
   Apples ______
   Blueberries ______
   Bananas ______
   Watermelons ______
   Cherries ______
   Kiwi ______
   Grapes ______
10. Do you like sherbet for dessert?  
   A. Yes  
   B. No

11. Do you like cookies for dessert?  
   A. Yes  
   B. No

12. What type of low fat / low sugar cookies do you like?  
   A. Peanut butter  
   B. Chocolate chip  
   C. Oatmeal raisin

13. What type of low fat pudding do you like?  
   A. Chocolate  
   B. Vanilla

14. Check the types of frozen fruit bars you like. You may check as many as you like.  
   Lemon ______  
   Lime ______  
   Grape _____  
   Cherry ______  
   Orange ______  
   Strawberry ______
15. Do you like yogurt?
   A. Yes
   B. No

16. Do you like cheese?
   A. Yes
   B. No

17. Would you like yogurt and/or cheese as an option in place of the main course? 
   A. Yes
   B. No

18. Do you buy the school lunch on pizza day?:
   A. Yes
   B. No

19. What one topping would you like most on your pizza:
   A. Ham
   B. Sausage
   C. Pepperoni
   D. Cheese Only

20. Would you like stuffed crust or plain crust? 
   A. Plain
   B. Stuffed

21. What meat would you like best:
   A. Ham
   B. Turkey
C. Chicken
D. Beef

22. What kind of chicken would you like best?
   A. Chicken nuggets
   B. Baked chicken

23. What nationality would you like your food to be based on:
   A. Italian
   B. French
   C. Mexican
   D. Chinese
   E. American

24. Would you prefer to have a bag lunch on Friday or a regular lunch:
   A. Bag
   B. Regular

25. Would you like to have soup served as part of a meal:
   A. Yes
   B. No

Thank you for sharing your opinions. Your ideas will be taken into consideration for future lunch menus.

Mrs. ____________ 4th Grade Class
Glacier Peaks Granola
This is not only a great snack on the trail, but also a jump-start breakfast when served with milk or yogurt.

Ingredients for 14 Servings:

3 cups regular oats
2 cups sweetened puffed-wheat cereal
(such as Kellogg’s Smacks)
½ cup wheat bran
2 tablespoons slivered almonds
½ cup applesauce
1/3 cup honey
1 tablespoon ground cinnamon
¼ teaspoon ground ginger
½ cup chopped dried apricots
½ cup sweetened dried cranberries
(such as Craisins)

1. Preheat oven to 375 degrees
2. Combine the first 4 ingredients in a large bowl. Combine applesauce, honey, oil cinnamon, and ginger in a small saucepan, and cook over medium heat 2 minutes or until honey is melted, stirring occasionally. Pour applesauce mixture over oat mixture, stirring to coat. Place mixture in a jelly-roll pan, and bake at 375 degrees for 20 minutes. Gently stir granola, and bake an additional 15 minutes or until dry. Cool, stir in apricots and cranberries.
3. Store in airtight container.

Yield: 7 cups (serving size: ½ cup)

*Cooking Light*, October 1998
FCAT recap
Please complete this questionnaire so that I can help select the snacks and activities that you like for future FCAT tests.

1. How ready did you feel to take the test? Circle the best answer.
   Not at all
   A little
   Really ready

2. How well did you feel you did on the FCAT? Circle the best answer.
   Not good at all
   Pretty good
   Really good

3. Did the FCAT Rally help you ready to take the test on the following Monday?
   Not at all
   A little bit
   A lot

4. Please rate the FCAT snacks, putting a 1 in front of your favorite snack and then 2 in front of the next, etc.
   _____ Apples
   _____ Grapes
   _____ Bananas
   _____ Cheese/peanut butter crackers
   _____ Sunflower seeds
   _____ Peanuts

5. I wish I had __________________________ for a HEALTHY snack next time.
NOTES FROM FCAT AND FL WRITES MARCH 2002

Ordered String cheese (96/case @ $24.20) and grapes in cups (48/ case @ $17.50) for Fourth Grade FL Writes-cost about $100.00
  Children did not like the cheese - ordered from Howard's Wholesale
  Children did not like the grapes -- were in cups with pear juice-ordered from Earl's

Ordered for FCAT-cost about $450.00 purchased through lunchroom

Monday 3rd -5th grade
Before
Cheese/peanut butter crackers
Howard's-144/case @ $19.85

Mid-test
Carrots
Earl's-100/case @ $16.00

Tuesday 3rd -5th grade
Before
Peanuts
Howard's-100/case @ $ 24.70

Mid-test
Bananas
Earl's-150/case @ $16.00

Wednesday 3rd -5th grade
Before
String cheese for 3rd (leftover)
Peanuts or Cheese/peanut butter cracker for 4th and 5th (leftover)

Mid-test
fresh grapes
Earl's 18 lbs@ 20.00

Thursday 4th-5th
Before
Sliced apples Earl's-100/case @ $27.00

*Notes* Had ordered String cheese and sunflower seeds for FCAT one week before testing and they were not available ........Make sure to order EARLY
Carrots were too hard for language kids to eat FCAT numbers 3rd -70, 4th -95, 5th -80
Preparation before testing begins ....
Working in the classrooms on nutrition and Brain Gym exercises The Three-B's -- Brilliant School Bulldogs
Lower stress-feel good exercises
Make smoothies as alternatives for breakfast
Conducted "experiment" in math class-timed One-minute test
Did Pep-Rally spot with Nurse ____ every morning before the testing
Talked about sleep, nutrition, feeling good and ended with Brain Gym
## Nutrition Program

### FCAT Recap from students

<table>
<thead>
<tr>
<th></th>
<th>T#1</th>
<th>T#2</th>
<th>T#3</th>
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<tr>
<td><strong>Pre-test snacks</strong></td>
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<tr>
<td>(%=#1 choice)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cheese/Peanut</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Butter Cracker</td>
<td>27%</td>
<td>30%</td>
<td>13%</td>
<td>40%</td>
</tr>
<tr>
<td>Peanuts</td>
<td>13%</td>
<td>20%</td>
<td>7%</td>
<td>13%</td>
</tr>
<tr>
<td>String Cheese</td>
<td>33%</td>
<td>20%</td>
<td>60%</td>
<td>13%</td>
</tr>
<tr>
<td>Sliced Apples</td>
<td>27%</td>
<td>30%</td>
<td>20%</td>
<td>33%</td>
</tr>
<tr>
<td><strong>How ready to take the test?</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not at all</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>A little</td>
<td>6%</td>
<td>33%</td>
<td>7%</td>
<td>18%</td>
</tr>
<tr>
<td>Really ready</td>
<td>94%</td>
<td>67%</td>
<td>93%</td>
<td>82%</td>
</tr>
<tr>
<td><strong>Mid-test snacks</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>(%=#1 choice)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baby Carrots</td>
<td>44%</td>
<td>27%</td>
<td>13%</td>
<td>33%</td>
</tr>
<tr>
<td>Bananas</td>
<td>13%</td>
<td>18%</td>
<td>33%</td>
<td>40%</td>
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<tr>
<td>Fresh grapes</td>
<td>44%</td>
<td>55%</td>
<td>54%</td>
<td>27%</td>
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<tr>
<td><strong>How well did you do?</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not at all</td>
<td>0%</td>
<td>7%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>A little</td>
<td>6%</td>
<td>26%</td>
<td>13%</td>
<td>6%</td>
</tr>
<tr>
<td>Really well</td>
<td>94%</td>
<td>67%</td>
<td>87%</td>
<td>94%</td>
</tr>
</tbody>
</table>
Nutrition Program

FCAT Recap

Name _________________________________   Date _____________________.

FCAT recap

Circle the answer that best describes how you felt about the FCAT snacks.

1. Put the pre-test snacks in the order you liked best ... 1 in front of your favorite

   _____ Cheese/Peanut butter crackers
   _____ Peanuts
   _____ String cheese
   _____ Sliced apples

2. How ready did you feel to take the tests? Circle the best answer.

   Not at all
   A little
   Really ready

3. Put the mid-test snacks in the order you liked best .... 1 in front of your favorite

   _____ Baby carrots
   _____ Bananas
   _____ Fresh grapes

4. How well did you feel you did on the FCA T? Circle the best answer

   Not at all
   A little
   Really well

5. I wish I had _______________________________ for a HEALTHY snack next time.
Build a trail mix while…..

*Walking Through the Pyramid*

1) Get a zip lock bag
2) Scoop servings of each of the 5 food groups into the bag
3) You will enjoy a balanced treat with
   - From grains
   - From fruits
   - From vegetables
   - From dairy
   - From protein
   - From fats

Thank you _________ Market for your continued support!

Build a trail mix while…..

*Walking Through the Pyramid*

1) Get a zip lock bag
2) Scoop servings of each of the 5 food groups into the bag
3) You will enjoy a balanced treat with
   - From grains
   - From fruits
   - From vegetables
   - From dairy
   - From protein
   - From fats

Thank you *Whole Foods Market* for your continued support!
Nutrition Program Breakfast Smoothie

About 1 cup low-fat vanilla yogurt
About ½ cup organic strawberry juice, or substitute white grape juice
About ¾ cup frozen strawberries
1 frozen banana (Hint: Peel before freezing)

Put all ingredients in blender. Blend until smooth.

No measuring cups necessary. The children pour the ingredients in the blender simply by estimating amounts.

Experiment substituting other frozen fruits for the strawberries.
Information for __________ Families

Happy Monday (maybe Tuesday?)!

This is an article that I thought you all might enjoy. It gives a good overview of the affects of sugar and other nutrients in the brain.

I will pass more things like this along as I get them if you would like.

Enjoy!

P.S. I had a blast cooking in Mrs. _____ class the other day. If you'd like me to do something in your room .. Just me know that too!!!! My schedule can be flexible.

Memory Training. Smart -drug and Brain Nutrient combinations.

*Eating sugar reduces brain fuel*

When high sugar soft drinks candy or other sweet foods are consumed we release insulin. The insulin signals all body cells to take sugar from the blood. Usually, the brain cells use 50% of all the sugar (glucose) in the blood and the other organs will burn fat. Since the brain is such a small percentage of body weight, with insulin present it must Complete with-the-other organs and muscles- which weigh 50 times as much as the brain for blood sugar (glucose). This results in too little fuel to the brain and is intensified if there is not enough chromium to bind insulin with the cellular membrane. The results are low energy,- and a craving-for even more sugar. Interestingly, a healthy non-diabetic person's circulating blood contains less than one teaspoon or-sugar. With a modern high sugar diet to pour twenty teaspoons of simple sugar into the bloodstream is easy at one- sitting! Hypoglycemia, diabetes, mental confusion, and behavioral problems are at epidemic proportions and are the outcome of unsuitable blood sugar levels.

Complex carbohydrates, vegetables, grains, legumes, and nuts are a timed-released form of sugar not requiring a large release insulin to the system, not forcing the brain to compete with other organs for sufficient energy or oxygen.

*Aging and the environment’s effect on the brain*

To burn sugar in the cell's mitochondria (power plant) neurons require adequate oxygen and other nutrients. The red blood cells deliver fresh oxygen with a chemical exchange of waste products. If the red blood cell loses its shape and elasticity, (most probably due to exposure to environmental chemicals or pollution or aging), the cell is unable to be squeezed through the small diameter of the capillary to the remotest parts of the brain. Also, as we age, the blood vessels supplying the brain tend to clog up (arteriosclerosis) reducing the brain's oxygen and nutrient supply, causing some forms of senility.

Oxygen is further reduced when it combines with fats, rather than with sugar, creating cellular
garbage called llipofuscin. Lipofuscin deposits damage and even kills neurons. Free radical fighting nutrients such as C, E, beta-carotene, zinc, manganese, selenium, cysteine, glutathione, and methionine reductase prevent the buildup of lipofuscin. A study done with rats showed vitamin E deprivation resulted in higher lipofuscin accumulation in all areas of the brain and a significant impairment in learning.

Sugar is burned to produce the crucial ATP energy, on which the brain depends for its very life. ATP (Adenosine Tri Phosphate) molecules release stored energy to generate neurotransmitters, to transport proteins to cells, to conduct electrical impulses, to extend and rebuild brain cells.

Most brain ATP energy is produced through two interlocking metabolic cycles: the -glycolitic cycle and Krebs cycle. The enzyme
Program Name: A grant funded by _______________

Happy October!!! One VERY EXCITING project that we have begun with some of the classes is that they will be planning the menus for our own lunchroom!!!!!!! Many thanks to __________, our lunchroom manager, for letting the children participate in the development of their own meals.

________ Terrific 3rd grade class is the first one featured. Look for their selections the week of October 14-16 during National School Lunch Week. They worked very hard to understand the Food Pyramid and how we can make our own balanced meals….even at school! The following week we will enjoy the brainstorming that came from __________ Fabulous 4th grade class. They picked a variety of themes to go with their menus.

I urge ALL FAMILIES at _____ to commit to buying lunch these two weeks. Our wonderful students put quite a bit of time and thought into their choices and we need to support them!

Mrs. ________ and other volunteers will continue to visit more classes this month in preparation for November lunches. I hope that this activity will continue to reinforce good eating habits here at school and at home as well.

Watch for more Program_____ information to come home and on our website. If you would like more information about what’s going on at _____ or about the grant in general, please feel free to contact me. We’re off to a great start!!!!!!!

Coordinator
PROGRAM GRANT INFORMATION

_____________ is off to a great start and we are_____________!!!!!! For our new families, School was awarded a 3-year grant _______ two years ago that we call-_________. Many cool things have happened these last two years and we'll work to do more this year!!!! Each month in the newsletter, there will be a tasty, healthy dish for you to try with your family and you'll always be updated with what's going on with the children here at school. For example, some of the 5th graders have already had a smoothie class, we have begun "Wellness Wednesday" activities, and a national TV production crew filmed all the good things happening here at School that will air nationally sometime this month!!! (As soon as we have the date, we'll let you know.) Quite a lot going on already.

A fun, FAMILY activity that we are participating in throughout the year is called "Fresh 2 U" from the Florida Department of Agriculture and Consumer Services. In September, your child brought home a Fresh 2 U "report card." We are encouraging all the children to learn more about the many fruits and vegetables grown in Florida. Please have fun with your child as you learn and try new things too. The first two fruits that we highlighted were carambolas (star fruit) and mangos. In October, we will all try greens (different lettuces) and avocados. As you try each item at home, mark the report card in the appropriate section and save it for the following month. At the end of the school year, we'll collect all the report cards (it's up to you to keep it handy at home) and have a Florida foods celebration. If you lose the report card during the year, there are more in the office.

Another aspect of being Program Name is being physically active. Watch for different things that the children and YOU can participate in to keep us all healthy.

We hope all our families eat what's good for them and get more exercise. This is the best way to have a healthy, thinking brain!!!!!!!

Coordinator
Wow! February is already here and that means that FCAT is right around the corner. To help ALL of us get ready, experts in Brain Gym will be here Monday, February 17 from 6:30-8:30. It is our hope that you come and learn more about some of the activities that your child will be doing to prepare for the tests. Brain Gym is a series of simple and enjoyable movements that we use with our students to enhance their experience of whole-brain learning. These activities make all types of learning easier, and are especially effective with academic skills. Not only does Brain Gym help with academics, but you will also learn more about exercises to reduce stress. We can all use some of that. Brain Gym was developed about 30 years ago by Dr. _______ and his wife, _______. Fourteen of the school faculty had the opportunity to hear these two experts in the field of brain studies speak at a conference that was attended last month. We learned so much, now it’s your turn to come and see for yourself what Brain Gym can do!

Healthy Breakfast Alternative

Many of the school students have participated in a smoothie class with Mrs. ______. Many varieties have been made, but this is the one that most choose for breakfast as a healthy alternative. It takes only a few minutes to make and drink, and is rich in vitamin C and protein.

1 cup low-fat yogurt
½ cup organic strawberry juice (or substitute white grape juice)
Approx. 1 cup frozen strawberries
1 frozen banana
Combine the yogurt and strawberry juice in a blender. Add the strawberries and banana. Blend until smooth.
Dear Families,

Welcome to School Elementary!!!!! There are many exciting things going on here that you will now be a part of!

Last year, the school received a multi-year grant from the ______________ named Program Name. We all had a great time learning about our brains and how to keep them healthy. One of the important things we learned is that it is important to **eat healthy**…very little sugar during the school day will help the brain stay in good thinking order.

The kindergarten classes, as you know, have a *share a snack* program. I encourage you to provide healthy snacks when possible to reinforce what children will be learning. Below, you will find some helpful suggestions that have been successful with children.

Happy “snacking”

Coordinator

<table>
<thead>
<tr>
<th>Snacks</th>
<th>Snacks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applesauce (in individually portioned containers)</td>
<td>Low fat yogurt</td>
</tr>
<tr>
<td>String cheese</td>
<td>Granola bars</td>
</tr>
<tr>
<td>Fat free pudding (individual packages)</td>
<td>Raisins</td>
</tr>
<tr>
<td>Trail mix</td>
<td>Pretzels</td>
</tr>
<tr>
<td>Fresh fruit (kabobs are fun)</td>
<td>Fresh veggies (with dip)</td>
</tr>
<tr>
<td>Jell-O</td>
<td>Water</td>
</tr>
</tbody>
</table>
Nutrition Program

Information for ___________ Families

School Cafeteria
Thursday, October 25, 2001

6:30  Taste Testing “New” Cafeteria Foods
      Time for questions and answers with
      _____________, Lunchroom Manager
      _____________, District Food Services Manager

7:00  Bran Gym Presentation

      Led by ___________ and ____________ both certified Brain gym Instructors

Brain Gym enhances, improves and promotes---

Reading and comprehension
Math, spelling and writing
The ability to focus and pay attention
Memory and recall
Positive attitudes
Confidence and self-esteem
Communication and organizational skills
Creativity and program solving ability
Fine and gross motor skills
Hand-eye coordination, catching and throwing
Eye teaming, tracking and depth perception
Teamwork and a sense of community
Body balance and posture
FCAT PREPARATION SHEET
FOR PARENTS AND CHILDREN

1. Take a Shower
2. Brush teeth
3. Get out of Bed

4. Eat a Health Break:
   - Eggs
   - Cornflakes
   - Oatmeal
   - Protein

5. Get Dressed
6. Head to school with a positive mind

7. Drink Water
There is so much going on at school these days and I hope that your child has shared some of their new knowledge about the brain and proper nutrition. With the FCAT testing here, I thought that you might like some ideas for ways that you can help your child off to a good start in the morning.

Current brain research shows that by starting the day with a breakfast higher in protein than sugar will boost the brain’s effectiveness. Foods such as eggs and meats for protein rather than a sugary cereal would be a better choice. Fresh fruit will provide the “right” kinds of sugar. Think FRESH instead of PROCESSED.

Research also shows that by simply drinking water, the brain’s ability to process information is increased. Making sure that your child has had plenty of water to drink in the morning before school will help them get off to a great start.

Plenty of rest and feeling good are also just as important. This is a great opportunity to give your child an extra pat on the back, a hug or anything else that sends the message that “I think you’re great!” When the brain is in a “happy state”, it naturally thinks better.

The children at ________ are all great! We, as parents, can help them by encouraging good eating, drinking water and feeling good when we send them off to school.

Our three year project supported by _______________.

Wow! What a year it’s been. The children have all learned new things about their brains and how to help them think better, now it’s time for the adults………..

It’s time to get moving ourselves and “Walk the Talk”. A group of parents have begun walking from 1:45-2:45 Monday’s, Tuesday’s, Thursday’s and Friday’s. We would love for you to join us!!!!! Meet at the picnic table area (outside of the cafeteria) and we’ll get you moving too! I’ll even give you your own water bottle!!!!! If you would like to participate, but this time doesn’t work for you, let me know and we’ll set up a group for you too! Strollers are also welcome.

Come on and GET MOVING!

Coordinator
Information for Elementary School Families

Dear School Families,

On the back of this letter, you will find very good information about Low-Fat Eating. Often, we all hear the reports talking about "good fat" and "bad fat," but which is which? Our bodies and brains need the right amount of "good fat" to function properly. This information will help clarify and gives helpful hints on substitutions in your diet to keep the "good" and get rid of the "bad."

Please take a minute to read this information. The health of the School Community has been a strong focus for the past two years thanks to a grant funded by __________________. National reports continually show high rates of childhood obesity and diabetes. It is our hope that School families have the knowledge to make healthy changes so that we do not become a "statistic" in these national reports.

Enjoy healthy eating!

Nutrition Program Coordinator
Dear Families,

**Happy Nutrition Month!!!!!!!** March is Nutrition Month and to celebrate, all classes will be participating in a variety of activities. Kindergarten and first grade start things off with the Walk through the Pyramid...the food Pyramid, that is. Each class is asked to provide pieces of the pyramid so that the students can build their trail mix. We ask that ALL supplies be in by this Wednesday.

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Item---Totals for the class</th>
<th>Food Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>12 boxes Chex cereal any variety</td>
<td>Grain</td>
</tr>
<tr>
<td>#2</td>
<td>10 containers dried veggies</td>
<td>Vegetable</td>
</tr>
<tr>
<td>#3</td>
<td>6 large bas M&amp;M Candies</td>
<td>Fats/Oils/Sweet</td>
</tr>
<tr>
<td>#4</td>
<td>6 large bags M&amp;M Candies</td>
<td>Fats/Oils/Sweet</td>
</tr>
<tr>
<td>#5</td>
<td>10 containers dried veggies</td>
<td>Vegetable</td>
</tr>
<tr>
<td>#6</td>
<td>10 lg. Bags yogurt covered raisins</td>
<td>Dairy and Fruit</td>
</tr>
<tr>
<td>#7</td>
<td>10 lg. Bags yogurt covered raisins</td>
<td>Dairy and Fruit</td>
</tr>
<tr>
<td>#8</td>
<td>10 lg. Bags sunflower seeds</td>
<td>Protein</td>
</tr>
<tr>
<td>#9</td>
<td>10 lg. Bags pumpkin seeds</td>
<td>Protein</td>
</tr>
</tbody>
</table>

Thank you in advance for your participation. The children all have a lot of fun with this activity.

Sincerely,

Program Coordinator
Music and the Brain

One of the "hot topics" in education the last couple of years has been related to music. You might have heard the term, "The Mozart Effect." While there is controversy as to how "smart" music can help us be, we do know from today's brain research that different kinds of music can help create different feelings or states in us as well as in the classroom.

A group of teachers attended the Brain Expo conference in January. One of the sessions dealt with the effects of music in the school. After hearing the studies, School students now begin their day with a selection of songs that have between 60-75 Beats Per Minute (BPM). Many classical pieces fit into this category. Music at this rate will activate the release of serotonin in the brain. This is the chemical that makes us "feel good." Monday through Thursday, these songs are played, but on Friday, we CELEBRATE! Celebration songs have a higher BPM rate and are for getting "pumped up." Some celebration songs that have been played so far are, "I Feel Good" by James Brown, "Celebrate" by Cool and the Gang, and "You're An All-star" (from Shrek) by Smash Mouth. Would you feel like celebrating? In the classroom, teachers can also play music to enhance brainstorming and problem-solving or chose selections to de-stress.

When listening to music with your family, be mindful of the state or feeling you would like to create, and play music that will enhance that feeling. For further information, feel free to contact me or your child's teacher.

Enjoy music!

Coordinator
Brain Facts at a Glance

**Eat Brain Food**
It is important to eat protein and fruit in the morning and carbohydrates in the afternoon. The best brain foods are fish, eggs, Brazil nuts, dark green vegetables, chicken, lecithin, and fruits.

**Water**
The most sensible drink is water. Having water available makes sipping easy and keeps the system hydrated and working at optimal efficiency. If this simple, but very healthful habit is new to you, it might take a little getting used to.

**Oxygen**
The brain makes up only one fiftieth of the body’s weight and yet it uses an amazing one fifth of the body’s oxygen. The first artery coming out of the heart carrying freshly oxygenated blood, the carotid, goes directly to the brain. The whole system takes care of the brain’s needs first.

**Movement/Exercise**
Movement is not only essential for nerve net development and thought, but also for adequate heart and lung development to support brain function.

Exercise increases nerve connections and brings nutrition to the brain.

Learn and use arm and leg crossover activities that can force both brain hemispheres to “talk” to each other better. “Pat your head and rub your belly” is an example of a crossover. (Brain Gym)

We know exercise fuels the brain with oxygen, but it also feeds it neurotropins (high-nutrient food) to enhance growth and greater connections between neurons. Aerobic conditioning also has been known to assist in memory.

**Stress**
Because studies suggest that exercise can reduce stress, there’s a fringe benefit too. Chronic stress releases the chemicals that kill neurons in the critical area of the brain for long-term memory formation, the hippocampus.
Researchers and nutritionists know that kids who eat breakfast perform better in school than those who don't, but parents know that getting kids to eat a healthy morning meal is not always easy. Well, you'll hear no excuses when this eye-opening blend of strawberries and bananas is served. It takes only a few minutes to make and drink, and it's rich in vitamin C and protein. Plus, kids find it irresistible.

1 cup low-fat vanilla yogurt

1/2 cup strawberry nectar

1/2 cup frozen unsweetened quartered strawberries

1 frozen banana, sliced

Combine the yogurt and strawberry nectar in a blender. Add the strawberries and banana. Blend until smooth.

MAKES ABOUT 2 1/2 CUPS; SERVES 2

PER SERVING: calories 210; calories from fat 18 (8%); total fat 2g; saturated fat 1 g; cholesterol 10 mg; carbohydrate 44 g; fiber 2 g; protein 6g; vitamin A 113 i.u.; beta-carotene 0.1 mg; vitamin B6 0.4 mg; vitamin B 120.6 mcg; vitamin C 42 mg; vitamin D 0 i.u.; vitamin E 0.5 mg; folate 22 mcg; calcium 187 mg; iron 0.5 mg; magnesium 23 mg; phosphorus 173 mg; potassium 595 mg; selenium 1 mcg; sodium 75 mg; phytochemicals: lycopene, polyphenols
Information for School Families

Dear Family,

Today we made spaghetti squash. We learned how to fix it THREE different ways! One way is with spaghetti sauce, another way is with butter and Parmesan cheese, and then we even tried it with butter and brown sugar!

I liked ____________________________ best.

Love,
The Importance of Sleep
Program Coordinator

Sleep is one of those funny things about being a human being—you just have to do it. Have you ever wondered why?

When we sleep, the heart slows down and the brain does some pretty funky things. If you attach an electroencephalograph (EEG) to a person’s head, you can record the person’s brainwave activity. An awake and relaxed person generates alpha waves, which are consistent oscillations at about 10 cycles per second. An alert person generates beta waves, which are about twice as fast.

During sleep, two slower patterns called theta waves and delta waves take over. Theta waves have oscillations in the range of 3.5 to 7 cycles per second, and delta waves have oscillations of less than 3.5 cycles per second. As a person falls asleep and sleep deepens, the brainwave patterns slow down. The slower the brainwave patterns, the deeper the sleep.

During a deep sleep a couple different things happen. A growth hormone in children is secreted during sleep, and chemicals important to the immune system are also secreted during sleep. You can become more prone to disease if you don’t get enough sleep, and a child’s growth can be stunted by sleep deprivation.

But the question remains—why do we need sleep? Here are some theories:
  Sleep gives the body a chance to repair muscles and other tissues, replace aging or dead cells, etc.
  Sleep gives the brain a chance to organize and archive memories. Dreams are thought to be part of this process.
  Sleep may be a way of recharging the brain.

What we know is that, with a good night’s sleep, everything looks and feels better in the morning. Both the brain and the body are refreshed and ready for a new day.

TIPS TO IMPROVE YOUR SLEEP

Exercise regularly. Exercise helps tire and relax your body.
Don’t consume caffeine after 4:00 p.m. or so. Remember sodas contain a lot of caffeine.
Try to stay in a pattern with a regular bedtime and wakeup time, even on weekends.
Dear Families,

Many of the students at *School* have requested additional water bottles to have on hand. We have some bottles in the office available for $1.00.

Happy drinking!

Nutrition Program Coordinator
BRAIN BREAK IDEAS

Remember, Brain Breaks last only a couple of minutes. They are meant to give your students time to "clear their cluttered desks" and be ready to learn even MORE!
Here are the examples you came up with on August 2, 2004. We'll be taking more about this all year. Have some fun with it .... it will make your day go faster too.

- Sing or play a song
- Finger plays
- Play a game (Simon Says .... )
- Stretch and exercise
- Ask questions
- Let the students talk among themselves
- Brain gym
- Bean bag toss at tables
- Change seating positions (chairs, tables, floor, etc)
- Go out on the playground
- Marching around the alphabet
- Walk around the room
- Read a quick book
- Play alphabet game (A is for __ , B is for __ , etc)
- Use sign language or signals for answers
- Be an animal using sound and movement
- Silent Speed Ball
- Line up tallest to shortest without talking
- Gotcha
- "Keep It Up"
- Follow the leader
- Short time for self.-free time
- Joke of the Day
- Tell a funny story

HAVE FUN! YOU AND YOUR CLASS WILL BE GLAD YOU DID!
Constructive Classroom Rewards: Promoting good habits while Protecting Children’s Health

Rewarding children in the classroom need not involve pizza parties, candy, and other foods that can undermine children’s diets and health and reinforce unhealthful eating habits. A wide variety of alternative rewards can be used to provide positive reinforcement for children’s behavior.

“It’s just a little treat”: the harm in using food to reward children

Schools should not only teach children how to make healthy choices and to eat to fulfill nutritional needs, but also should provide an environment that fosters healthy eating. Providing food based on performance or behavior connects food to mood. This practice can encourage children to eat treats even when they are not hungry and can instill lifetime habits of rewarding or comforting themselves with food behaviors associated with unhealthy eating or obesity. Awarding children food during class also reinforces eating outside of meal or snack times.

Since few studies have been conducted on the effect of using food rewards on children’s long-term eating habits, the best policy is to not reward children with food at all. At minimum, children should not be rewarded using low-nutrition foods.

The value of rewarding children (with non-food rewards)

As teachers know, classroom rewards can be an effective way to encourage positive behavior. Children, like everyone, alter their actions based on short-term anticipated consequences. When trying to foster a new behavior, it is important to reward a child consistently each time he or she does the desired behavior. Once the behavior has become an established habit, rewards can be given every now and then to encourage the child to maintain the preferred behavior.

The ultimate goal of rewarding children is to help them internalize positive behaviors so that they will not need a reward. Eventually, self-motivation will be sufficient to induce them to perform the desired behavior, and outside reinforcement will no longer be necessary.

State policies

Few states address the issue of using food as a reward. Only Alabama and the District of Columbia prohibit the use of food to reward children for good behavior or academic performance. Seven other states (Alaska, Arkansas, Minnesota, Nevada, Oregon, Wisconsin, and Wyoming) discourage this practice. Thus in most states, policies regarding classroom rewards are determined at the local level by individual school districts, schools, or teachers.
Physical activity and food should not be linked to punishment

Punishing children by taking away recess or physical education classes reduces their already-scarce opportunities for physical activity. Another counter-productive punishment is forcing children to do physical activity such as laps or pushups. Children often learn to dislike things that are used as punishments. Thus, penalizing children with physical activity might lead them to avoid activities that are important for maintaining wellness and a healthy body weight. In addition, food should not be withheld as a means of punishing children.

Examples of beneficial (and inexpensive) rewards for children¹

- **Social rewards**
  “Social rewards,” which involve attention, praise, or thanks, are often more highly valued by children than a toy or food. Simple gestures like pats on the shoulder, verbal praise (including in front of others), nods, or smiles can mean a lot. These types of social rewards affirm a child’s worth as a person.

- **Recognition**
  - Trophy, plaque, ribbon, or certificate in recognition of achievement or a sticker with an affirming message (e.g., “Great job”)
  - Recognizing a child’s achievement on the school-wide morning announcements and/or the school’s website
  - A photo recognition board in a prominent location in the school
  - A phone call, email, or letter sent home to parents or guardians commending a child’s accomplishment
  - A note from the teacher to the student commending his or her achievement

- **Privileges**
  - Going first
  - Choosing a class activity
  - Helping the teacher
  - Having an extra few minutes of recess with a friend
  - Sitting by friends or in a special seat next to or at the teacher’s desk
  - “No homework” pass
  - Teaching the class
  - Playing an educational computer or other game
  - Reading to a younger class
  - Making deliveries to the office

• Reading the school-wide morning announcements
• Helping in another classroom
• Eating lunch with a teacher or principal
• Listening with a headset to a book on tape or CD
• Going to the library to select a book to read
• Working at the school store
• Taking a walk with the principal or teacher
• Designing a class or hall bulletin board
• Writing or drawing on the blackboard/whiteboard
• Taking care of the class animal for a day

❖ Rewards for a class
• Extra recess
• Eating lunch outdoors
• Going to the lunchroom first
• Reading outdoors
• Holding class outdoors
• Extra art, music, PE, or reading time
• Listening to music while working
• Dancing to music
• Playing a game or doing a puzzle together
• “Free choice” time at the end of the day
• A song, dance, or performance by the teacher or students
• A book read aloud to the class by the teacher
• A field trip

❖ School supplies
• Pencils: colored or with logos or other decorations
• Pens
• Erasers
• Notepads/notebooks
• Boxes of crayons
• Stencils
• Stamps
• Plastic scissors
• Bookmarks
• Highlighters
• Chalk (e.g., sidewalk chalk)
• Markers
• Coloring books
• Rulers
• Glitter
• Pencil sharpeners, grips, or boxes
• Gift certificate to the school store
- **Sports equipment and athletic gear**
  - Paddleballs
  - Frisbees
  - Water bottles
  - NERF balls
  - Hula hoop
  - Head and wrist sweat bands
  - Jump rope

- **Toys/trinkets**
  - Stickers
  - Yo-yos
  - Rubber balls
  - Finger puppets
  - Stuffed animals
  - Plastic or rubber figurines
  - Toy cars, trucks, helicopters, or airplanes
  - Plastic sliding puzzles or other puzzle games
  - Slinkies
  - Gliders
  - Magnifying glasses
  - Spinning tops
  - Marbles
  - Jacks
  - Playing cards
  - Stretchy animals
  - Silly putty
  - Bubble fluid with wand
  - Balloons
  - Capsules that become sponges/figures when placed in water
  - Inflatable toys (balls, animals)
  - Small dolls or action figures

- **Fashion wear**
  - Temporary tattoos
  - Hair accessories (barrettes, elastics, or ribbons)
  - Bracelets, rings, necklaces
  - Sunglasses
  - Eyeglasses with nose disguise
  - Hat or cap
  - T-shirt
  - Sneaker bumper stickers
  - Shoe laces
- **Miscellaneous**
  - Key chains
  - Flashlights
  - Cups
  - Magnets
  - Crazy straws
  - Backscratchers
  - A plant, or seeds and pot for growing a plant
  - Books

- **A token or point system**, whereby children earn points that accumulate toward a bigger prize. Possible prizes include those listed above and:
  - Gift certificate to a bookstore or sporting goods store
  - Movie pass or rental gift certificate
  - Ticket to sporting event
  - Puzzle
  - Book
  - Stuffed animal
  - Magazine subscription
  - Board game
  - Step counter (pedometer)
  - Sports equipment, such as tennis racket, baseball glove, soccer ball, or basketball

Children can be given fake money, tokens, stars, or a chart can be used to keep track of the points they have earned. Points can be exchanged for privileges or prizes when enough are accumulated.

A point system also may be used for an entire class to earn a reward. Whenever individual children have done well, points can be added to the entire class’s “account.” When the class has earned a target number of points, then they receive a group reward.

For more information, visit [www.cspinet.org/schoolfood/](http://www.cspinet.org/schoolfood/) or contact CSPI at <nutritionpolicy@cspinet.org>. 

Observations from School Counselors

The program has contributed at School Elementary in the following ways:

1. Children, staff and families have a strong sense of community because of the various projects we are involved in.

2. The children have a sense of empowerment in stressful situations. When facing standardize testing and day to day situations, we often hear the children say, "I'm ready! I know I can do it!"

3. Children's self-esteem has been raised. They feel like now that they know how to take better care of themselves, they can also take better care of others. They now are more confident when presented with a conflict.

4. The children, staff and families have taken an interest in what they've learned and share the information willingly with others.
Dear School Staff,

I thought you might find the following article from Runners World mag interesting……

After you have read the information, consider this…… LET’S GET RUNNING / WALKING!!!!!!!!!!!!

Some teachers have expressed interest in running a half marathon next year. The idea is that we train together and get sponsors or pledges for our efforts. The money generated would be put towards the continuation of the health and fitness activities that School has benefited from these last 3 years. (Remember, our grant ends this year…boo, hoo!)

I can hear you now….. “WHAT? ME RUN A HALF MARATHON????” Trust me, if I can do it, ANYONE CAN DO IT!!!!!!!!!!!!!!!!!!!! I have a doable training schedule and can fill you in if you’d like further info. The other thing is, you don’t have to run…walking is allowed.

It would serve as a wonderful model for our children to see as many of us as possible taking on this challenge. Maybe we could even challenge other schools!!!!!!!!!!!

Let me know if you are interested, ASAP. I will expect MANY responses.
Let’s get going!

Coordinator
Welcome Back!!!!!!!!!!!!

Along with our nutrition and physical activity focus, this year we will be introducing “Brain Breaks” to the students and parents. What is a Brain Break?????? Quite simply, it’s a break in the activity that is in progress in your classroom. For example, you have introduced a lesson, shown examples, your students have worked on it for a couple of minutes….now it’s time for a BREAK! The brain needs down time to process or digest what it has just learned. Your students can only hold their attention to you for 5, maybe 7 minutes at a time (brain fact), therefore, it’s up to you to stop what you are in the middle of and let their brains catch up. Also, by creating a break, students that begin to feel stressed if they’re not “getting it” right off the bat, will have time to catch their breath and refocus. Their brains will be able to shift back into gear much quicker if they are not stressed.

A Brain Break in your classroom lasts only a couple of minutes. We have many resources available with ideas in my office. Just ask, and I’ll let you have whatever you need. In the meantime, here are some quick examples that you could do for a Brain Break:

- Any Brain Gym activity
- Walk around the room
- Have the students change seats for the rest of the lesson
- Turn on the music and just let the student listen
- Allow the students to talk amongst themselves about what they’ve just learned
- Play a game totally unrelated to the subject

I hope you have fun with this. While it seems that you’ll be losing teaching time, what you’ll gain in student performance over the long run will astound you. Have a wonderful year.

Coordinator
APPENDIX E: EVALUATION TOOLS
NUTRITION SKILLS BEHAVIOR ASSESSMENT TOOL

Teachers,

We appreciate your time and efforts given to the *Cooking Light* Healthy Kids Challenge Program. As a classroom teacher, you are a vital part of this project. You and your class have been selected to help us measure the success of this program by having your students complete a pre-test now-and then again next spring. Following are guidelines and directions for classroom implementation of the nutrition assessment tool. If you have questions, please direct those to your project site coordinator, who can directly contact me for more information.

Guidelines for classroom implementation of the nutrition assessment tool:

1. If at all possible, the pre-test assessment is to be given prior to the use of any Food Guide Pyramid classroom curriculum.
2. The assessment is to be given to the entire class at one time. One-on-one or small group testing is not necessary.
3. The students will not be given direction sheets. Please orally review the directions with them at the time of the assessment implementation.
4. We are recommending third, fourth, and fifth graders for best results with this assessment. They will have two tasks to complete. You are welcome to use the tool with first and second graders as a classroom teaching tool, but they will probably only be able to complete the first of the two tasks. We estimate about 30 to 45 minutes will be needed for completion of the assessment. In addition to the assessment itself, the students will need a pencil.
5. Please make sure the student's complete name is on each page of the assessment. The names of the students will be kept confidential, and will be changed to an ID numbering system for data entry.
6. In addition, a cover sheet is included for you to complete with the assessments. It requires entering such information as the total number of students tested, date, teacher's name, grade, number of students absent, deviations from the directions for implementation, etc. It is important that the information on this sheet be completed accurately to ease data entry and coding for each school site.
7. The cover sheet and all completed assessments should be returned to the HKC project site coordinator.
8. Please try to be as consistent with the testing as possible. This is very important because of the evaluation component of this project. During the pre-testing, you may get many questions about the Food Guide Pyramid since this will be prior to the implementation of any nutrition curriculum. Please refrain from any "mini lessons" at the time of testing that would help the students understand the pyramid. We fully expect that the students will not be very familiar with the concept during pre-testing, but believe that the programs, events, and opportunities to practice healthy eating.
9. Now repeat the same directions, substituting the word "lunch" for the word "breakfast," and give different examples of food choices that may possibly be eaten together, such as taco/burrito meat and a tortilla shell.
10. Now repeat the same directions, substituting the word "dinner" for the word "breakfast," and give different examples of food choices that may possibly be eaten together, such as hamburger and bun.

11. Now repeat the same directions, substituting the word "snacks" for the word "breakfast." In addition to the above directions, tell the students this is to include all the snacks they would choose for one day to go along with their meal choices.

TASK #2: FOR 3rd, 4th, AND 5th GRADERS ONLY

A. Now look at the page with the empty Food Guide Pyramid. You are to try and put all of the food choices you circled for meals and snacks in the right food groups in the pyramid.

B. To do this, look at each food/beverage choice you circled. Find the number (found in the lower right-hand corner of the box) for each food or drink that you circled.

C. Write the number of each food you circled on a blank line in the food group where you think that food belongs in the pyramid.

*(Teachers, please give an example here of a possible food choice circled, its number, and where to write that number within the pyramid. So this does not influence the students, please create an example that's not on the assessment, such as asking students to pretend watermelon was choice number 97; “97” would be written on a blank line in the fruit group within the pyramid.)*

D. If you chose the "no breakfast," "no lunch," "no dinner," or "no snack" boxes, you do not need to write these numbers anywhere.

E. Just do the best you can with this task. Enjoy searching the Food Guide Pyramid!
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<thead>
<tr>
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<tbody>
<tr>
<td>No Lunch</td>
<td>25</td>
<td>Turkey</td>
<td>26</td>
<td>Bread</td>
<td>27</td>
</tr>
<tr>
<td>Meat for Taco/Burrito</td>
<td>31</td>
<td>Tortillas</td>
<td>32</td>
<td>Refried Beans</td>
<td>33</td>
</tr>
<tr>
<td>Veggie Dip/Salad Dressing</td>
<td>37</td>
<td>Lettuce Salad</td>
<td>38</td>
<td>Grapes</td>
<td>39</td>
</tr>
<tr>
<td>Macaroni &amp; Cheese</td>
<td>43</td>
<td>French Fries</td>
<td>44</td>
<td>Cottage Cheese</td>
<td>45</td>
</tr>
<tr>
<td>Snack Cakes</td>
<td>46</td>
<td>Chocolate/White Milk</td>
<td>47</td>
<td>Fruit Juice</td>
<td>48</td>
</tr>
<tr>
<td>Lunch Meat</td>
<td>29</td>
<td>Miracle Whip/Margarine</td>
<td>30</td>
<td>Rice</td>
<td>34</td>
</tr>
<tr>
<td>Chicken Nuggets</td>
<td>35</td>
<td>Raw Carrots</td>
<td>36</td>
<td>Cooked Vegetables</td>
<td>41</td>
</tr>
<tr>
<td>Cornbread</td>
<td>42</td>
<td></td>
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</table>
Hi Nancy! Yes, Claudia has found the pages you need on her computer and will send to you tomorrow. And, our program since 2002 or so is Healthy Kids Challenge, no longer Cooking Light Healthy Kids Challenge so the pages she sends you reflect that logo change. Do you need the tools as such too?

As for the second item you need -

"When working with schools to guide environmental change, this survey tool was included as a HKC recommended tool to measure knowledge, attitude, and behavior change. We also encouraged the use of this tool as a goal setting teaching tool, not just for evaluation. The HKC concepts and best practices have always been based on current recommended theory and guidelines set by national health organizations, such as CDC and USDA. This tool has been utilized by numerous programs and schools in a variety of situations since its creation and now with the new MyPyramid will be once again revised to meet current guidelines and will continue to be offered by our organization looking for such tools.

Vickie L. James, R.D., L.D., Healthy Kids Challenge Director

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vickie@healthykidschallenge.com
www.healthykidschallenge.com
October 28, 2002

Dear Ms. _____,

You might be interested in the following account, as it relates to the Nutrition Program initiative you are coordinating at ___________ Elementary School.

Our family hosted a backyard "Fall Celebration" this past weekend, with my daughter, _____, her friends and their siblings in attendance. Our thirteen guests were kindergarten and third grade students at ___________. One of the games they enjoyed most was the classic, "bobbing for apples." As the last participant successfully retrieved her apple and the excitement of the challenge waned, I commented to the other mothers how Quiet the crowd had become. We smiled with satisfaction as each girl was perched on a pumpkin, happily munching an apple. One girl exclaimed, "Mrs. ______, these apples are so good! Where did you get them?" Another girl echoed this and added, "I don't usually eat the skin, but this apple is delicious!"

I expressed to Katie's aunt the thought that most children would have tossed their apple in the trash after the game had finished, but she said, "Well, these are __________ students. They are used to eating healthy foods."

Not only did they enjoy the fruit, but their beverage of choice on that hot October afternoon was water. Apple juice was also available. More often than not, the children said, "I want water first and then some juice later, please." No one asked for a soft drink.

Our children made healthy decisions when offered healthy choices, which is the “healthy nutrition” message to parents, students, and the community. It worked for us!

Sincerely,

Parent
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