ABSTRACT

Introduction:
Among children aged 6-11 years old, obesity rates have increased from 6.6% to 19.6% between 1976-1980 and 2007-2008. Although childhood obesity has become a priority on a national, state, and local level, there is no simple solution to solving this issue. Decreasing the incidence of obesity among children requires targeting their diet and activity levels, and given that children spend most of their waking hours in the school system, school-based interventions serve as a potential outlet for prevention. SMART Food for Thought is a partnership with Healthy Carolinians of Orange County within the Orange County Health Department and the Chapel Hill-Carrboro City School District in North Carolina to create a SMART Board based nutrition curriculum to improve the nutrition and physical activity knowledge of children in the school district.

Literature Review:
A literature review was conducted in order to identify and evaluate existing curriculum-based programs that promote healthy eating and physical activity similar to SMART Food for Thought. The MEDLINE, ISI Web of Science, and the Education Resources information Center were searched for original research articles. The review demonstrated that most programs were successful interventions over the short term for improving nutrition knowledge; however, the long-term efficacy is questionable.

Program Plan:
The program plan provides a detailed description of the SMART Food for Thought program. SMART Food for Thought is grounded in behavior change theory, and it focuses on the Health Belief Model, the Social Cognitive Theory, and the Diffusion of Innovations Theory. The main activities in the creation of the program include the development of SMART Board lessons for grades kindergarten through fifth grade, stakeholder presentations, a trial launch of the program during National Nutrition Month, the creation of a teacher training presentation, and full implementation of the curriculum this upcoming school year.

Evaluation Plan:
In order to ensure the sustainability and dissemination of SMART Food for Thought, an evaluation plan for the program is described. The program would likely benefit from an internal evaluator. Qualitative methods, such as, interviews and focus groups, and quantitative methods, such as surveys, will be used to obtain data. The implementation evaluation will be conducted with an observational study design while the outcomes evaluation will use a quasi-experimental design with a one group, pre-test/post-test method to assess changes in nutrition knowledge. The findings will be disseminated through a final report, conference presentations, and publications in relevant journals.

Discussion:
The future of SMART Food for Thought is promising based on its accessibility, convenience, and alignment with the state standard course of study. The developers of SMART Food for Thought may look at integrating a family component as parents largely influence a child’s health behavior choices. By forming partnerships with other school districts and working
to find SMART Board resources for lower-income areas, the dissemination of the program across the state is possible. Overall, curriculum is only one piece of the puzzle, and to achieve a lasting effect, schools will likely need to adopt a holistic approach and change the school infrastructure to one that supports healthy eating.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>Systematic Review</td>
<td>4</td>
</tr>
<tr>
<td><strong>Program Plan</strong></td>
<td></td>
</tr>
<tr>
<td>Program Overview</td>
<td>20</td>
</tr>
<tr>
<td>Program Context</td>
<td>22</td>
</tr>
<tr>
<td>Program Goals and Objectives</td>
<td>27</td>
</tr>
<tr>
<td>Theoretical Framework</td>
<td>28</td>
</tr>
<tr>
<td>Program Implementation</td>
<td>31</td>
</tr>
<tr>
<td>Program Sustainability</td>
<td>36</td>
</tr>
<tr>
<td><strong>Evaluation Plan</strong></td>
<td>38</td>
</tr>
<tr>
<td>Rationale for the Evaluation</td>
<td>38</td>
</tr>
<tr>
<td>Approach to the Evaluation</td>
<td>39</td>
</tr>
<tr>
<td>Evaluation Study Design</td>
<td>41</td>
</tr>
<tr>
<td>Evaluation Methods</td>
<td>43</td>
</tr>
<tr>
<td>Evaluation Planning Tables</td>
<td>45</td>
</tr>
<tr>
<td>Dissemination Plans</td>
<td>49</td>
</tr>
<tr>
<td><strong>Discussion</strong></td>
<td>51</td>
</tr>
<tr>
<td>Acknowledgements</td>
<td>53</td>
</tr>
<tr>
<td>References</td>
<td>54</td>
</tr>
<tr>
<td><strong>Appendix</strong></td>
<td></td>
</tr>
<tr>
<td>Table 1: Summary of Similar Programs</td>
<td>56</td>
</tr>
<tr>
<td>Figure 1: Implementation Timeline</td>
<td>57</td>
</tr>
<tr>
<td>Figure 2: Logic Model</td>
<td>58</td>
</tr>
<tr>
<td>Figure 3: SMART Food for Thought Curriculum</td>
<td>59</td>
</tr>
</tbody>
</table>
INTRODUCTION

Among children aged 6-11 years old, obesity rates in the United States have increased from 6.5% to 19.6% between 1976-1980 and 2007-2008.\(^1\) Our society has become characterized by an environment that promotes the consumption of less healthy food and sedentary behavior, and thus, it can be difficult for children to make healthy choices and to get enough physical activity.\(^1\) This increased prevalence of childhood obesity is accompanied with an increase in hypertension, dyslipidemia, hyperinsulinemia, Type 2 diabetes, osteoarthritis, and asthma.\(^2\) Moreover, overweight youth are often depressed, rejected by their peers, and have lower self-esteem.\(^2\)

It is obvious that there is no simple solution to the childhood obesity epidemic; however, the importance of prioritizing this health problem is apparent based on the national, state, and local initiatives that public health officials and policy makers have created over the years. On a national level, initiatives such as the Let’s Move campaign created by the First Lady, Michelle Obama, have attempted to help solve the childhood obesity crisis.\(^3\) Additionally, North Carolina has attempted to tackle this issue with their Eat Smart and Move More movement that focuses on promoting increased opportunities for healthy eating and physical activity.\(^4\) Lastly, on a local level, school based initiatives such as improving the Chapel Hill- Carrboro City Schools Nutrition Policy, attempt to promote an environment supportive of healthy nutrition.\(^5\)

Ultimately, decreasing the incidence of obesity among children requires targeting their diet and activity levels.\(^6\) Thirty-five to forty percent of a children’s daily caloric intake occurs during the school day, and ninety-five percent of all school-age children in the United States attend school; thus, the school setting serves as a perfect opportunity to address childhood obesity.\(^6\) School-based interventions have been identified as “one of the most efficient means the
nation might employ to reduce four main chronic disease risks: tobacco use, unhealthy eating patterns, inadequate physical activity, and obesity. Moreover, a systematic review of school-based interventions by Brown and Summerbell demonstrated that school-based interventions may help prevent children from becoming overweight in the long term.

Seeing the potential for school-based nutrition interventions, SMART Food for Thought was created with the intent of improving the nutrition and physical activity knowledge of elementary school children so that they can make better food choices in the future. This project is a partnership with Healthy Carolinians of Orange County within the Orange County Health Department and the Chapel Hill-Carrboro School District in North Carolina, and it focuses on the creation of a SMART Board based nutrition curriculum. The main activities for the development of SMART Food for Thought include the creation of SMART Board lessons for grades kindergarten through fifth grade, which were adapted from the state developed Food for Thought nutrition curriculum, as well as stakeholder presentations and a trial version of the lessons during National Nutrition month, which were used to garner support for the program.

Although many nutrition curricula have been created to educate youth on healthy eating and physical activity, there are no peer-reviewed articles describing the usage of SMART Board Technology to create a curriculum for elementary school students. Thus, SMART Food for Thought served as a perfect opportunity to address this gap. Given that children are more technologically advanced than ever, utilizing this innovative approach will hopefully spur students’ excitement for the material. Moreover, by providing teachers with ready-made, easily accessible lessons, they will likely be motivated to teach nutrition in the classroom, which will ultimately lead to increased numbers of children receiving nutrition education.
The purpose of this paper is to provide a comprehensive overview of *SMART Food for Thought*. The first section of the paper consists of a review of the literature for other curriculum-based programs. By identifying and evaluating similar programs, more can be learned about existing programs in order to improve the success of *SMART Food for Thought*.

The second section of the paper comprises the program plan. The purpose of this section is to provide a detailed description of the program. It includes information regarding the program context, relevant program theories, goals and objectives, an implementation plan, a sustainability plan, and a logic model.

Following the program plan, the next section of the paper contains a plan for evaluation. This aim of this section is to provide a framework for the implementation and outcome evaluation of the program. Specifically, this section details the evaluation study design, methods, and questions, as well as plans for dissemination.

The paper concludes with a discussion of the implications and future direction of *SMART Food for Thought*. Ultimately, it is hoped that this paper will shed light on a potential solution for tackling the childhood obesity epidemic.
SYSTEMATIC REVIEW

Introduction

Schools serve an important role in reaching the country’s youth for health prevention. In 2004, the Institute of Medicine recommended, “schools should provide a consistent environment that is conducive to healthful eating behavior and regular physical activity.” They also advised that “coordinated changes in the classroom curriculum, the in-school advertising environment, school health services, and after-school programs all offer the potential to advance obesity prevention efforts.” Several school-based intervention studies have demonstrated that changes in the school environment can affect students’ dietary choices as well as improve the quality of their diets while at school.

*SMART Food for Thought* addresses this potential outlet for behavior change through a curriculum-based approach to educating elementary school students on the importance of healthy eating and physical activity. A central element of this program is the utilization of a SMART Board, which is an interactive whiteboard, in order to disseminate the lessons to students. By creating multidisciplinary, ready-made lessons that teachers can easily access, we hope to encourage nutrition education in the school setting.

Given the ability of schools to significantly influence child health, it is essential to determine the effectiveness of these school-based interventions. The purpose of this literature review is to identify and evaluate existing curriculum-based programs that promote healthy eating and physical activity in order to improve the success of *SMART Food For Thought*. Specifically, the review was carried out with the following research question: *What can be learned from existing programs that utilize nutrition education in the classroom to encourage healthy eating and physical activity?*
Methods

Search Strategy

In order to identify potential programs, I searched the electronic databases Pubmed (MEDLINE), ISI Web of Science, and the Education Resources Information Center (ERIC) from February 4, 2011 to February 15, 2011. I used the search terms ("Intervention" OR "Prevention" OR "Health Program" OR "Health Promotion") AND ("Obesity" OR "Overweight") AND "Elementary School AND ("Curriculum" OR "Education"). I identified 160 articles in Pubmed, 88 articles in ISI Web of Science, and 70 articles in ERIC. I then reviewed the titles and abstracts of these articles in order to determine whether each article met inclusion criteria. An additional search included the search terms Technology OR Smart Board in order to target the most similar programs to SMART Food for Thought; however, given the lack of applicable articles, I included none of the articles from this search in this review.

Inclusion Criteria

Criteria for inclusion included:

1. The article is in English and the program took place in the United States.
2. The program takes place in an elementary school.
3. The program’s primary component is the use of a curriculum to educate students on healthy eating and physical activity (excluded if they used other strategies in addition to a curriculum)
4. The lessons take place during regular school hours (excluded after-school programs)

Given the large numbers of articles focused on preventing childhood obesity in the school setting, these criteria allowed for the selection of the programs most applicable to SMART Food for Thought.
Results

Color My Pyramid

Moore, Pawloski, Goldberg, et al describe *Color My Pyramid*, which is a nutrition education program based on the revised USDA Food Guide Pyramid for fourth and fifth graders. The intervention consisted of six classes taught over a period of 3 months, and it included content based on “general nutrition concepts, moderation and variety, portion sizes, exercise and activity, introduction to MyPyramid.gov for kids, and experiential learning with the Blast Off Game.

The Blast Off game is an entertaining way for students to increase their knowledge about making healthy food choices and physical activity. Students are asked to choose food and activities that will help them meet their daily food group and calorie requirements while avoiding high fat and sugary foods. Once the selections are complete, students can attempt to “blast off” to see whether they have an appropriate balance of food and activities to reach Planet Power. Similar to *Smart Food for Thought*, it focuses on an interactive approach to education.

The authors evaluated the effect of the *Color My Pyramid* nutrition education program on children’s nutrition knowledge, nutrition self-care practices, physical activity, and nutrition status (blood pressure and percentiles for height, weight, and BMI). They compared one hundred and twenty-six students from two schools. Although both schools received the same education and activity content, the experiential learning implemented differed. School 1 students received a more didactic presentation on playing the Blast-Off Game while the students in School 2 used individual computers to evaluate their diets in small groups.

Based on combined pre-test and post-test results from both schools, the authors found significant improvements in self-care practices (*p*<0.05), physical activity (*p*<0.001), and
systolic blood pressure ($p<0.001$). Additionally, they discovered a significant difference in nutrition knowledge between School 1 and School 2 from pre- to posttest with School 1 making the greatest gains ($p=0.029$).

Despite the improvements that the program achieved, there are some limitations to this study. One issue is the generalizability of the study given that the participants were primarily African-American with low socioeconomic status. Given this demographic, these students may experience barriers to obtaining fresh fruit and vegetables as well as access to safe areas for physical activity. Moreover, the fact that the program only consisted of six lessons may have affected the efficacy of this curriculum. Additionally, physical activity was a self-reported outcome, thus, there could be issues of overreporting that occurred during the post-test given increased awareness of physical activity. Lastly, the study does not report how the authors monitored implementation of the curriculum by teachers, thus, if teachers did not use the curriculum properly or used it differently between the two schools, it may have resulted in a lower or possibly higher strength of effect.

One of the strengths of this curriculum is its focus on the self-care deficit nursing theory, which is focused on students taking responsibility for their own food choices and physical activity through the Blast Off Game rather than relying on parental decision making. However, although it is essential to improve children’s self-efficacy, a parent component may prove beneficial for future reproduction of this curriculum, as a child’s social environment plays a large role in their decision to eat healthy. Additionally, the short training course for teachers not only increased teacher “buy-in” to the project but also allowed for an increased familiarity with the nutrition content and interventions. Lastly, given that children are more technologically
advanced than in the past, approaching nutrition education through an interactive game seems to be an approach that targets the current interests of children.

**Improving Meals and Physical Activity in Children and Teens**

*The Improving Meals and Physical Activity in Children and Teens (IMPACT)* is a school-based curriculum that uses a “train-the-trainer” model to improve healthy eating. IMPACT consisted of medical students training high school students as health educators, and then both groups implementing the IMPACT diet and activity curriculum in a rural elementary school. The program was based around a 12 week school-based curriculum that consisted of approximately twenty minutes of physical activity and forty minutes of a nutrition lesson developed to fit within the North Carolina academic competency goals in math, science, reading, social studies, language arts, and/or healthful living for the 4th grade. Similar to *Smart Food for Thought*, this curriculum was based around the concept of cross-content lessons to educate students.

In addition to the in-class lessons, students had weekly homework assignments that required parent or guardian participation for each lesson. The curriculum content included information on MyPyramid for kids, reading nutrition labels, food and activity from around the world, identifying food advertising strategies, and the benefits of a healthy, active lifestyle. The study authors were present at each of the lessons and participated in the lesson instruction. Additionally, control classrooms received the usual health education materials, but none of the IMPACT materials.

The authors’ evaluated the outcome of IMPACT by changes assessed in self-reported nutrition and physical activity knowledge, attitudes, and behaviors. This was assessed pre- and post-intervention through the use of a validated age-appropriate Texas School Physical Activity
Thirty-eight fourth grade students from the intervention classrooms and thirty-seven fourth grade students from the control classrooms participated.

Students who participated in the IMPACT curriculum reported a statistically significant increased intake of fruits and vegetables (p<0.05) as well as an increased intake of calcium-containing foods and grains, which was not statistically significant. Although intervention students increased their consumption of these foods, they experienced no changes regarding their dietary attitudes and beliefs. Additionally, although one-third of the curriculum was devoted to physical activity, the authors did not detect significant differences in physical activity.

Despite some of the positive results obtained, there are some limitations for this study. The small sample size may have limited the ability to detect differences in some outcomes. Although the study was powered enough to detect a difference of one serving per day in the outcome of daily fruit/vegetable and calcium servings, the sample size may have been insufficient to detect smaller differences that may prove beneficial. Additionally, at baseline, the intervention students had a higher BMI, which served as a source of selection bias. Thus, this limits the comparability of the intervention and control groups, and may have contributed to the inability to detect a difference in some of the outcome measures. Moreover, issues with continuity of the instructors may have limited the efficacy of the curriculum in its use of peer educators. Lastly, the generalizability of IMPACT is limited in light of the small sample size.

A strength of this curriculum is its focus on peer-led interventions. IMPACT, like SMART Food for Thought, is based on the Social Cognitive Theory, which recognizes the influence of the school and home environment on dietary behavior. Since the curriculum incorporates homework assignments as well as peer modeling, it considers these different aspects that contribute to behavior change. Additionally, the use of cross-content lessons contributes to
the utility of the lessons as teachers have more incentives to incorporate the curriculum into their standard course of study, which is an essential element of SMART Food for Thought.

**It’s All About Kids**

The Tulsa Health Department, Tulsa Public Schools, and community partners designed *It’s All About Kids* in order to improve food choices and increase physical activity of students in first through fifth grade. The curriculum component consisted of six weekly 30-minute classroom lessons. Topics included food labels, lower-fat food choices, portion sizes, and decision-making related to food choice. Additionally, each lesson was based on a hands-on activity in order for students to achieve the objectives of the lesson.

The evaluation of the curriculum consisted of one hundred and forty fourth grade students from five intervention schools (71 students) and five comparison schools (69 students). The authors measured knowledge, attitudes, and behaviors related to nutrition using the Knowledge, Attitudes, and Behaviors questionnaire during a pre-, post-, and three-week follow-up test.

Intervention students demonstrated a significantly improved food choice intention score (p=0.012) at post-test as compared to control students. Mean scores on the *Which Food Has More Fat* scale increased significantly (p=0.043) from pretest to posttest in the intervention group, however, this was not maintained at the three week follow-up test. There was no significant difference between groups in the Food Self-Efficacy or Nutrition Knowledge scores at posttest or follow-up test.

One of the limitations of this curriculum is the short time frame of the lessons. The curriculum consisted of only six lessons that lasted thirty minutes, raising the question of whether the authors would have achieved stronger results if the lessons were longer.
Additionally, the authors do not discuss the use of a teacher training to acclimate teachers to the content of the lessons in order to improve their comfort with utilizing the curriculum or a method of monitoring their use. Lastly, the participants in the intervention were students from Title 1 schools, which qualify for assistance due to poor student performance, poor parental involvement, limited access to health care services, and 80% free and reduced cost lunch meals. Thus, these barriers to healthy foods and physical activity may have weakened the effect of the program in this population; however, any effect seen with a more challenging group demonstrates the potential of the program on a larger scale with a more diverse population.

A strength of *It’s All About Kids* is its incorporation of healthful-eating food games, taste-tasting, whole-grain bread baking, and food demonstrations. By providing students with a hands-on approach to learning, it encourages a fun learning environment that is important for elementary school students. Additionally, the authors analyzed the harms associated with the curriculum such as, increased worry about overweight or increased attempts to lose weight in unhealthful ways. Especially among young children, it is essential that nutrition education programs do not promote unhealthy eating habits or contribute to distorted body images.

**Wellness, Academics & You**

*The Wellness, Academics & You (WAY)* program “engages students in multidisciplinary activities in language arts, mathematics, science, and health content, building their academic skills while developing their health attitudes and behavioral intent.” Through this curriculum, students confront their own attitudes and beliefs, consider beliefs of others, and examine their behaviors in relation to their attitudes and beliefs.” The program activities are organized into discrete modules: Module 1 orients students to the program and the concept of wellness; Module 2 teaches students to collect, report, and analyze data about themselves and their health; Module
3 focuses on physical activity and fitness; Module 4 addresses nutrition and the way one eats; Module 5 teaches students more about their bodies; Module 6 provides an orientation to genetics and family health history as a resource to examine personal health; and Module 7 encourages students to bring home the information and skills they learn in class. In addition to the modules, intervention classes followed a ten-minute aerobic exercise routine each day during class. Moreover, the WAY program included activities that required students to interview family members to learn about their family health history as well as discuss meal and activity planning with their parents or guardians. The program also used a website (www.wayplanet.com) that provided resources for teachers, students, and parents as well as interactive DVD and DVD player, box of laboratory equipment, and student personal journals. Lastly, before the implementation of the program, a workshop was conducted for all intervention teachers in order to educate them on the proper way to integrate the curriculum into their courses.

Overall, the sample consisted of 1013 students in fourth and fifth grades from sixty-nine classes in four states (Delaware, Florida, Kansas, and North Carolina). The intervention group contained 479 students, while the control group contained 534 students. The author’s outcome measures for the evaluation of the program included BMI shifts, increased fruits and vegetable consumption, and increased physical activity levels.

The authors’ noted a significant shift (p=0.01) in BMI in the intervention group with a 2% reduction in overweight (BMI>85% for age and sex). Additionally, post study comparisons demonstrated an increased consumption of fruits and vegetables in both groups with a higher increase in the intervention group; however, this was not statistically significant. Despite the increases both groups of students reported, fruit consumption still remained below recommended
levels. Lastly, physical activity levels in the intervention group increased in both school and home settings with a reported baseline mean activity rate of 11.8 min/day during the school day and 22.34 min/day outside of the school data and a post study reported mean activity rate of 20.5 min/day during the school day and 37.42 min/day outside of the school day; however, this was not statistically significant.

Although the authors looked at the changes in fruits and vegetable consumption, they did not measure nutrition knowledge pre- and post- intervention. Given that the program did not demonstrate statistically significant increases in fruit and vegetable consumption, it is possible that there was an increase in health knowledge that was not reflected in increased consumption, as a child’s diet is partially dependent on the foods provided at home. Additionally, although the authors noted increased physical activity levels in the intervention group, it is possible that because this information was self-reported, the increase was a result of increased awareness of physical activity since physical activity was incorporated into the lessons. Moreover the authors’ do not discuss methods for monitoring use of the curriculum in the classroom.

One of the strengths of this program is its multidisciplinary approach to teaching kids about the benefits of healthy eating, which is similar to SMART Food for Thought. By combining objectives from other core subjects, it encourages teacher “buy-in” to the curriculum. Additionally, like SMART Food for Thought it uses technology to aid in the dissemination of information. Children use the internet more than ever, so by providing children and parents with a website to be used at home and at school, the authors can target their intervention in multiple settings. The use of a daily journal to record personal reflection and food choices is a way to encourage students to understand their attitudes and intentions for their behavior so that they can make healthful changes. By selecting the intervention and control schools through random
sampling techniques the authors diminished the chance of bias in the study. Lastly, since a person’s environment influences behavior change, the use of a lesson that orients students to genetics and family health history is an effective way to examine the social circles that influence their attitudes.

**FoodMASTER**

*The Food, Math, and Science Teaching Enhancement Resource Initiative*

(FoodMASTER) curriculum focuses on using food as a tool to teach mathematics and science. The program consisted of 45 one-hour hands-on lessons comprised of ten topics that include, measurement; food safety; vegetables; fruits; milk and cheese; meat, poultry, and fish; eggs; fats; grains; and meal management.

The teachers participated in a four-day training where they received educational material, an overview of the curriculum, and practice in the test kitchen with the hands-on activities. Overall, the study consisted of 204 third grade intervention students and 34 third grade control students. In order to evaluate the FoodMASTER curriculum, the authors used The Bock Kids Food Frequency Questionnaire 2004 (BKFFQ) to measure the dietary intake of students. Students completed the questionnaire prior to the intervention, as well as at the completion of the study.

Results demonstrated the FoodMASTER curriculum contributed to no significant differences in intake of macronutrients, specific nutrients, or food groups between the pretest and posttest for the two groups of students. However, in an analysis comparing higher and lower socioeconomic groups, which was determined based on the school-level proportion of students receiving free or reduced-price lunch, significant differences were found for the intake of protein, percentage of kilocalories from sweets, and for servings of fats, oils, and sweets.
Children from the higher socioeconomic group consumed a greater percentage of their kilocalories from protein, and children in the lower socioeconomic group had a higher percentage of kilocalories coming from sweets as well as a higher number of servings of fats, oils, and sweets.

A possible cause for the failure to demonstrate a significant difference in dietary intake could be that the overall dietary intake assed by the BKFFQ did not target all of the specific dietary changes that the curriculum emphasized i.e. whole grain pasta. Another consideration is that because the lessons are multidisciplinary and the authors did not monitor lesson implementation, it is possible that the teachers stressed the mathematics and science objectives of the curriculum over the nutrition content. Thus, when designing a cross-content nutrition curriculum, it is essential to ensure an appropriate balance of subjects so that the nutrition content is not overlooked. Another limitation of the study is that the authors did not include nutrition knowledge as an outcome measure. Even though the study demonstrated no significant difference in dietary intake, it is possible that the curriculum contributed to a change in knowledge given the large number of lessons, even though it did not result in dietary intake change. However, if this is the case, then the ability of the curriculum to address childhood obesity is limited regardless. Additionally, the authors only included 34 students in the control group, so it is questionable whether the study was adequately powered to detect a significant difference. Lastly, the program consisted of a four-day teacher training to acclimate teachers to the curriculum, which ideally may be beneficial; however, considering the hectic schedules of teachers, it is likely that this approach is not realistic outside of the research setting.

One of the strengths of this program was the number of lessons that it included. Some of the other curricula described above contained limited numbers of lessons, and it is likely that
incorporating more exposure to the nutrition content is a method to increase retention and knowledge. Additionally, although this may also be viewed as a weakness, the use of a multidisciplinary approach to creating the lessons is another strength of the program because it does provide a cross-content approach to learning that teachers might appreciate.

**Summary of Findings**

See Table 1 (Appendix) for a summary of included programs.

**Discussion**

The curricula described in this literature view provide a picture of the existing programs for elementary school children. Although more programs exist, those selected are similar to *SMART Food for Thought* given their use of technology and their cross-content approach.

The programs reviewed demonstrated various commonalities. For example, all but one program\(^2\) consisted of a teacher training prior to implementation in order to familiarize teachers with the content of the lessons. *SMART Food for Thought* capitalizes on this critical component that is necessary to develop a foundation for implementation. Additionally, the use of a teacher training allows teachers to feel more comfortable utilizing the curriculum, which ultimately improves the quality of the lessons taught.

Additionally, three of the programs described\(^7,10,12\) incorporated a multidisciplinary approach to developing the curriculum content. States require teachers to complete certain math, science, and language arts requirements, and unless there is a specific health policy that is enforced, nutrition education is often omitted. Therefore, the use of a lesson that incorporates all of these different subjects provides motivation for teachers to make nutrition education a priority. An integral part of *SMART Food for Thought* is utilizing this method to increase teacher “buy-in” as well as aid in the attainment of the Standard Course of Study objectives.
Two of the programs\textsuperscript{6,7} used technology, such as a website or online game, to aid the curriculum. This is a vital aspect of \textit{SMART Food for Thought}, and given the technological advances over the years, this may become a common trend in educating youth.

The use of physical activity embedded into the lessons is another aspect that two of the programs\textsuperscript{7,10} had in common with \textit{SMART Food for Thought}. Incorporating physical activity not only encourages students to exercise, but also, establishes a routine in which students are more likely to follow on their own. Moreover, some research suggests that students who participate in exercise regularly are less depressed, use drugs less frequently, have higher attendance levels at school, and have higher grade point averages than students who do not have regular physical activity\textsuperscript{7}.

Another component of the various programs is the incorporation of a family component into the curriculum\textsuperscript{7,10}. However, overall, this was a less emphasized part of the programs in this review. Although, \textit{SMART Food for Thought} uses this approach in some of its lessons, this aspect is not an integral element. Since families serve as a fundamental part of a child’s life, encouraging positive behavior changes in parents is a method to foster healthy eating habits in children.

Most of the studies described took place in low socioeconomic or rural elementary schools\textsuperscript{2,6,10,12}. Although the Chapel Hill-Carrboro City School District has some pockets of low socioeconomic and/or rural communities, overall, it is questionable whether the results obtained from these studies are generalizable to this population in light of the better resources available in this community.

Focusing on outcome measures, three of the studies evaluated nutrition and physical activity knowledge and attitudes\textsuperscript{2,6,10}, four studies assessed dietary intake\textsuperscript{2,7,10,12}, two studies
evaluated anthropometric measures,\textsuperscript{6,7} and three studies evaluated changes in physical activity.\textsuperscript{6,7,10} Although all but one of the programs showed trends toward improvements in these factors,\textsuperscript{12} most of these differences were not statistically significant. Given the small sample sizes, it is possible that these studies did not have enough power to detect a statistically significant difference. However, in terms of health related outcomes, such as BMI, weight, blood pressure, out of the two studies that reported these outcomes, only one study\textsuperscript{7} demonstrated a significant positive shift in BMI in the intervention group. Lastly, only one study\textsuperscript{2} commented on harms associated with the intervention. Future studies should look at the effects of nutrition curriculum programs on body self-perception and as well as increased attempts to lose weight in unhealthy ways.

Overall, this review provides insight into five curriculum-based programs that focus on healthy eating and physical activity. Further questions remain on the effectiveness or appropriateness of a nutrition curriculum for grades kindergarten through two as all the programs discussed here used a sample of third, fourth, or fifth graders. Since \textit{SMART Food for Thought} is a curriculum for grades kindergarten through fifth, these programs do not shed light on younger age groups. Additionally, questions remain surrounding the number of lessons that should be incorporated into a successful curriculum. In the five programs evaluated, the number of lessons ranged from six to forty-five. However, despite these questions, important messages that can be taken from this review are the use of teacher training and cross-content lessons to improve teacher “buy-in,” employing technology to encourage greater participation from students and families, integrating physical activity and family components, encouraging student reflection through the use of journals or food logs as well as the importance of measuring patient centered
outcomes and harms in evaluation outcomes. Incorporating these lessons learned will hopefully contribute to the successful implementation of *SMART Food for Thought*. 
PROGRAM PLAN

Overview

*SMART Food for Thought* targets elementary school children in the Chapel Hill-Carrboro School District. The goal of this program is to promote child health through a school initiative by converting the current *Food for Thought* nutrition curriculum into Smart Board lessons. The Nutrition Services Branch of the North Carolina Division of Public Health created the Food for Thought curriculum in order to help educators teach the nutrition objectives of the healthful Living Standard Course of Study.

A SMART Board is an interactive whiteboard that uses touch detection for user input. Using a combination of a simple whiteboard and the power of a computer, teachers can create dynamic lessons to improve lesson outcomes. Each elementary school in the Chapel-Hill Carrboro City school district is equipped with Smart Board technology, and thus, this district serves as an appropriate population for this pilot program given its resources. By providing teachers with an interactive and easily accessible approach to teaching nutrition, we hope to increase teacher utilization of these lessons.

Unhealthy eating and lack of physical activity are risk factors for obesity, and effective nutrition education can motivate students to adopt healthier eating patterns and incorporate physical activity into their daily routines, with the hope of reducing rates of childhood obesity. Additionally, healthier eating and physical activity can improve academic performance in students. After implementing this program in Chapel Hill and Carrboro, we hope to disseminate these lessons to other school districts in the state with Smart Board operating systems.

*SMART Food for Thought* is a coordinated effort with the Healthy Carolinians of Orange Country Partnership within the Orange County Health Department. Healthy Carolinians is a
network of agencies and citizens partnering to promote health and wellness in Orange County. Their mission is to advocate, guide and assist Orange County in planning and implementing health care strategies to promote healthy lifestyle and improve health status. Additionally, the Chapel Hill-Carrboro City school district will serve in an advisory function to manage this program. The Health Coordinator will maintain contact with school principals and teachers, and she will facilitate market research by coordinating presentations with teachers in order to provide feedback on the lessons that are created.
Program Context

National, State, and Local Priorities

Although the early and middle childhood years are typically healthy ages, these children are at risk for certain conditions, such as asthma, dental caries, child maltreatment, developmental and behavioral disorders, and obesity. Healthy People 2010 addressed the earliest stages of childhood through goals for “Maternal, Infant, and Child Health,” however; the early and middle childhood stages of development were not highlighted. Given this gap, the “Early and Middle Childhood” area was included in Healthy People 2020 with the goal of “documenting and tracking population-based measures of healthy and well-being for early and middle childhood populations over time in the United States.”

In addition to a focus on early and middle childhood health, Healthy People 2020 continues to concentrate on reducing the proportion of children who are considered obese (NWS-10) and preventing inappropriate weight gain in youth (NWS-11). Between 2005-2008, 17.4% of children aged 6 to 11 years were considered obese, and Healthy People 2020 has set a target goal of 15.7%.

The Centers for Disease Control and Prevention (CDC) has also made childhood obesity a pertinent issue through their Division of Adolescent and School Health (DASH). DASH addresses the issue of childhood obesity by “supporting school-based strategies to promote lifelong, healthy eating habits and physical activity among young people.” This goal is achieved through data collection and analysis (biennial Youth Risk Behavior Surveillance System), science-based guidance, funding to state departments of education and health, evaluation, and integration with other federal efforts.
Lastly, the “Let’s Move!” campaign, initiated by First Lady Michelle Obama, has taken on a national goal of solving the challenge of childhood obesity within a generation.³ This campaign aims to combat the growing trend of childhood obesity through providing communities, schools, and families with the resources they need to allow kids to live healthier lives. With the launch of this initiative, President Barack Obama established the Task Force on Childhood Obesity whose purpose is to develop and implement a coordinated strategy and action plan to end childhood obesity.³

In North Carolina, childhood obesity is being addressed through a statewide movement through the “Eat Smart, Move More North Carolina” campaign. This movement promotes “increased healthy eating and physical activity wherever people live, learn, earn, play, and pray.” In 2009, 17.1%¹⁶ of children in North Carolina aged 5-11 years old were overweight, and 25.8%¹⁶ of children aged 5-11 years old were obese, which was much greater than the national average of 19.6%¹⁷ based on NHANES data from 2007-2008. In the school setting, the creation of the Food for Thought nutrition curriculum for elementary school students continues to serve as a resource for educators across the state to integrate healthy eating and physical activity with Math and Language Arts.

In 2004, the Chapel Hill-Carrboro City School District adopted a nutrition policy aimed at promoting healthy eating habits and fitness in students through curriculum and healthy and nutritious meals and snacks to students. This policy included a program of nutrition instruction with objectives from the North Carolina Standard Course of Study, which serve to influence student’s present knowledge and attitudes toward healthy lifestyles. Given that the childhood obesity rate in this county is 19.2%¹⁸, which is greater than the Healthy People 2020 target goal, it is essential to target interventions in educating youth about healthy eating habits in this area.
The Political Environment

The political environment is ripe for initiating SMART Food for Thought. Given that childhood obesity is a priority at a national, state, and local level, the time is now to enact programs that educate youth on the issues of healthy eating and physical activity.

Program Acceptability

Since teachers in kindergarten through fifth grade are familiar with the current Food for Thought curriculum, we are optimistic that both teachers and students in the school district will implement and adopt SMART Food for Thought. A major component of the curriculum is making the lessons easily accessible and customizable. By allowing teachers to take a ready-made lesson and adjust it to suit their teaching style, we anticipate that it will promote greater use of the SMART Food for Thought curriculum.

Additionally, we will create a lesson guide and provide a teacher training in order to ensure that teachers understand how to use the lessons as well as to prevent technical problems. Moreover, we plan to make the lessons interactive and fun so that students are engaged in the learning process. All classrooms in the school district are equipped with SMART Board Technology, so we believe that teachers will be responsive to the opportunity to use this resource. However, if teachers are currently not using the Food for Thought curriculum or the technology in their classrooms, it may prove difficult to encourage utilization of the SMART Board lessons even if they are easily accessible. This could be addressed by conducting presentations where the benefits of the curriculum are conveyed to teachers.

Overall, achieving diversity is an essential goal, and this is achieved by having a diverse group of individuals on the planning team as well as embracing other cultures within the curriculum. For example, introducing foods from different cultures and using clip art characters
from different ethnic backgrounds in the lessons are a way to encourage cultural competence. Moreover, the Healthy Carolinians Coordinator has expertise in the area of program planning, the Health Coordinator has experience with program planning within schools, and I have an undergraduate degree in Nutrition, we hope to play to each member’s abilities to ensure a successful program.

We hope to include teachers throughout the planning process, because as stated before, a big challenge will be encouraging teachers to use the new SMART Food for Thought curriculum if they never used the original lessons. Thus, we made presentations to teachers regarding the curriculum in order to receive feedback about each lesson and to ensure that we are reaching their needs. Moreover, we executed a trial launch of some of the lessons in order to get teachers and students excited about the project, to encourage teacher buy-in, and to use teachers to market the program to their colleagues.

**Stakeholders**

Healthy Carolinians of Orange County within the Orange County Health Department and the Chapel Hill-Carrboro City School District are two key stakeholders in this project, in addition to the students and teachers in the school district. The Coordinator of Healthy Carolinians and the Health Coordinator of the School District are the main players in this program. These key players originated the concept of developing a SMART Board approach to nutrition education, and they serve an advisory role during the creation of the curriculum. The biggest challenge that may arise from this partnership is a lack of communication of each person’s objectives or priorities; thus, maintaining communication through email and meetings is essential in order to ensure the success of this project.
Other resources in the community include the Chartwells School Dining Services Director and Registered Dietitian and the IT Customer Support Manager for the District. In addition to maintaining open lines of communication with the main project partners, these contacts may serve beneficial in the implementation of this project. Lastly, other stakeholders in this program include principals, teachers, students and parents.

**Financial Resources and Technical Feasibility**

Financial resources to fund this project arise primarily from Healthy Carolinians; however, the Chapel Hill-Carrboro City School district provided the SMART Board software and license. It is estimated that these financial resources will most likely go towards printing, a large flash drive, which will be used to back-up the lessons, and duplicating CDs for distribution.

Given that each classroom in the district is equipped with a SMART Board, we do not have concerns about the SMART Board lessons reaching our target audience. However, a challenge to consider in our planning is the unpredictable nature of technology. The lessons will be created on a laptop and transferred to a computer that will be linked to a SMART Board in each classroom. Thus, we may run into the issues of the lessons not converting properly or the lessons not showing well on the actual SMART Board. Moreover, teachers may experience some problems when using the curriculum, such as if the games or website links that are embedded into the lessons start to malfunction.

In order to anticipate these challenges, we will schedule a time to work with an actual SMART Board in order to ensure that the lessons convert properly from the laptop. Additionally, we will include “Trouble-Shooting Tips” in the lesson guide that we will create and we will develop a teacher training video in order to get teachers acclimated to the SMART Board lessons.
Goals and Objectives

Goal: Improve the nutrition and physical activity knowledge of elementary school children in the Chapel Hill-Carrboro City School District.

• Short Term Objectives:
  
  o By May 2012, at least 50% of the elementary school teachers in the Chapel Hill-Carrboro City School district will watch the SMART Food for Thought teacher training and use the SMART Food for Thought lessons appropriate for their grade level.
  
  o By May 2012, at least 50% of the elementary school students in the Chapel Hill-Carrboro City School district will demonstrate better knowledge in regards to nutrition and physical activity.
  
  o By August 2014, the SMART Food for Thought curriculum will be used in a school district other than Chapel Hill-Carrboro City.
  
  o By August 2014, 50% of the elementary school students in the Chapel Hill-Carrboro City School district will demonstrate improved science grades a sign of academic improvement.

• Long Term Objectives
  
  o By 2016, 90% of the elementary school teachers in the Chapel Hill–Carrboro school district will use the SMART Food for Thought lessons appropriate for their grade level.
  
  o By 2017, at least 50% of the elementary school students in the Chapel Hill-Carrboro school district will be taught all of the SMART Food for Thought lessons from kindergarten to fifth grade.
  
  o By 2017, the obesity rate for children aged 5-11 years old in Orange County (19.2%) will decrease by 3%.
  
  o By 2017, 75% of the elementary school students in the Chapel Hill-Carrboro City School district will demonstrate improved science grades as a sign of academic improvement.
Theoretical Framework

It is clear that unhealthy eating and decreased physical activity are contributing factors to the increased prevalence of childhood obesity. With the proliferation of fast-food restaurants and super-sized portions, it has become more difficult for children to make healthy choices when it comes to food. However, when armed with the necessary knowledge, skills, and confidence, individuals are able to make positive changes in spite of their environment. We believe that the success of SMART Food for Thought lies with the utilization of theory to guide activities for this project on an individual, population, and a community level.

Health Belief Model

The Health Belief Model addresses the individual’s perceptions of the threat posed by a health problem, the benefits of avoiding the threat, and factors influencing the decision to act. In order for children to advocate for their health, they must be educated on the risks of unhealthy eating as well as the benefits of living a healthy life. Thus, the basis of this program lies in the curriculum that will be created to educate and promote discussions of these issues.

SMART Food for Thought addresses the concept of perceived susceptibility by providing students with risk factors for overweight and obesity. Additionally, the lessons include information regarding the consequences of unhealthy eating in order to address perceived severity, as well as the positive health effects of living a healthy lifestyle in order to target perceived benefits.

Social Cognitive Theory

The Social Cognitive Theory holds that environmental, individual, and behavioral factors interact in order to influence health behavior. It specifies a core set of determinants, the
mechanism through which they work, and the optimal ways of translating this knowledge into effective health practices.\textsuperscript{20} These core determinants include knowledge of health risks and benefits, perceived self-efficacy, outcome expectations, health goals, social support, and social and structural impediments.\textsuperscript{20} By understanding that a child’s choice of eating is contingent on the availability of healthy foods in his or her physical environment as well as the social and cultural environment, we can lay the groundwork for successful health-related interventions.

\textit{SMART Food for Thought} includes homework assignments and activities that students can work on with their parents as well as incorporates a pre-lesson workout that all students can participate. Additionally, since teachers will be coordinating the dissemination of the curriculum, it will provide them with an authority figure to model their behavior. By obtaining social support from teachers and family members as well as increased self-efficacy to exercise from the physical activity incorporated in the lessons, we are hopeful that we will enact positive behavior change.

\textbf{Diffusion of Innovation}

Diffusion of Innovations Theory addresses how ideas, products, and social practices that are perceived as “new” spread throughout a society or from one society to another.\textsuperscript{19} An important concept in this theory is the idea of innovation, which in this program is the utilization of a SMART Board to disseminate the lesson plans. The use of a SMART Board to develop an entire nutrition curriculum is a new approach given the opportunity provided by this technology.

Attributes affecting the speed and extent of an innovation’s diffusion include compatibility, complexity, and trialability.\textsuperscript{19} Given that each school in the district is equipped with a SMART Board and a paper version of the curriculum currently exists, the compatibility of \textit{SMART Food for Thought} is apparent. Moreover, the complexity of \textit{SMART Food for Thought}
will be limited by creating user-friendly materials for teachers. Lastly, by launching a trial period of the lessons during National Nutrition Month, we hope to enhance the trialability of the proposed program before its full implementation.
Implementation

*SMART Food for Thought* will be implemented in elementary schools in conjunction with the Healthy Carolinians of Orange County within the Orange County Department and the current Health Coordinator for the Chapel Hill-Carrboro City School district. The primary focus of the program is the development of SMART Board based, multidisciplinary nutrition lessons for grades kindergarten through fifth grade that teachers will use in the classroom during the academic school year. The main activities of this program include stakeholder presentations to increase teacher “buy-in”, a trial launch of the lessons during National Nutrition Month in March 2011, a formal teacher training, and the completed *SMART Food for Thought* curriculum. By implementing each of these activities, we will be able to achieve the necessary outputs to ensure a successful project, which ultimately correlate with the achievement of the short- and long-term goals of this program.

**Stakeholder Presentations**

In order to assess teacher willingness to use the *Smart Food for Thought* lessons, we made presentations to various teachers in the school district that were arranged by the Health Coordinator for the Chapel Hill-Carrboro school district. Each presentation included a handout with the purpose and description of the project, as well as a visual demonstration of an actual lesson. After the presentation, feedback was gathered from the participants regarding strengths of the curriculum and suggestions for improvement.

These presentations allowed teachers to feel as though they are an integral part of the planning, and, consequently, allow them to feel more invested in the program. Additionally, we obtained valuable feedback that was used to improve the lessons. Although there are other
stakeholders involved in this program such as principals, students, and parents, we targeted teachers because ultimately, they will be the ones presenting the lessons to the students.

**Trial Launch**

In addition to presenting to teachers, an essential component of *SMART Food for Thought* was the launch of a trial version of the curriculum during National Nutrition Month in March 2011. The Health Coordinator for the school district sent a letter to all elementary school principals encouraging teachers to use a lesson during a specified time period during the month. One lesson and lesson guide for each grade level was created for the trial. In addition to the lessons, teachers were asked to fill out a survey providing comments about the strengths/weaknesses of the curriculum, technological problems experienced, suggestions for improvement, and whether they would use the *SMART Food for Thought* lessons in the future.

Given that the curriculum is technologically based, it was crucial to execute a trial version of SMART Food for Thought in order to ensure that the lessons were transferrable and there were no major glitches with using the SMART Board. Additionally, like the stakeholder presentations, a goal of this trial was to encourage teacher “buy-in” to the program. Since teachers are an essential component of the program, gaining their support is vital to ensure proper implementation of the curriculum.

**Teacher Training**

In order to ensure that teachers are comfortable utilizing the lessons, a component of the program will be a teacher training. The literature review that was completed demonstrated that a teacher training is a valuable part of familiarizing teachers with the curriculum and making sure that the lessons are taught appropriately. Realizing the limited time that teachers have on a day-to-day basis, it was decided to create the training using a Powerpoint presentation with audio,
and then disseminate the presentation to teachers within the district. Thus, teachers can access the training at their own convenience, and they can go back and review it if necessary.

The training will provide a tutorial on using the lesson guides and accessing links within the lesson. Additionally, it will cover how to fix problems with the lessons if they arise. Moreover, it will provide a basic tutorial on using a SMART Board for teachers who are not as skilled in SMART Board technology. Each teacher who uses the curriculum will be required to view the training, and we will request that the training take place before the lessons are used for the first time. By providing flexibility with the teacher training, we hope that more teachers will be interested in using the SMART Food for Thought lessons given the minimal time commitment.

Curriculum (See Figure 3, Appendix, for SMART Food for Thought Curriculum).

The main component of SMART Food for Thought is the SMART Board nutrition lessons. The content for the lessons are derived from the Food for Thought nutrition curriculum that was developed by the Nutrition Services Branch of the North Carolina Division of Public Health in order to help educators teach the nutrition objectives of the Healthful Living Standard Course of Study. In addition to coordinating with the standard course of study for healthful living, these lessons also integrate the Math and Language Arts Standard Course of Study objectives, and thus, are a cross-content approach to teaching elementary school students about nutrition.

Each lesson starts with a “Warm-Up” and students participate in different aerobic activities in order to get comfortable with incorporating physical activity into their daily routines. After the “Warm-Up” activity, the rest of the lesson consists of a lecture and a set of activities that help students focus on the topic covered in the lesson. Overall, there are five lessons for
kindergarten, three lessons for first grade, four lessons for second grade, five lessons for third grade, five lessons for fourth grade, and six lessons for fifth grade

The teachers will be able to access the lessons through the school district’s online website, and these files will be uploaded by the Health Coordinator. Each lesson file will include a link to access the handouts and teacher resources from the *Food for Thought* curriculum and a lesson guide. The lesson guides are a PDF version of the SMART Board lesson, and they include objectives and step-by-step instructions to complete the lesson.

**Resources**

In order to successfully implement *SMART Food for Thought*, the primary resources will come from human resources, such as teachers. The success of this program lies within the ability to disseminate the information to students, so if we have the support of teachers in the school district, it is likely that this project will be a success. Additionally, continued involvement will be needed from the Healthy Carolinians Coordinator as well as the Health Coordinator for the school district.

Physical resources needed for implementation include the SMART Board software to create the lessons, as well as the SMART Board units in each classroom. Additionally, we will need Powerpoint in order to create the *SMART Food for Thought* teacher training. Moreover, in order to provide teachers with an electronic version of all of the lesson guides, we will need CDs in order to copy and burn the guides. From a financial aspect, this program can function on limited monetary resources, and we will depend on funding from the School District and the Orange County Health Department.

**Timeline**

See Figure 1 (Appendix) for a year-long timeline for implementation
Logic Model

See Figure 2 (Appendix) for the SMART Food for Thought Logic Model
Sustainability

Given the national, state, and local priorities on nutrition and childhood obesity, it is essential to ensure the sustainability of this program. In light of the limited financial and physical resources this program requires, we expect to maintain a high level of sustainability. However, in order to reach the goals of SMART Food for Thought, it will be necessary to keep teachers invested in this program, as they are the driving force for dissemination. Listed below are the strategies that will be used to ensure the sustainability of SMART Food for Thought.

Vision

The vision of SMART Food for Thought is represented by the goal of improving the nutrition and physical activity knowledge of children in the Chapel Hill-Carrboro School District in order to decrease rates of overweight/obesity and improve academic performance. By maintaining focus on this goal, we hope to continue to spur excitement and garner support from teachers and educators within the school district, as well as outside of the district.

Results Orientation

An evaluation component is a key part to ensuring the sustainability of SMART Food for Thought. By evaluating the results obtained in parallel with the goals and objectives of the program, we hope to make the necessary changes to continually improve the effectiveness of SMART Food for Thought.

Strategic Financing

SMART Food for Thought is currently funded through the Orange County Health Department with support from the Chapel Hill-Carrboro City Schools. The program requires limited financial resources, however, if the program is expanded to other districts outside of the Chapel-Carrboro school district, additional financial resources may be required. In particular, if
schools that do not currently have a SMART Board request implementation of the program, grants or monetary resources from the school district, as well as the local, state, and national government will be sought to ensure the expansion of the program. Possible sources include childhood obesity grants from the Robert Wood Johnson Foundation as well as The Center for Health and Health Care in Schools.

**Broad-Based Community Support and Key Champions**

Healthy Carolinians of Orange County, the Orange County Health Department, and the Chapel Hill-Carrboro School district currently support *SMART Food for Thought*. The Healthy Carolinians Coordinator and the Health Coordinator for the school district are key players that are vital to the sustainability of this program. Together we can continue to gain teacher support for the program both locally and statewide, and we can network with the State Board of Education and the NC Department of Health and Human Services in order to provide support for the program on a larger scale.

**Adaptability to Changing Conditions**

As childhood obesity continues to come to the forefront of the nation’s agenda, it will be essential to stay informed of changing practices and evidence-based approaches. Additionally, given that the program is dependent on technology, program leaders will need to remain invested in adjusting the curriculum based on changes to the SMART Board software. By staying informed and invested in this program we hope to continually improve the nutrition knowledge, and, ultimately, the health of children in this school district.
EVALUATION PLAN

Rationale for Evaluation

In order to ensure the continued support, sustainability, and dissemination of SMART Food for Thought, it is essential to create an evaluation component for this program. Given that childhood obesity is a priority at a national, state, and local level, it is important that implementation is successful and that the program reaches its objectives and intended outcomes.

The primary reason for conducting this evaluation is to assure that SMART Food for Thought is making progress towards the program goal, which is improving the nutrition and physical activity knowledge of elementary school children in Chapel Hill and Carrboro. This program has the potential to significantly influence child health in this school district; thus, it is necessary to ensure that the activities of the program are aligned to achieve this final outcome.

Additionally, performing an evaluation will provide opportunities for continuous quality improvement. Given that this program is technology-based, there is a potential for technical errors to occur. Thus, it is necessary to stay abreast of any issues, and make changes where necessary. Additionally, since teachers will be disseminating the lessons to students, it is essential that the curriculum fits their needs and appeals to students.

Lastly, an evaluation is necessary in order to ensure that the program is effective so that resources are not wasted on an ineffective program. In SMART Food for Thought, the biggest resources are time and people. Teachers have numerous demands placed on them with a limited amount of time to complete them. Thus, it is essential to determine the effectiveness of this program, in order to determine whether it is worth utilizing teachers and class time to undertake this program.
Approach to the Evaluation

At this point, *SMART Food for Thought* will benefit most from an internal evaluator who is familiar with the project and has access to organizational resources. Moreover, *SMART Food for Thought* is a new program with limited resources; thus, utilizing an evaluator who understands the needs of the program will be an essential component to completing a successful evaluation. Additionally, an internal evaluator often has more opportunities for informal feedback with project stakeholders, and we hope that this will allow an opportunity for incremental changes to occur.\(^1\) However, it is important to consider that an internal evaluator often lacks the outside perspective and technical skills of an external evaluator.\(^1\) Thus, if *SMART Food for Thought* is disseminated to other school districts, at that point, it may be necessary to contract an external evaluator with a broader evaluation expertise.

One of the most important overall characteristics that an evaluator for *SMART Food for Thought* should possess is the ability to remain flexible and problem solve.\(^1\) Additionally, an evaluator should have some degree of training in evaluation methodology as well as previous evaluation experience. Given that this program is based in the school system, the evaluator should have some contacts within the school district or have a means for obtaining those contacts. Moreover, an evaluator should be personable with good communication skills in order to engage stakeholders in all stages of the evaluation process. Lastly, he or she should be organized, punctual, and professional in order to obtain results in the most efficient manner.

It will be necessary to include stakeholders at all levels during the evaluation process. Stakeholders are much more likely to support the evaluation and act on the results and recommendations if they are involved in the evaluation process. The primary stakeholders for *SMART Food for Thought* include the Healthy Carolinians Coordinator, the Health Coordinator
for the school district, the school board, principals, teachers, parents, and elementary school students.

Although students and parents may not be involved at every stage of the evaluation process, they will be important factors in regards to obtaining results so that final recommendations can be formulated. The other stakeholders involved will be essential to provide insight into key questions that should be included in the evaluation design, to offer suggestions concerning the most effective method to obtain data, to make judgments regarding the evidence obtained, and to use the final recommendations. Specifically, the Healthy Carolinians Coordinator and the Health Coordinator will be key advocates in determining the methods of the evaluation design, while the principals and teachers will be key factors in justifying the conclusions that are made from the evaluation. Moreover, school principals, teachers, and parents will serve as key informants during the evaluation process. Lastly, school officials as well as the Healthy Carolinians Coordinator and Health Coordinator will be essential players in ensuring the best use of the recommendations.

A big challenge that may arise with the evaluation of SMART Food for Thought will be gathering information from students. Since students are in grades kindergarten through fifth grade, there is a wide range of skills and abilities when it comes to reading and writing. Thus, it may prove difficult to streamline a standardized approach to the evaluation. Additionally, teachers are very busy, and it may prove challenging to contact teachers for in-depth interviews or surveys. Lastly, because the curriculum will be disseminated to all elementary schools in the school district (10), it may be a large task for one evaluator to undertake both an implementation and outcome evaluation. Overall, it is necessary to be aware of these potential challenges so that problems can be addressed if they arise.
Evaluation Study Design

Implementation Evaluation

In order to assess the success achieved with implementation of *SMART Food for Thought*, we will use an observational study design in order to obtain insight from program stakeholders, such as the Healthy Carolinians Coordinator, the Health Coordinator for the school district, principals, teachers, parents, and students. We will primarily use qualitative methods to obtain information, which will include engaging these stakeholders in interviews and focus groups. From a quantitative perspective, we hope to use surveys and create activity logs, which teachers can use to record the sessions that they complete, so that this information can be used to further assess compliance with implementation.

Outcomes Evaluation

Given that the primary focus of *SMART Food for Thought* includes looking at the effect of this program on elementary school children, we will employ a quasi-experimental design to evaluate our outcomes. A quasi-experimental design will be the most feasible approach in light of the fact that we are working with the school system, and it is possible that principals may not want their school to participate in an experimental study. Thus, an easier approach will be to use schools that are willing to participate.

Because we would like to look at the amount of change in nutrition knowledge in students, we will use a one group, pre-test/post-test method in order to collect outcome data. This method can be used at both an individual as well as an aggregate or population level, so we will be comfortable using this approach to evaluate our outcome. Moreover, this design has a relatively low cost, and since we have limited resources, this will be the best approach.
One of the limitations to consider with this design, is the testing effect, which occurs when the process of being involved in providing the pre-test data in some way affects the post-test data.\textsuperscript{22} Moreover, students may be exposed to other nutrition education outside of \textit{SMART Food for Thought} that may improve their knowledge, and thus, a positive outcome could be independent of our program. Lastly, another disadvantage is instrumentation, which means that if the pre- and post-test information are not collected in exactly the same way, the findings can be influenced by the data collection method, as opposed to the program.\textsuperscript{22} Thus, when interpreting data obtained from this design, we will need to take these limitations into consideration to ensure that our results were not biased.
Evaluation Methods

The primary methods of data collection for the SMART Food for Thought implementation evaluation will include the use of surveys, interviews, focus groups, and document review, while the outcome evaluation will use surveys and document review.

In order to obtain insight regarding stakeholders’ attitudes towards the curriculum, as well as its strength and weaknesses, our main approach will be through the use of in-depth interviews. These interviews will be focused primarily towards the Healthy Carolinians Coordinator, the Health Coordinator for the school district, principals, and teachers. These interviews will be essential because we hope that we will obtain detailed and reflective information that can be used to make necessary changes to the program to ensure its success.

In order to obtain reflective information from the students, we will use focus groups as a primary method. Although focus groups can be difficult to set up, we believe that this will be a beneficial method for obtaining additional insights from students about the strengths and weaknesses of the curriculum. Since elementary school students have varying levels of reading comprehension, a standardized survey may not be the best option in order to obtain this type of information. Additionally, a one-on-one interview may be intimidating for a young child. Therefore, a focus group will allow children to be among their peers, and thus, a more relaxed environment.

Online surveys will be used to obtain information from parents about their child making healthier choices at home and sustainability of the knowledge obtained. Even though some parents may not have computer/internet access, mailed surveys are more expensive and time-consuming. Online surveys will also be used to gain further insights from teachers and principals regarding usage of SMART Food for Thought. Lastly, pre-test and post-test data
regarding nutrition knowledge, attitudes, and behaviors from students, will be obtained through the use of paper surveys that will be completed during class time. These surveys will be age appropriate in order to obtain the most valid information.

Document review will be essential from both an implementation and outcomes perspective. We will use activity logs in order to track use of the curriculum, thus, these will be reviewed in order to determine the number of teachers as well as which schools are utilizing the curriculum. By performing yearly pre- and post-test surveys, we will be able to review these documents to determine how many students received all of the lessons. Given that we hope to decrease the obesity rate in Orange County by 2017, we will use document review to analyze epidemiological data regarding obesity rates in the county. Lastly, document review will be necessary to compare improvements in academic performance with increased nutrition education.
### Evaluation Planning Tables

**Short Term Objective 1:** By May 2012, at least 50% of elementary school teachers in the Chapel Hill-Carrboro City School district will participate in SMART Food for Thought teacher training and use the SMART Food for Thought lessons appropriate for their grade level.

<table>
<thead>
<tr>
<th>Evaluation Question</th>
<th>Participant</th>
<th>Evaluation Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did at least 50% of teachers participate in training and use the SMART Food for Thought lessons?</td>
<td>Health Coordinator (1, 2)</td>
<td>1. Document Review</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. In-depth Interview</td>
</tr>
<tr>
<td>How did staff keep track of who completed the trainings and used the SMART Food for Thought Curriculum</td>
<td>Principals (1, 2) Health Coordinator (1) Teachers (1, 2)</td>
<td>1. In-depth Interview</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Online Survey</td>
</tr>
<tr>
<td>Did teachers like and enjoy the training?</td>
<td>Teachers (1, 2)</td>
<td>1. In-depth Interview</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Online Survey</td>
</tr>
<tr>
<td>Did teachers feel confident utilizing the SMART Food for Thought Curriculum after participating in the training?</td>
<td>Teachers (1, 2)</td>
<td>1. In-depth Interview</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Online Survey</td>
</tr>
<tr>
<td>In what ways can the training video be improved?</td>
<td>Health Coordinator (1) Healthy Carolinians Coordinator (1) Teachers (1, 2)</td>
<td>1. In-depth Interview</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Online Survey</td>
</tr>
<tr>
<td>Did the SMART Food for Thought curriculum change teachers’ perceptions about incorporating nutrition into the Standard Course of Study?</td>
<td>Teachers</td>
<td>1. In-depth Interview</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Online Survey</td>
</tr>
<tr>
<td>What did teachers and other stakeholders like and enjoy about the SMART Food for Thought nutrition curriculum?</td>
<td>Teachers (1, 2) Students (3)</td>
<td>1. In-depth Interview</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Online survey</td>
</tr>
<tr>
<td>3. Focus Groups</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In what ways can the SMART Food for Thought nutrition curriculum be improved?</td>
<td>Health Coordinator (1) Healthy Carolinians Coordinator (1) Teachers (1, 2) Students (3)</td>
<td>1. In-depth Interview</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Online survey</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Focus Groups</td>
</tr>
</tbody>
</table>
Short Term Objective 2: By May 2012, at least 50% of elementary school students in the Chapel Hill-Carrboro City School district will demonstrate better knowledge in regards to nutrition and physical activity.

<table>
<thead>
<tr>
<th>Evaluation Question</th>
<th>Participant</th>
<th>Evaluation Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did at least 50% of students in the school district demonstrate better nutrition and physical activity knowledge?</td>
<td>Health Coordinator (1) Students (2)</td>
<td>1. Document Review 2. Pre-Test/Post-Test Paper Survey</td>
</tr>
<tr>
<td>Did students and other stakeholders feel the SMART Food for Thought Curriculum was appropriate for increasing their nutrition and physical activity knowledge?</td>
<td>Principals (1) Health Coordinator (1) Teachers (1)</td>
<td>1. In-depth interview</td>
</tr>
<tr>
<td>Did students experience any difficulty in understanding the material presented?</td>
<td>Teachers (1, 2) Students (3)</td>
<td>1. In-depth interview 2. Online interview 3. Focus Groups</td>
</tr>
<tr>
<td>Did students use the knowledge obtained to make healthier food choices?</td>
<td>Teachers (1, 2) Parents (2) Students (3)</td>
<td>1. In-depth interview 2. Online survey 3. Focus Groups</td>
</tr>
<tr>
<td>To what extent was the knowledge obtained sustained?</td>
<td>Teachers (1, 2) Parents (2) Students (3)</td>
<td>1. In-depth interview 2. Online survey 3. Focus Groups</td>
</tr>
</tbody>
</table>

Short Term Objective 3: By August 2014, the SMART Food for Thought curriculum will be used in a school district other than Chapel Hill-Carrboro City.

<table>
<thead>
<tr>
<th>Evaluation Question</th>
<th>Participant</th>
<th>Evaluation Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the SMART Food for Thought curriculum used on a district other than Chapel-Hill Carrboro?</td>
<td>Health Coordinator (1,2)</td>
<td>1. Document Review 2. In-depth Interview</td>
</tr>
<tr>
<td>How did other school districts become aware of SMART Food for Thought and how were they recruited?</td>
<td>Health Coordinator (1)</td>
<td>1. In-depth Interview</td>
</tr>
<tr>
<td>Were there any problems with dissemination of the materials?</td>
<td>Health Coordinator (1) Healthy Carolinians Coordinator (1) Principals (1, 2) Teachers (1)</td>
<td>1. In-depth Interview</td>
</tr>
<tr>
<td>What did teachers in other school districts like and enjoy about the curriculum?</td>
<td>Teachers (1)</td>
<td>1. In-depth Interview</td>
</tr>
<tr>
<td>What improvements can be made to the curriculum?</td>
<td>Principals (1) Teachers (1)</td>
<td>1. In-depth Interview</td>
</tr>
<tr>
<td>Is the curriculum appropriate for the</td>
<td>Teachers (1)</td>
<td>1. In-depth Interview</td>
</tr>
</tbody>
</table>
population that it was implemented? | Students (2) | 2. Focus Group
---|---|---
What resources were used to teach nutrition prior to the implementation of SMART Food for Thought? | Health Coordinator (1, 2) Principals (2) Teachers (2, 3) | 1. Document Review 2. In-depth interview 3. Online Survey
Do school officials prefer SMART Food for Thought over previous methods used for teaching nutrition and physical activity? | Principals (1, 2) Teachers (1, 2) | 1. In-depth Interview 2. Online Survey

**Long Term Objective 1:** By 2017, at least 50% of elementary school students in the Chapel Hill-Carrboro City School district will be taught all of the *SMART Food for Thought* lessons from kindergarten to fifth grade.

<table>
<thead>
<tr>
<th>Evaluation Question</th>
<th>Participant</th>
<th>Evaluation Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did at least 50% of students in the school district experience all of the SMART Food for Thought lessons from kindergarten to fifth grade?</td>
<td>Health Coordinator (1, 2)</td>
<td>1. Document Review 2. In-depth Interview</td>
</tr>
<tr>
<td>How did the school district track which teachers taught the lessons?</td>
<td>Health Coordinator (1, 2)</td>
<td>1. Document Review 2. In-depth Interview</td>
</tr>
<tr>
<td>How did students respond to completing the entire curriculum?</td>
<td>Teachers (1) Students (2) Parents (3)</td>
<td>1. In-depth interview 2. Focus Groups 3. Online Survey</td>
</tr>
<tr>
<td>Did students’ nutrition and physical activity knowledge improve?</td>
<td>Teachers (1, 2) Parents (2) Students (3)</td>
<td>1. In-depth Interview 2. Online Survey 3. Pre-test/Post-test Paper Survey</td>
</tr>
<tr>
<td>What issues did teachers experience with teaching the lessons?</td>
<td>Teachers (1, 2)</td>
<td>1. In-depth Interview 2. Online Survey</td>
</tr>
<tr>
<td>Did students’ develop sustainable lifestyle changes?</td>
<td>Teachers (1,2) Parents (2) Students (3)</td>
<td>1. In-depth Interview 2. Online Survey 3. Focus Groups</td>
</tr>
<tr>
<td>Have teachers’ attitudes regarding nutrition educated changed?</td>
<td>Teachers (1, 2)</td>
<td>1. In-depth Interview 2. Online Survey</td>
</tr>
</tbody>
</table>
**Long Term Objective 2:** By 2017, the obesity rate for children aged 5-11 years old in Orange County (19.2%) will decrease by 3%.

<table>
<thead>
<tr>
<th>Evaluation Question</th>
<th>Participant</th>
<th>Evaluation Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did the obesity rate for children aged 5-11 years old decrease by 3% in Orange County?</td>
<td>Health Coordinator (1, 2) Healthy Carolinians Coordinator (1, 2)</td>
<td>1. Document Review 2. In-depth Interview</td>
</tr>
<tr>
<td>Which schools have the highest obesity rates?</td>
<td>Health Coordinator (1)</td>
<td>1. Document Review</td>
</tr>
<tr>
<td>How many students have received SMART Food for Thought?</td>
<td>Health Coordinator (1) Principals (1) Teachers (1)</td>
<td>1. Document Review</td>
</tr>
<tr>
<td>Have teachers’ experienced increased competence in nutrition education?</td>
<td>Teachers (1)</td>
<td>1. In-depth Interview</td>
</tr>
<tr>
<td>What are barriers to reducing the obesity rate and how can these challenges be improved?</td>
<td>Health Coordinator (1) Healthy Carolinians Coordinator (1)</td>
<td>1. In-depth Interview</td>
</tr>
</tbody>
</table>

**Long Term Objective 3:** By 2017 75% of elementary school students in the Chapel Hill-Carrboro City School district will demonstrate improved science grades as a sign of academic improvement

<table>
<thead>
<tr>
<th>Evaluation Question</th>
<th>Participant</th>
<th>Evaluation Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did 75% of students in the school district demonstrate improved science grades?</td>
<td>Principals (1) Teachers (1)</td>
<td>1. Document Review</td>
</tr>
<tr>
<td>How were students’ performing in science prior to implementation of the curriculum?</td>
<td>Principals (1, 2) Teachers (1, 2)</td>
<td>1. Document Review 2. In-depth Interview</td>
</tr>
<tr>
<td>What barriers do students experience in improving their science grades and how can they be improved?</td>
<td>Principals (1) Teachers (1) Students (2)</td>
<td>1. In-depth Interview 2. Focus Group</td>
</tr>
<tr>
<td>Do school officials believe that increasing nutrition education is correlated to improved academic performance?</td>
<td>Health Coordinator (1) Principals (1, 2) Teachers (1, 2)</td>
<td>1. In-depth Interview 2. Online Survey</td>
</tr>
</tbody>
</table>
Dissemination Plans

In order to ensure that relevant findings of the evaluation are communicated with stakeholders and the public, we will use various methods for dissemination. It is likely that important findings will arise during the evaluation that can be addressed incrementally, especially in regards to technical trouble-shooting given the nature of the curriculum as well as issues with the content of the lessons. Therefore, monthly meetings will be held with the key players, the Healthy Carolinians Coordinator and the school district Health Coordinator, in order to keep them abreast of key findings so that improvements can be made. The Health Coordinator can then serve as a liaison between school officials in order to keep them informed of any important developments.

At then end of the evaluation, one method that will be used to ensure dissemination of findings is the creation of a final written report that will be sent to the Healthy Carolinians Coordinator, the Health Coordinator for the school district, principals, and teachers. This report will highlight the methods and results of the evaluation as well as provide final recommendations for improvement, which the Healthy Carolinians Coordinator and the Health Coordinator for the school district will likely find the most useful.

Although the report will be made available to principals and teachers, these educators may have limited amounts of time available; thus, they may not have the opportunity to read through this entire document. Therefore, in addition, we will use oral presentations in order to present big picture findings that these stakeholders as well as school board members may find easier to synthesize. Moreover, since parents will participate in the evaluation, we will need to inform them of our findings. This information will be disseminated through Parent Teacher Association newsletters and via the school district website.
Given that a SMART Board formatted nutrition curriculum is a relatively new concept, other school districts may want to hear about the efficacy of this program. Thus, we will take advantage of peer-reviewed journals, such as the North Carolina Medical Journal, the Journal of School Health, which have published nutrition curricula programs in the past, and the Journal of Nutrition Education and Behavior in order to disseminate evaluation findings. Additionally, on a larger scale, evaluation results can be presented at national conferences, such as the American Public Health Association, the National Association for the Education of Young Children, the National School Health Association, or other relevant public health and/or educational organizations such as the Physical Activity and Nutrition Branch of the NC Department of Health and Human Services. Ultimately, by increasing buy-in for the program by disseminating results, it will not only inform current stakeholders, but also ensure the sustainability of SMART Food for Thought.
DISCUSSION

The rapid increase in the prevalence of childhood obesity has alarmed public health agencies, health care clinicians, health care researchers, and the general public.\textsuperscript{23} Severe obesity in children and adolescents can be associated with negative health consequences that can negatively affect their quality of life.\textsuperscript{24} Seeing the potential for school-based interventions as an outlet for prevention, \textit{SMART Food for Thought} was created with the intent of improving the nutrition and physical activity knowledge of children in the Chapel Hill-Carrboro City School District. By providing them with the knowledge about how to make healthy lifestyle choices, it is hoped that students will advocate for their health and focus on eating healthier and increasing their physical activity.

The literature review of similar programs to \textit{SMART Food for Thought} provided insight into five-curriculum based programs. It demonstrated that a solid program included a teacher training, employed technology, and incorporated a multi-disciplinary approach to the curriculum content, which are all components of \textit{SMART Food for Thought}. Although a multidisciplinary approach can improve teacher buy-in because it allows them to reach multiple learning objectives in one lesson, a weakness of this method is that teachers may spend more time highlighting the other subjects instead of focusing on nutrition education.

Although most of the programs demonstrated success in improving student’s nutrition and knowledge and behavior, an important consideration is that only short term successes were described. \textit{SMART Food for Thought}, as well as future studies will need to focus on long-term changes in order to determine whether these interventions are truly successful.

Moreover, we need to understand that improved nutrition knowledge is simply not enough in order to enact behavior change. Other factors, such as, access to healthy food based
on a family’s financial restraints or the makeup of one’s neighborhood can affect the health choices that a child makes. Although children can sometimes choose what they eat at school, at home, it will largely depend on the health priorities of their parents. Thus, as SMART Food for Thought continues to develop, we may consider integrating a larger family component into the program, which will further expound on the Social Cognitive Theory approach to the program.

The success of SMART Food for Thought lies in its stakeholder support. Teachers are ultimately the key link in which the lessons are disseminated, thus, it will be necessary to maintain solid collaborations between the teachers, Healthy Carolinians of Orange County, and the Health Coordinator for the School District. The evaluation phase will be an essential step to hearing what teachers and other stakeholders have to say, and initiating changes that will support program outcomes.

Overall, the future of SMART Food for Thought is promising based on its accessibility, convenience, and alignment with the state standard course of study. We hope to form partnerships with other school districts so that the program can be disseminated to other schools around the state. Additionally, not every school district is like the Chapel Hill-Carrboro City School District, and thus, may not have a SMART Board in every classroom, especially in lower income areas. Therefore, we could possibly work with these areas in order to provide them with SMART Board resources so that they can use the lessons, especially given the fact that these areas usually have higher rates of overweight and obesity. Lastly, a curriculum is only one piece of the puzzle. In order for significant results to occur regarding childhood obesity rates, school systems need to adopt a holistic approach and make changes to the school infrastructure, such as promoting healthy lunches, getting rid of snack machines, or adopting a nutrition policy, in order to provide an environment conducive to a healthy lifestyle.
ACKNOWLEDGEMENTS

I would like to thank the following individuals for their help and guidance during this process:

Diane Calleson
Pam Dickens
Nidhi Sachdeva
Stephanie Willis
Alice Ammerman

“I would thank you from the bottom of my heart, but for you my heart has no bottom”
~ Author Unknown
REFERENCES

## APPENDIX

### Table 1: Summary of Similar Programs

<table>
<thead>
<tr>
<th>Program</th>
<th>*Shared Elements</th>
<th>Curriculum Description</th>
<th>Evaluation</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color My Pyramid 6</td>
<td>1, 2, 4, 5</td>
<td>Consisted of general nutrition concepts, moderation and variety, portion sizes, exercise and activity, MyPyramid and the Blast Off Game</td>
<td>Effect of the intervention on children’s nutrition knowledge, nutrition self-care practices, physical activity, and nutrition status (blood pressure and percentiles for height, weight, and BMI)</td>
<td>Increase in nutrition knowledge in both schools with School 1 making the greatest gains (p=0.029); Significant improvements in self care practices (p&lt;0.05), physical activity (p&lt;0.001), and systolic blood pressure (p&lt;0.001)</td>
</tr>
<tr>
<td>Improving Meals and Physical Activity in Children and Teens (IMPACT) 10</td>
<td>1, 2, 3, 5</td>
<td>Consisted of approx 20 min of physical activities and 40 min of a nutrition lesson developed to fit within the North Carolina academic competency goals in math, science, reading, social studies, language arts, and/or healthful living</td>
<td>Effect of the program on elementary school students’ knowledge, attitudes, and behavior regarding nutrition and physical activity</td>
<td>Increased fruit and vegetable intake (p&lt;0.05) and improved knowledge of the food in which to eat the most servings (p&lt;0.01); increased intake of calcium-rich foods and grains (not statistically sig.); no changes regarding dietary attitudes and beliefs; no significant differences in physical activity</td>
</tr>
<tr>
<td>It’s All About Kids 2</td>
<td>1, 2</td>
<td>Thirty min lessons including topics on food labels, lower fat food choices, portion sizes, and decision-making related to food choice. Each lesson based on a hands-on activity</td>
<td>Did the nutrition component result in changes in students’ knowledge, attitudes, and behaviors related to nutrition? Did the nutrition component result in changes in students’ self-reported food choices</td>
<td>Intervention group with improvements in knowledge of which food had more fat (p&lt;0.043) and food choice intention score (p&lt;0.012); no sig difference in food self-efficacy or nutrition knowledge</td>
</tr>
<tr>
<td>Wellness, Academics, &amp; You (WAY) 7</td>
<td>1, 2, 3, 4, 5</td>
<td>Engages students in language arts, mathematics, science, and health content; includes a ten min aerobic routine; access to website; requires students to interview family members and use a journal</td>
<td>Effect of the program on BMI, consumption of fruits and vegetables, and physical activity</td>
<td>Intervention group with a sig shift (p&lt;0.01) in BMI; higher increased consumption of fruits and vegetables in the intervention group but not statistically sig; increased physical activity levels in the intervention group but not statistically sig</td>
</tr>
<tr>
<td>FoodMASTER 12</td>
<td>1, 2, 3, 5</td>
<td>One hour lessons that use food as a tool to teach math and science; comprised of 10 food topics containing engaging hands-on science activities</td>
<td>Assess dietary intake</td>
<td>No sig diff in intake of macronutrients, specific nutrients or food groups btwn intervention and controls</td>
</tr>
</tbody>
</table>

*Shared elements with SMART Food for Thought:
1) A main focus is the use of a school-based curriculum to influence healthy eating and physical activity
2) Target audience is elementary school students
3) The lessons are multidisciplinary.
4) The curriculum incorporates technology
5) A training to familiarize teachers with the curriculum content.
<table>
<thead>
<tr>
<th>Activity</th>
<th>Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mtgs w/ program partners- Healthy Carolinians and CHCS Health Coordinator</td>
<td>Nov Dec Jan Feb Mar Apr May June July Aug Sept Oct</td>
</tr>
<tr>
<td>Development of curriculum</td>
<td></td>
</tr>
<tr>
<td>Monthly mtgs with Healthy Carolinians Coordinator</td>
<td>Nov Dec Jan Feb Mar Apr May June July Aug Sept Oct</td>
</tr>
<tr>
<td>Stakeholder Presentations</td>
<td></td>
</tr>
<tr>
<td>Trial run of SMART Food for Thought</td>
<td>Nov Dec Jan Feb Mar Apr May June July Aug Sept Oct</td>
</tr>
<tr>
<td>Videotape Teacher Training</td>
<td></td>
</tr>
<tr>
<td>Teacher Training</td>
<td></td>
</tr>
<tr>
<td>Teacher use of curriculum</td>
<td></td>
</tr>
</tbody>
</table>
Figure 2: SMART Food for Thought Logic Model

**Inputs**
- SMART Board Availability
- Support of the school district Health Coordinator
- Support of Teachers
- Time to develop the curriculum

**Activities**
- Develop the SMART Food for Thought nutrition curriculum
- Assess teacher willingness to implement the curriculum
- Initiate a small trial of the curriculum during National Nutrition Month
- Train teachers on how to use the curriculum

**Outputs**
- # of students receiving nutrition education
- # of students excelling academically
- # of teachers willing to participate
- # of teachers teaching nutrition education

**Short Term Outcomes**
- Increased nutrition and physical activity knowledge
- Change in students’ attitudes about healthy eating
- Improved grades and test scores
- Increased awareness of curriculum outside CHCCS
- Change in teachers’ attitudes about teaching nutrition

**Long Term Outcomes**
- Increased # of students achieving a healthy weight
- Increased interest and competency in nutrition

**Impact**
- Decreased rates of obesity in Orange County
- Improved education system in CHCCS
- Decreased rates of obesity in North Carolina
- Increased competency in nutrition education
Figure 3: SMART Food for Thought Curriculum

**Lesson Topics by Grade Level**

<table>
<thead>
<tr>
<th>Kindergarten Lessons</th>
</tr>
</thead>
<tbody>
<tr>
<td>MyPyramid: Eat a Variety of Foods</td>
</tr>
<tr>
<td>Around the World with Food</td>
</tr>
<tr>
<td>Building Strong Bones and Teeth</td>
</tr>
<tr>
<td>Moooving Over to Low-fat Milk</td>
</tr>
<tr>
<td>From Farm to Table</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grade 1 Lessons</th>
</tr>
</thead>
<tbody>
<tr>
<td>MyPyramid and Time</td>
</tr>
<tr>
<td>Whole Grains, Fruits and Vegetables and Low-fat Dairy</td>
</tr>
<tr>
<td>Focus on Fruits and Vary Your Veggies</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grade 2 Lessons</th>
</tr>
</thead>
<tbody>
<tr>
<td>MyPyramid and Measurements</td>
</tr>
<tr>
<td>Breakfast Builds Brains</td>
</tr>
<tr>
<td>Healthy Choices, Healthy Lifestyles</td>
</tr>
<tr>
<td>The Very Hungry Kid</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grade 3 Lessons</th>
</tr>
</thead>
<tbody>
<tr>
<td>What’s in My Drink?</td>
</tr>
<tr>
<td>Moooving to Low-fat Milk</td>
</tr>
<tr>
<td>Sugar Seekers</td>
</tr>
<tr>
<td>Don’t Forget Breakfast</td>
</tr>
<tr>
<td>Portions and Servings</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grade 4 Lessons</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Digestive System</td>
</tr>
<tr>
<td>Keeping Food Safe to Eat</td>
</tr>
<tr>
<td>Food Labels and Serving Sizes</td>
</tr>
<tr>
<td>Planning Healthy Meals and Snacks</td>
</tr>
<tr>
<td>Portion Sizes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grade 5 Lessons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy Choices – Part 1</td>
</tr>
<tr>
<td>Healthy Choices – Part 2</td>
</tr>
<tr>
<td>Food and Culture</td>
</tr>
<tr>
<td>Ad Savvy</td>
</tr>
<tr>
<td>Healthy Mind and Healthy Body</td>
</tr>
<tr>
<td>Walk with Me</td>
</tr>
</tbody>
</table>
Lesson Guide Example

Front Page

The Digestive System

Grade 4

Teacher Resources

Digestion Process

Handouts

1. Chewing Your Chow
2. The Saliva Solution

Materials

Unsated satine crackers (one per student)
Apples (enough for each student to have 1/2 of an apple)
Pitcher of ice water
Small paper cups (one per student)

Objectives

Healthful Living Objective
4.01 Identify the major components of the digestive system and summarize the digestive process

Math Objectives
1.01 Develop a sense of rational numbers 0.01 through 99,999

English Language Arts Objectives
Goal 4 "The learner will apply strategies and skills to create oral, written, and visual text"

Slide-by-Slide Instructions

First, pull out the "MyPyramid" tab to explain the purpose of MyPyramid

Third, click on the rectangles to reveal the food group that it represents

Orange=Grains

Red=Fruits

Purple=Meat

Second, pull out the "Food Group" Tab to explain that different colors represent different food groups

Green=Vegetables

Blue=Milk

Yellow=Oils
Physical Activity Warm-up Routine