8-2014

Identification of Best Practices for Childhood Nutrition Education Interventions

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To the Graduate Council:

I am submitting herewith a thesis written by Kelsey Rebecca Shanklin entitled "Identification of Best Practices for Childhood Nutrition Education Interventions." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Nutrition.

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Identification of Best Practices for Childhood Nutrition Education Interventions

A Thesis Presented for the
Master of Science
Degree
The University of Tennessee, Knoxville

Kelsey Rebecca Shanklin
August 2014

ACKNOWLEDGEMENTS

Thank you to my advisor, Dr. Sarah Colby, my committee, and the experts who participated in this project.

ABSTRACT

Childhood obesity remains a major concern in the United States, as 17% of children and adolescents ages 2-18 years are obese. Although changes in knowledge alone are not enough to change behavior, most successful nutrition interventions to reduce childhood obesity include nutrition education. The purpose of this study is to understand practices that impact the effectiveness of childhood nutrition education, and to identify expert opinions of essential best practices for childhood nutrition education. A literature review was conducted to identify previously established best practices for childhood nutrition education for 6-12 year olds. Eight sources were identified, and 33 best practices were cited. Ten members of a United States Department of Agriculture multi-state research group reviewed the best practices and edits were made according to their feedback. Three practices were added, and four were deleted. In order to understand experts' opinions about childhood nutrition education, an interview script was developed based on the revised list of best practices. Cognitive interviews were conducted with faculty members at the University of Tennessee, Knoxville Department of Nutrition, Public Health Nutrition Program, and Extension agents. Three practices were deleted, and eight practices were combined. To ensure clarity, a second round of cognitive interviews were conducted with the same interviewees. Four practices were added during this process. A total of 23 best practices were included in the subsequent interview and ranking process. Four experts received a list of the final 23 best practices and were asked to rank the top ten best practices. Through an interview, experts were asked to provide greater detail about each of the 23 practices, explaining and describing in their own words. Emerging concepts were documented in narrative form. Experts reviewed this

document to ensure that it represented their thoughts accurately. This study found that there is great variability among the literature and experts regarding best practices for childhood nutrition education interventions. In the future, best practices for specific settings and age groups should be established and disseminated to improve the effectiveness of childhood nutrition education interventions.

TABLE OF CONTENTS

LIST OF ATTACHMENTS

CHAPTER 1
LITERATURE REVIEW

Childhood obesity remains a major concern in the United States (1). In the past 30 years the rate of obesity increased from 7% to 18% in 6 to 11 year olds (2,3). Obese youth have an increased risk of developing cardiovascular disease, diabetes, and psychological problem (3). Children who are obese are more likely to be obese in adulthood, which may increase the risk of heart disease, type 2 diabetes, stroke, and cancer (3,4). Many factors influence lifestyle habits that may lead to obesity. These factors include families, communities, schools, child-care settings, medical care providers, faith-based institutions, government agencies, and the media (5). While changes in knowledge alone are not enough to change behavior, many nutrition interventions to reduce childhood obesity include nutrition education.

In the United States, 17% of children and adolescents ages 2 to18 years are obese (6). Consequences of childhood obesity include high blood pressure, high cholesterol, increased risk for cardiovascular diseases and type 2 diabetes, sleep apnea, asthma, and psychological problems due to social stigma (3,7). Children who are obese are more likely to be obese in adulthood, and are at a greater risk for conditions such as heart disease, diabetes, and cancer. In addition to health problems, obesity related illnesses cost the United States approximately $147 billion in 2008, and it is estimated that medical cost for each obese individual is $1,429 higher than those with a healthy body weight (7).

Because of the health and economical consequences of obesity, agencies such as the National Institutes of Health, and the Robert Wood Johnson Foundation have increased funding for research projects to attenuate childhood obesity (8). The Institute

of Medicine is currently working to understand effective nutrition interventions, and to create nationwide standards for school-based nutrition education interventions (9). In order to create successful initiatives, such as these, it is important to utilize evidence-based best practices. While many best practices have been identified, they remain vague, program-specific, and are rarely evidenced-based.

Best Practices for Nutrition Education Interventions

Existing best practices for childhood nutrition education interventions were identified through PubMed, Google, and textbooks. Each publication was required to meet the following inclusion criteria: published in last ten years, published in English language, and focused on nutrition education for 6 to 12 year olds. Most publications also included the terms "best practices," or "promising practices" (Attachment 1).

The Washington State Basic Food Nutrition Education Program (BFNEP) developed best practices in response to requests from local BFNEPs in need of evidence-based curricula to be used in nutrition education (10). This assessment tool is titled Assessment Tool For Nutrition Education Curriculum.

The Johns Hopkins Center for a Livable Future developed best practices based on expert opinions and solicited recommendations from key childhood obesity researchers (11).

Best practices were outlined for the Canadian program Breakfast for Learning (12). Scientific studies were identified through various search engines in order to develop best practices for Breakfast for Learning.

In a 2010 report to Congress, the Food and Nutrition Service identified best practices for nutrition education and promotion through research findings (13).

In a 2009 report, the Society for Nutrition Education found evidence that suggested best practices for nutrition education interventions (14) The office of Superintendent of Public Instruction of Washington developed the School Wellness Policy Toolkit (15). The purpose of this tool kit is to assist in the implementation of the Healthy, Hunger-Free Kids Act (16).

The Institute of Medicine conducted a study to review the literature and identify proposed best practices for school-based nutrition interventions, and evaluate school-based intervention for kindergarten through 12th grade (17).

Contento and colleagues identified best practices according to evidence of previous studies (18).

Variables Potentially Impacting Childhood Nutrition Education

Age of participants

Cognitive development is an important issue to consider when developing nutrition interventions. According to Piaget's Theory of Cognitive Development (19), children pass through four stages of development. First is the sensory intelligence phase in 0 to 2 year olds. In this phase, behavior is based on sensory thinking, meaning that the child does not have the ability to think logically, although cognition is developing rapidly. The preoperational stage occurs between 2 to 7 years of age. This phase is marked by the development of language and rapid conceptual development. Reasoning is based on perception and is pre-logical, or semi-logical. Behavioral sequences can be played out in the head instead of through physical events alone. Cognitive development slowly progresses throughout this stage. Ages 7 to 11 years are marked by the stage of concrete operations. Children in this age range can apply logical thought to concrete,

existing problems; however, they lack the ability to solve abstract or hypothetical problems. Most importantly, children begin to re-evaluate their knowledge in this stage (20). The last stage is formal operations and occurs in 11 to 15 year olds. This level is the greatest stage of development and is marked by the application of logical reasoning to all classes of problems. Reasoning is not limited to concrete problems and cognitive capabilities of fully developed formal operational stage are equivalent to those of an adult (19).

Learning Styles

Celli-Sarasin defines learning style as the preference or predisposition of an individual to perceive and process information in a particular way or in a combination of ways (21). While there are several approaches to understanding learning styles, the auditory, visual, kinesthetic approach theorizes a simple, practical way to conceptualize how students perceive and process information. Learning styles are important in that they can enable more effective teaching if students' learning styles are known. Lessons can also accommodate for learning styles through a holistic approach where all three learning styles are integrated. While some students learn through one, two, or three styles, it is important to understand that if the student feels comfortable with the learning style being utilized, they will be more motivated, therefore, more successful.

Auditory learners receive information through oral communication. Information is best received if it is presented as individual facts that make up the larger concept. Auditory learners have the capacity to think abstractly, and are reflective, sequential, analytical, and cognitive by nature. Strategies to accommodate for auditory learners include lectures, discussions, independent work, objective presentation and practices,

asking questions that require exact answers, activities that involve members, and verbal sorting activities.

Visual learners need visual aids, such as drawings, charts, diagrams, and outlines. If visual aids are not available, they will often form a mental picture to facilitate learning. Visual learners tend to be random, holistic, global, perceptual, concrete, and imaginative in the learning process. In order to accommodate learning for this style, visual formats, social cues, group learning, graphic organizers, models and demonstrations, role-playing and student presentations, field trips, computer aided instructions, and activities that emphasize creativity should be employed.

Kinesthetic, or tactile, learners learn by doing. These individuals rely on physical interaction during the learning process and must be active and dynamic participants to understand new concepts. Because kinesthetic learners are behavioral by nature, they need to actually do something to understand nuances of a concept or truly master a concept in order to translate that concept to other situations. Teaching strategies for kinesthetic learners include practicum, field trips, experiential learning activities, simulations, and demonstrations.

There are additional learning style theories including Felder and Silverman's theory, Kolb's Experiential Learning Theory, the Jungain psychological/ learning dimensions theory, and Gardner's seven intelligences (22).

Health Behavior Theories

The use of theories in nutrition interventions can assist in directing the program planner in developing an effective nutrition intervention (23). Between 1998-2008, there was a large increase in the number of theory based interventions (24). Glanz and

colleagues determined that the Health Belief Model, the Transtheoretical Model, and the Social Cognitive Theory were the most utilized health behavior theories (23).

The Health Belief Model, developed in the 1950s, was one of the first theories created for health behavior, and states that behavior depends on the value placed by an individual on an outcome and the individual's estimate of the likelihood that a given action will result in that outcome (25). Several constructs, or building blocks to behavior change are included in this theory. Perceived susceptibility, or the belief that a person may acquire a disease as the result of behavior, and perceived severity, or the belief in the extent of harm that can result from disease, make up the perceived threats construct. Perceived benefits is the belief in the advantages of methods suggested to reduce risk or severity of disease. Perceived barriers describe the beliefs concerning actual and imagined costs of engaging the new behavior. Cues to action are the force that makes a person feel the need to take action, and self-efficacy is the confidence in one's ability to pursue a behavior. One limitation of the Health Belief Model is the lack of evidence showing that this theory can modify behavior, especially long-term behavior.

The Transtheoretical Model focuses on explaining behavior change and is unique because it specifies a time dimension in behavior change (25). This theory is based on the idea that people move through various stages while making a behavior change, which is a process that might take six months to five years. The first construct, and most well known, is the Stages of Change construct, which consists of the following stages: precontemplation, contemplation, preparation, action, and maintenance. Consciousness raising is the second construct, and is defined as an experiential process that entails raising awareness about the causes, consequences, and cures for a particular problem.

Decisional balance, which addresses the relative importance placed by an individual on the advantages of behavior change as opposed to the disadvantages, and the previously defined self-efficacy act in constructs of this theory. Temptation and levels of change, which are five distinct but interrelated levels of psychological problems that are addressed in psychotherapy, are the final constructs of the Transtheoretical Model. Critiques of this model have stated that change is a continuous process, and should not be categorized.

The Social Cognitive Theory, formerly known as the Social Learning Theory, focuses on the explanation of behavior change through behavioral, environmental, and personal factors (25). The creator of this theory, Bandura, states that factors must be targeted in health education and promotion. This idea became known as reciprocal determinism. Constructs of this theory include knowledge, defined as learning facts and gaining insights related to an action, idea, object, person or situation. Outcome expectations outline the anticipation of the probable outcomes that would facilitate behavior change. Outcome expectancies are the value a person places on the probable outcomes that result from the behavior change. Situational perception, or how one perceives the surrounding environment, which is the physical or social circumstances that surround a person, is also a construct of the Social Cognitive Theory. Finally, self-efficacy is the main construct of this theory. One limitation of this theory is that it tends to target those who are prepared to change their behavior, resulting in a lack of engagement of a large majority of the population.

Technology

Website Use

Because many individuals look to the Internet for nutrition information, a well designed website may serve as a method of nutrition education (26). According to Anderson and Krathwohl, blogs can be used to understand existing knowledge and to introduce new ideas (27). Thompson and colleagues conducted a nine-week web-based nutrition intervention with members of the United States Boy Scouts organization, and an eight week web-based nutrition intervention with girls to increase fruit and vegetable consumption. Both interventions resulted in increased fruit and vegetable consumption, and an increase in physical activity (28,29).

Social Media

Social creativity sharing enables students to share videos, pictures, and personal publications, and is widely used everyday. Facebook, Flickr, and YouTube are a few of the popular social creativity sharing sites. In an educational setting, students may use social creativity sharing for activities, such as making a video of a cooking demonstration (30). The Oregon Extension Nutrition Education Program conducted the Food Hero social marketing campaign which aimed to increase the amount and variety of fruits and vegetables consumed by low-income mothers with young children living at home, who speak English or Spanish, and who have access to the internet (30). It was found that social media sites Facebook, Twitter, and Pinterest were an effective way to engage the target audience in nutrition education.

Video-games

Baranowski and colleagues suggest that video games can be designed to facilitate behavior change (31). Potential mediators for behavior change through video games include knowledge increase and attitude change. The Center for Disease Control and Prevention has implemented behavior change video games through the BAM (Body and Mind) website (32). A behavior change video game designed to affect child diet and physical activity gave information about goals and energy balance at each level of the game (33). This game led to significant increases in fruit and vegetable intake, but had no effect on physical activity behavior. Baranowski and colleagues found that children participating in Squire's Quest, a video game designed to increase fruit, juice, and vegetable intake, increased fruit, juice, and vegetable consumption by 1.0 more servings than the children who did not participate in the video-game (34).

Social Marketing

Social marketing is the use of commercial marketing techniques to facilitate behavior change in target populations (25). A core construct of social marketing is the exchange theory, which implies the transfer of something valuable between two individuals or groups. In social marketing, the benefits the social marketer presents to the consumer must be more appealing than the losses and costs. Weinrich describes social marketing in eight constructs: product, or behavior that is intended for adoption, price, place, promotion, or mechanisms of message communication, publics, partnerships, policy, and purse strings, or funding. Social marketing has been used in many ways from nutrition education in preschoolers, to self-help weight management interventions. There are limitations to the social marketing approach. First, public health aims to reach as many people as possible, but social marketing is tailored to target audiences. Therefore,

some individuals might not receive the marketing messages. Social marketing also requires a lot of formative research in order to understand the target audience. While social marketing may be effective for changing a behavior once or a few times, it is not effective for maintenance of the behavior change.

Social Ecological Model

The Social-Ecological Model (SEM) is a model conceptualized to assist in the planning and evaluation of multiple-component nutrition education programs (35). The Social Ecological Model accounts for the five levels of influence of the social structure: policy, and systems; community; institutional or organizational, interpersonal, and individual. Contento and colleagues suggests intervening at multiple levels in order to increase effectiveness (18).

The outermost sphere is the social structure, policy, and systems sphere (35). This level is the broadest level of influence and includes local, state, and federal policies that regulate organizational or individual behavior. Policies are not limited to laws and regulations, but may include resources such as USDA's MyPlate.

The community level of influence includes social networks, norms and standards that exist formally and informally within social realms such as groups, partnerships, and organizations (36). The community level of the SEM focuses on collaborations in which individuals, groups, and organizations work together to create a change. It is important to note that broad community support for nutrition education may improve the behavior change environment (35).

The institutional or organizational level of influence includes factors that influence organizational behavior in businesses, schools, churches, public agencies,

service organizations, and professional or trade associations. Many nutrition interventions, such as school-based or workplace interventions, also take place at this level.

The interpersonal sphere outlines the level of influence primary groups such as peers, family, and friends have over an individual in terms of role delineation and identity (37). This sphere is important in that it accounts for the dynamic social environment that allows attitudes and actions of others to influence individual's behavior (35).

The final level of the SEM is the individual level (35). This level focuses on behavior choices and knowledge, attitudes, beliefs, and personality. Theories, such as the Transtheoretical Model are commonly employed when dealing with this realm of influence (23).

Intervention Mapping

Intervention mapping is a developmental strategy aimed to provide health promotion program planners with a framework for planning, implementation, and evaluation at every step (38). This particular planning approach is based on the importance of developing theory and evidenced informed programs. The first step in intervention mapping is conducting needs assessment, which will help establish program goals. Next is the development of matrices that state outcomes for behavior and environmental change, performance objectives, and select changeable determinants. An appropriate theory-based intervention is then identified and themes, sequence, and materials are designed to fit the chosen theory. Adoption and implementation follows, and consists of selecting methods and practical applications and designing interventions for adoption and implementation. The final step in intervention mapping is the

evaluation plan, which includes developing indicators and measures, and specifying evaluation design.

Mode of Delivery

Theater education has shown to be an effective method for increasing knowledge about health-related behaviors (14,39,40). Video-based learning can be highly effective if used in the correct way (41). If used in moderation, videos can improve learning by providing learners with visual description of the concepts being taught. Web-based nutrition education often places text and activities online, which allows participants to engage in the material at their own preference (42). Student Bodies 2, a web-based nutrition intervention focusing on overweight or obese students, resulted in only modest reductions in z-BMI after 16 weeks (43). Data indicated that participants may not have been motivated enough to use the web-based material as intended, resulting in less than optimal results. Text messages have been utilized to facilitate tailored messages to children, and research has shown that participants prefer the text messages to be positive in order to avoid temptation of an undesired behavior (44). However, text messages relaying tailored messages are more likely to modify behavior in adults than in children (45). Nutrition education through video games is a new method of education and is not well understood (31). However, in multiple fields of study, video games have shown positive effects, with 26 out of 27 studies demonstrating promising development in this area (46). Bravender and colleagues conducted a study to determine if reading age-appropriate novels could improve BMI, and exercise and nutrition behaviors in females age 9 to13. This study found significant decreases in BMI in the intervention group compared to the control group. Board games have been used to facilitate learning in the

school setting, and other multimedia games have shown to successfully increase nutrition knowledge and dietary behavior change (47). A randomized study was designed to assess the efficacy of a board game, Kaledo, in increasing nutrition knowledge and promoting healthy weight in middle school students. There was a significant difference in nutrition knowledge, supporting evidence that board games facilitate learning.

Peer Led Nutrition Education

Peer education may be a more effective method for positive health behavior change than adult led education (48). Peer educators are defined as students delivering an educational program who are of similar age as the target audience. The framework for peer educators stems from the Social Cognitive Theory in that children are influenced by the expectations, attitudes and behaviors of peer groups. Mellanby and colleagues conducted a systematic review to understand the efficacy of peer led nutrition education in comparison to adult led education (48). Out of 13 studies, seven reported knowledge gains and positive attitude changes. One study resulted in more knowledge gain in adult led students than peer led students. Peer led interventions were also more effective in behavior change than adult led nutrition interventions (49). A study focusing on perceptions of adolescents involved in promoting lower-fat foods in schools concluded that youth may prefer to deliver health education themselves, and that students would prefer to receive information from peers.

Group Size

Group learning has been found to improve classroom learning through key factors, such as learning environment, concentration on teaching and learning, purposeful teaching, high expectations, positive reinforcement, and monitoring progress (50). Child

to teacher ratio also plays a role in participant success. The Student Teacher Achievement Ratio found that students with lower student to teacher ratio classrooms outperformed classmates with higher student to teacher classrooms after four years (51). A follow up study found that students with lower student to teacher ratio classrooms were 2% more likely to be enrolled in college at age 20 than students with higher student to teacher ratio classrooms.

Demographics of Participants

Demographic characteristics of participants are an important factor to consider (52). In particular, participant culture should be considered when developing nutrition education interventions. Culture is defined as norms, values, beliefs, expectations, actions and emotional responses (53). Delgado-Gaiten and colleagues found that teaching and learning strategies adopted in classroom settings may be in conflict with the natural learning strategies of the learner because of cultural differences. Because of this, teachers have found the need to re-evaluate traditional teaching strategies to accommodate for cultural diversity.

Cultures may differ by country or by community (53). A study considered the differences in metropolitan, provincial, rural, and mining town schools and found that learning strategies, student behavior, and teacher-student relationships differed in each of these communities (54). This study indicates the need to identify culturally sensitive factors of learning environments of multi-cultural students in order to create effective teaching strategies.

Strategies to enhance cultural appropriateness have been outlined (18). Peripheral strategies using preferred colors, images, fonts, or picture of group members to convey

relevance to the group may increase cultural appropriateness. Evidential strategies that seek to enhance the perceived relevance of the health issue for a particular group may improve appropriateness. Other strategies include linguistically appropriate materials, and involving the audience through cultural experiences of the staff.

Dialogue Style

Interactions between students and instructors are important aspects of learning, and are responsible for information sharing, understanding, providing feedback, and building knowledge and skills (55). It is suggested that nutrition educators should encourage participants to talk with each other. When participants do not interact with one another and the nutrition educator simply lectures about the information, complex cognitive processes do not occur. These cognitive processes facilitate memory, elaboration, or changes in attitude. Facilitated discussions have been effective in promoting conversations that require complex cognitive processes (18).

Caregiver Involvement

Effective caregiver involvement may play a role in child learning and behavior modification (56). Practices of parents or caregivers may influence a child's behavior to consume or reject health foods. Therefore, parents or caregivers should be involved in nutrition education. Parents can be involved through educational sessions, assisting with nutrition related activities sent home with children, or through other channels designed to minimize burden on busy parents (18).

Goal Setting

A goal is defined as the object or aim of an action (57). Goal setting is a technique that is frequently used to facilitate behavior change, and has been seen to

promote dietary change in both adults and children. Goal setting is important because it increases perceptions for self-efficacy and mastery, which may create a sense of fulfillment (18). Four steps are suggested for adult goal setting: recognizing need for change, establishing a goal, monitoring goal-related activities, and self-reward for goal attainment. Adult nutrition interventions that included goal setting have been effective at changing behavior. In child interventions, goal setting was an effective behavior change strategy (58). However, goal-setting process and successful goal setting strategies for children remain unknown.

Socioeconomic Status

The Centers for Disease Control and Prevention defines socioeconomic status as a measure, which includes economic, social, and work status (59). Economic status is measured by income, social status is measured by education, and work status is measured by occupation. The United States Department of Health and Human Services reported that the majority of children who are obese do not live below the 130% poverty line. All boys, girls, non-Hispanic white, and non-Hispanic black girls who live in a highly educated household are less likely to be obese than children who live in households where the lead has less than a high school degree. In addition, from 2005 to 2008, the prevalence of childhood obesity increased in children at all levels of income and education except in girls living in households where the head had at least a college degree (60). Trends, such as these, indicate that there is a need to consider socioeconomic status, rather than income, social, or work status alone.

Instructor Training

Rosario, and colleagues have found that the amount of instructor training has been shown to impact the effectiveness of childhood nutrition education interventions (61). A study was conducted to assess the effects of a six-month nutrition program delivered by first through fourth grade classroom teachers with 72 hours of in-service nutrition training. The three intervention schools had significantly greater differences in z-BMI than the four control schools, whose teachers received no in-service training.

Food choices and dietary behaviors are determined by many different factors, and require that the nutrition educator have a variety of skills (18). The Society of Nutrition Education has identified five competencies in which nutrition educators should be proficient: food and nutrition content, eating behavior, behavioral and educational theory, research methods and program evaluations, and design and delivery of nutrition education (62).

Process Evaluation

Process evaluations assist in understanding the implementation, receipt, and setting of an intervention, and help in interpreting the outcomes (63). The objective of a process evaluation is to examine the participant perceptions of an intervention, study the implementation of the intervention, distinguish between components of the intervention, explore factors that affect an intervention, monitor dose to assess the reach of the intervention, and study how the intervention effects vary in subgroups (64). Finally, process evaluations may assist in differentiating interventions that are faulty, and those that are poorly implemented (65). Process evaluations are commonly conducted through surveys, but can be conducted through focus groups, interviews, researcher observations,

and structured field notes. When utilizing process evaluations, process data should be collected from all intervention and control sites; data should be quantitative and qualitative; process data should be analyzed before outcome data; and bias should be minimized through statistical analysis (66).

Surveys and Data Collection

Tools chosen to collect data depend heavily on the exact indicators chosen for each study and should be based on goals and objectives of the nutrition education intervention (18).

Evaluation mediators to behavior change are short-term outcomes. When identifying evaluation tools, mediators that are actually being measured should be considered. Examples of indicators include the following: increased awareness of risks or issues of concern, increased outcome expectancies, decreased sense of barriers, and improved attitudes or feelings toward the targeted behaviors. In order to collect data on mediators to behavior change, surveys, in-depth interviews, or focus groups may be used (18).

Behavioral-focused nutrition interventions assessing behavior modification are considered medium-term outcomes. Food intake may be measured through observations of intake, 24-hour dietary recall, food records, food frequency questionnaire, food intake checklist or short food frequency questionnaire, and food intake checklist or screener. When choosing an instrument to analyze food intake, food lists must use foods commonly eaten by study participants, and the names of food should be clear. Food frequency questionnaires tend to overestimate intakes, and should be used to compare intakes before and after the intervention, rather than to measure actual intakes. Food

behavior checklists or questionnaires, or eating patterns should be used to assess eating behaviors or patterns. Diet quality can be measured through diet quality indices or questionnaires, such as the Healthy Eating Index (18).

Physiological or health outcomes, such as change in BMI, are considered long-term outcomes and may be measured by biochemical or physiological measures. Examples include diabetes management measured through blood glucose levels, or weight gain prevention and BMI (18).

Intervention Material for Participants

Printed materials allow participants who may be apprehensive to discuss issues in a group to read and learn in private, and reinforce information discussed in a group setting or presentation (18). When choosing printed materials, the following questions should be considered: what is the primary purpose of each printed piece, what are the secondary purposes, what actions or behaviors will the audience take from this piece, how will this piece be used, who is the intended audience, what length should the piece be, what resources are available, how will you evaluate the effectiveness of these materials. In addition, printed material should be tailored to the audience, motivational and reader friendly, simple and direct, and easy to read.

Duration

Interventions with more contact hours have been more effective (67). In the CATCH study, the intervention duration was 15 to 20 hours per year for three years. This study led to behavior changes that were maintained at 3-year follow-up (68). Other researchers suggest durations of 50 hours (18). In order to provide sufficient duration

and intensity, multiple levels and methods of intervention should be utilized in order to attenuate short consumer attention spans.

Number of Messages per Session

When developing childhood nutrition education interventions, it is important to focus on two to five messages (18). While the entire session or presentation should provide enough information to be convincing, enhance decision-making, or provide a new skill, the information must be manageable in length and complexity in order to facilitate learning. Main points should also be emphasized so the audience can determine the message importance.

Presentations

Presentations may be used to deliver information to an audience at various settings (18). When delivering a presentation, it is suggested that the nutrition educator, or presenter, develop rapport with the audience, appear confident and appropriately groomed, maintain eye contact, and develop a safe learning environment.

School Involvement

The school environment can have a substantial impact on child dietary behavior because 35% to 40% of daily calories are consumed at school (69). School-based nutrition interventions have improved dietary behavior through nutrition education and strategies, such as improving variety and attractiveness of fruits and vegetables served, increasing the availability of an extra fruit item when a dessert was served, and point-of purchase signs in the cafeteria to encourage healthy eating (70). The CATCH study focused on decreasing total fat, saturated fat, and sodium in the school meals through training of food service staff on meal planning, food purchasing, food preparation

methods, and program promotion (67). In the Cookshop study, the food service workers learned to prepare healthier meals from scratch (71). Treatment group students received nutrition education and environmental change, while control group students received the environmental change, but no nutrition education. The treatment group had a significantly higher fruit and vegetable intake than the control group. These studies exemplify the importance of nutrition education in conjunction with environmental changes in the school.

Limited Information

Literature regarding instructor demographics, instructor material, number of instructors, and instructor education is limited.

CHAPTER II
MANUSCRIPT

Background

Childhood obesity remains a major concern in the United States (6). In the past 30 years the rate of obesity increased from 7% to 18% in 6 to 11 year olds (3,6). Obese youth have an increased risk of developing cardiovascular disease, diabetes, and psychological problems (2,4). Children who are obese are more likely to be obese in adulthood, which may increase the risk of heart disease, type 2 diabetes, stroke, and cancer. Many factors influence lifestyle habits that may lead to obesity (5). These factors include families, communities, schools, child-care setting, medical care providers, faith-based institutions, government agencies, and the media. While changes in knowledge alone are not enough to change behavior, many nutrition interventions to reduce childhood obesity include nutrition education.

It is important to understand key elements and approaches that make childhood nutrition education interventions more or less effective. Various efforts to identify best practices for childhood nutrition education have been made, including those made by institutions such as the Washington State Basic Food Nutrition Education Program (10); Johns Hopkins Center for a Livable Future (11); the office of the Superintendent of Public Instruction of Washington (40); the Breakfast for Learning program (12); the Society for Nutrition Education and Behavior (14); government agencies such as the USDA Food and Nutrition Services (13); and the Institute of Medicine (72). Textbooks, such as *Nutrition Education: Linking Research, Theory, and Practice* determined best practices through literature reviews (18).

These efforts utilized different methods to identify best practices, and all resulted in various identified practices (Attachment 1). Of 31 best practices identified through literature review, there was little agreement or overlap in the previously identified practices (appendix D). Only eight practices were cited three or more times, and 21 of the 31 practices were only identified by one of the sources. Additionally, the sources did not provide a detailed explanation of the practice. Thus, it is possible that of those practices cited three or more times, different experts may have had different understandings or perceptions of what the practice involved.

The purpose of this project was to determine if experts (with demonstrated expertise in childhood nutrition education) after evaluating previously identified best practices, would generate a congruent list of best practices with consistent narrative explanations of the practices. If such a list could be produced it could be used when developing future childhood nutrition education interventions. If a list is unable to be produced, this would indicate potential inadequacies in existing resources detailing best practices and highlight the need for future research investigating the feasibility of identifying expert-accepted best practices in nutrition education.

Methods

Identification of Best Practices

A literature review was conducted in order to identify previously identified best practices for childhood nutrition education. Sources were identified in PubMed using the key terms "nutrition education," "childhood nutrition," "best practices in nutrition education," and "nutrition education intervention." One textbook was identified by searching the university library online card catalog. A Google search using the key

terms, “nutrition education,” “childhood nutrition,” “best practices in nutrition education,” “childhood nutrition education interventions,” and “best practices in nutrition” identified one government report. Sources were included if they were published in the last ten years, written in English language, and focused on nutrition education for children 6 to 12 years of age. While the terms “best practices” did not have to be included, most sources used “best practices,” “promising practices,” or similar terms. Eight sources were identified in the literature review. Thirty-one best practices were identified, with 21 practices being cited once, four practices cited twice, six practices cited three times, one practice cited four times, and one practice cited five times.

A list of identified practices was sent, via email, to a content review panel consisting of five members of a nutrition education focused USDA multi-state research group. The list was reviewed for content and panel members provided feedback on edits, additions, and deletions of best practices needed. During this phase, five practices were deleted as the content review panel experts did not see them as essential, and the experts added three practices that were not found in the literature. This initial stage did not generate a congruent list of best practices with consistent narrative explanations of the practices.

Given the inconsistencies between previously existing best practices and the non-cohesive list generated from the initial content review panel, to gain further understanding of expert opinion about childhood nutrition education best practices, an interview script was developed by a team of four researchers. The interview script was developed based on the revised list of best practices developed in the previous research step by the content review panel. The interview script was cognitively interviewed and

tested with five additional nutrition education research experts who had not been in the previous content review panel to determine if the questions were clear and queried on the information the researchers intended to investigate (73). In addition to revisions in the interview script, the five additional nutrition education research experts also contributed their thoughts and opinions on best practices in childhood nutrition education. Changes were made according to feedback after each interview. Changes included three practices being deleted and eight practices being combined (as seen in the cognitive interviewing section of (Attachment 2). To gather consensus on changes in the interview script and list of best practices to include in the interview process, a second round of cognitive interviews were conducted with the same five experts and four more practices were added (final interview script as seen in Appendix B)

Interviews

Thirteen experts were first contacted via email to ask if they were willing to participate in the research project. Six experts agreed to participate, three did not participate, and four did no respond. The six experts who agreed were emailed the list of previously identified best practices, asked to review the list, and an interview was scheduled at his or her convenience. One expert did not schedule an interview, and one expert did not complete the ranking process. Four interviews were recorded and conducted over the telephone. Interviews lasted no more than two hours.

Experts gave verbal consent at the beginning of the interview process. Experts were then asked if they believed that any additions, omissions, or edits should be made the list of best practices previously reviewed. Finally, the primary researcher conducted the interview according to the interview script (Appendix B).

Emerging concepts about each practice were documented in notes during the interviews and again after listening to the recordings of the interviews. Concepts for each practice were compiled and summarized in narrative form. All four experts that participated in the interview process received a document listing the practices, rankings and the corresponding narrative summaries provided by all four experts and they were asked to verify that the rankings and summaries captured what they thought about each practice or if there were any changes they would like to make to their summary or rankings (Attachment 3). One expert changed the wording of a description, and one expert changed the practice ranked number 4 from " Community/school involvement" to "Based on the interest of the community."

Results

There was little consensus among experts about best practices for childhood nutrition education interventions (Appendix C). Among the top 10 best practices each of the four experts ranked during interviews, a total of 19 practices were included. Two practices were suggested as additions, "activities should be experimental," and "evaluations should be included." Two practices were assigned the same ranking more than once, "theory based," and "based on the interest of the community." Three practices were ranked as a top ten best practice four times, and four practices were ranked as a top ten best practice three times. Two practices were ranked as a top ten best practice two times, and nine practices were ranked as top ten best practices one time. Expert opinion of descriptions of each practice differed as well (Attachment 3).

The expert interviews also indicated that challenges in childhood nutrition education might prevent evidence based best practices from being implemented. For

example, evidence suggests that parental involvement may be an effective practice; however, it may be challenging to involve caregivers in a way research may suggest. Experts believed that it was important to base nutrition education not only on evidence-based practices, but realistic practices.

Discussion

This study identified diversity in expert opinion on best practices for childhood nutrition education interventions. This research process highlighted the differences in current recommendations in the literature and incongruent opinions among experts in childhood nutrition education. While during interviews experts thought the same 13 practices were essential for childhood nutrition education, indicating some level of consistency in expert opinion, prioritization of those 13 practices varied. All experts ranked "theory-based," "seeks to modify behavior," and "based on the interests of the community;" however, "theory-based" was cited twice in the reviewed literature, "seeks to modify behavior" was cited four times, and "based on the interests of to community" was cited two times. Additionally, "appropriate duration" was cited five times in the reviewed literature, but ranked in the top ten by only one expert.

Since conduction of the initial literature review, the Academy of Nutrition and Dietetics (the Academy) has established best practices for nutrition education interventions (74). Identified best practices include the following: integrate education with supportive environmental change; include both nutrition education and physical activity; build in parent engagement for younger children; promote community engagement in school and child care; policies that limit food availability show promise; and dose and continuity is important. Four of the six practices were comparable to best

practices identified through the initial literature review. The Academy identified "dose and continuity" as a best practice, but as previously noted, only one expert in this study ranked "appropriate duration" as a top 10 best practice. "Include both nutrition education and physical activity" was identified by the Academy and ranked three times as a top ten best practice. Finally, "parent engagement" and "promote community engagement in school and child care" were both ranked as top 10 best practices twice as "caregiver involvement" and "community/school should be involved," respectively.

Implication for Research and Future Practice

While a small number of expert opinions cannot adequately determine best practices for childhood nutrition education, this research project has demonstrated the lack of consensus within the field of childhood nutrition education on best practices. This research clearly demonstrates the need for future research investigating not only whether best practices exist but if they do exist, future research is needed to not only identify the practices but also to define the practices to reduce potential difference in interpretation.

LIST OF REFERENCES

1. Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of obesity and trends in body mass index among US children and adolescents, 1999-2010. *JAMA: the journal of the American Medical Association.* 2012/02/01/ 2012;307(5):483-490.

2. Freedman DS, Khan LK, Serdula MK, Dietz WH, Srinivasan SR, Berenson GS. The relation of childhood BMI to adult adiposity: the Bogalusa Heart Study. *Pediatrics.* 2005/01// 2005;115(1):22-27.

3. Freedman DS, Mei Z, Srinivasan SR, Berenson GS, Dietz WH. Cardiovascular risk factors and excess adiposity among overweight children and adolescents: the Bogalusa Heart Study. *J. Pediatr.* 2007/01// 2007;150(1):12-17.e12.

4. Freedman DS, Wang J, Thornton JC, et al. Classification of body fatness by body mass index-for-age categories among children. *Arch Pediatr Adolesc Med.* 2009/09// 2009;163(9):805-811.

5. CDC - Obesity - Facts - Adolescent and School Health. http://www.cdc.gov/healthyyouth/obesity/facts.htm

6. Ogden CL. Prevalence of Obesity and Trends in Body Mass Index Among US Children and Adolescents, 1999-2010. *JAMA: The Journal of the American Medical Association.* 2012/02/01/ 2012;307(5).

7. CDC - Chronic Disease - Obesity - At A Glance. http://www.cdc.gov/chronicdisease/resources/publications/aag/obesity.htm

8. Grants. *RWJF* http://www.rwjf.org/en/grants.html

9. National Nutrition Education Curriculum Standards - Institute of Medicine. http://www.iom.edu/Activities/Nutrition/NutritionEducationStandards.aspx

10. Kiley V, Gail B, Trish B, Harriett H, Faith J. Promising Practices in Nutrition Education: Choosing the Right Nutrition Education Currciulum for Your Program. Washington State Department of Health; 2009.

11. The Johns Hopkins Center for a Livable F. *Perspectives on Childhood Obesity Prevention: Recommendations from Public Health Research and Practice.* 615 N Wolfe Street E2150 Baltimore, MD 2007 Winter 2007.

12. Jacqueline R. Best Practices for Child Nutrition Programs: a Review of the Literature. Breakfast for Learning, Canadian Living Foundation; 2004.

13. Food, Nutrition S. Nutrition Education and Promotion: The Role of FNS in Helping Low-Income Families Make Healthier Eating and Lifestyle Choices: A Report to Congress. 2010.

14. Shure J, Contento I. *State of Nutrition Education and Promotion for Children and Adolescents.* Indianapolis, IN: Society for Nutrition Education; 2009 2009.

15. Moll PH. School Wellness Policy Best Practices for Policy Development, Implementation and Evaluation. 2013.

16. Vilsack TJ. The Healthy, Hunger-Free Kids Act--building healthier schools. *Childhood obesity (Print).* Feb 2012;8(1):4.

17. Roseman MG, Riddell MC, Haynes JN. A content analysis of kindergarten-12th grade school-based nutrition interventions: taking advantage of past learning. *J Nutr Educ Behav.* Jan-Feb 2011;43(1):2-18.

18. Contento I. *Nutrition Education:Linking Research, Theory, and Practice.* 2 ed. Sudbury, Massachusetts: Jones and Bartlett Publishers, LLC; 2011.
19. Barry W. *Piaget's Theory of Cognitive Development.* White Plains, New York: Longman Group Ltd; 1996.
20. Taylor L. *Introducing Cognitive Development.* New York, New York: Psychology Press Inc; 2005.
21. Sarasin LC. *Learning Styles Perspectives.* 2 ed. Madison, WI: Atwood Publishing; 2006.
22. Konig M. *Theory of Learning Styles and Practical Applications.* Norderstedt, Germany: Books on Demand GmbH; 2005.
23. Glanz K, Rimmer B, Viswanath K. *Health Behavior and Health Education: Theory, Research, and Practice.* 4th ed: John Wiley & Sons, Inc.; 2008.
24. Contento I. Review of Nurtion Education Research in the Journal of Nutrition Education and Behavior,1998 to 2007. *Journal of Nutrition Education and Behavior.* 2008/12//November 2008;40(6):331-340.
25. Sharma M, Romas J. *Theoretical foundations of health education and health promotion.* Sudbury, Massachusetts: Jones and Bartlett Publishers, LLC; 2008.
26. Brug J, Oenema A, Kroeze W, Raat H. The internet and nutrition education: challenges and opportunities. *Eur J Clin Nutr.* 2005/08// 2005;59 Suppl 1:S130-137; discussion S138-139.
27. Krathwohl D. A Revision of Bloom's Taxonomy: an Overview. *Theory into Practice.* 2002 Autumn 2002;41(4).
28. Thompson D, Baranowski T, Baranowski J, et al. Boy Scout 5-a-Day Badge: outcome results of a troop and Internet intervention. *Preventive medicine.* 2009/12// 2009;49(6):518-526.
29. Thompson D, Baranowski T, Cullen K, et al. Food, fun, and fitness internet program for girls: pilot evaluation of an e-Health youth obesity prevention program examining predictors of obesity. *Preventive medicine.* 2008/11// 2008;47(5):494-497.
30. Tobey LN, Manore MM. Social Media and Nutrition Education: The Food Hero Experience. *Journal of Nutrition Education and Behavior.* 2014/03// 2014;46(2):128-133.
31. Baranowski T, Buday R, Thompson D, Baranowski J. Playing for real: Video games and stories for health-related behavior change. *American Journal of Preventative Medicine.* 2008/01// 2008;34(1):74-82.
32. CDC - BAM, Home. http://www.cdc.gov/bam/
33. Baranowski T, Baranowski J, Thompson D, et al. Video game play, child diet, and physical activity behavior change: a randomized clincial trial. *American Journal of Preventative Medicine.* 2011/01// 2011;40(1):33-38.
34. Baranowski T, Baranowski J, Cullen KW, et al. Squire's Quest! Dietary outcome evaluation of a multimedia game. *Am J Prev Med.* 2003/01// 2003;24(1):52-61.
35. Gregson J, Foerster S, Orr R, Jones L. System, Environmental, and Policy Changes: Using the Social-Ecological Model as a Framework for Evaluating Nutrition Education and Social Marketing Programs with Low-Income Audeinces. *Society for Nutrition Education.* 2001/09// 2001;33(1).

36. Building Collaborative Communities - An Essay by Scott London. https://access.utk.edu/articles/,DanaInfo=www.scottlondon.com+oncollaboration.html
37. McLeroy KR, Bibeau D, Steckler A, Glanz K. An ecological perspective on health promotion programs. *Health Educ Q.* 1988 1988;15(4):351-377.
38. Bartholomew LK, Parcel G, Kok G, Gottlieb N, Fernandez M. *Planning Health Promotion Programs: An Intervention Mapping Approach.* 3 ed. Hoboken, NJ: Jossey-Bass; 2012.
39. Position of the American Dietetic Association: individual-, family-, school-, and community-based interventions for pediatric overweight. *Journal of the American Dietetic Association.* 2006/06// 2006;106(6):925-945.
40. Moll PH. School Wellness Policy Best Practices for Policy Development, Implementation and Evaluation.
41. Yadav V. *Using Multimedia in Education.* Delhi, IND: Global Media; 2006.
42. Baranowski, Frankel. Let's get technical! Gaming and technology for weight control and health promotion in children. *Childhood Obesity.* 2012/02/08/ 2012.
43. Jones M, Luce KH, Osborne MI, et al. Randomized, controlled trial of an internet-facilitated intervention for reducing binge eating and overweight in adolescents. *Pediatrics.* 2008/03// 2008;121(3):453-462.
44. Woolford SJ, Barr KLC, Derry HA, et al. OMG do not say LOL: obese adolescents' perspectives on the content of text messages to enhance weight loss efforts. *Obesity (Silver Spring).* 2011/12// 2011;19(12):2382-2387.
45. Robbins LB, Gretebeck KA, Kazanis AS, Pender NJ. Girls on the move program to increase physical activity participation. *Nurs Res.* 2006/06//May-undefined 2006;55(3):206-216.
46. Bravender T, Russell A, Chung RJ, Armstrong SC. A "novel" intervention: a pilot study of children's literature and healthy lifestyles. *Pediatrics.* 2010/03// 2010;125(3):e513-517.
47. Amaro S, Viggiano A, Di Costanzo A, et al. Kalèdo, a new educational board-game, gives nutritional rudiments and encourages healthy eating in children: a pilot cluster randomized trial. *Eur. J. Pediatr.* 2006/09// 2006;165(9):630-635.
48. Mellanby AR, Rees JB, Tripp JH. Peer-led and adult led school health education: a critical review of available compartative research. *Health Education Research.* 2000 2000;15(5):533-545.
49. Hamdan S, Story M, French S, Fulkerson J, Nelson H. Perceptions of Adolescents Involved in Promoting Lower-Fat Foods in Schools: Associations with Level of Involvement. *Journal of the American Dietetic Association.* 2005/02// 2005;15(2).
50. Sammons P, Hillman J, Morimore P. *Key characeteristics for effective schools: a review of school effectiveness research.* London, England: Office of Standards in Education; 1995.
51. Chingos MM, Whitehurst GJR. Class Size: What Research Says and What it Means for State Policy. *The Brookings Institution*

http://www.brookings.edu/research/papers/2011/05/11-class-size-whitehurst-chingos

52. Phelan P, Davidson A, Cao H. Students' multiple worlds: Megotiating the boundaries of family, peer, and school cultures. *Anthropology and Education Quarterly.* 1991 1991;22:224-250.

53. Delgado-Gaiten C, Trueba H. *Crossing cultural borders.* London, England: The Falmer Press; 1991.

54. Thaman KH. Culture and the curriculum in the South Pacific. *Comparitive Education.* 1993 1993;29(3):249-260.

55. Luppicini R. *Handbook of Conversation Design for Instructional Applications.* Hershey, New York: Information Science Reference; 2008.

56. Hornby G. *Improving Parental Involvment.* London, England: Continuum International Publishing; 2000.

57. Bandura A. *Social Foundations for Thought and Action: A Social Cognitive Theory.* Englewood Cliffs, NJ: Prentice Hall; 1986.

58. Cullen KW, Baranowski T, Smith S. Using goal setting as a strategy for dietary behavior change. *Journal of the American Dietetic Association.* 2001/05// 2001;101(5):562-565.

59. CDC - Social Determinants of Health - Definitions. http://www.cdc.gov/socialdeterminants/Definitions.html

60. Ogden CL, Lamb M, Carroll M, Felgal K. *Obesity and Socioeconomic Status in Children and Adolescents: United States, 2005-2008.* Hyattsville, MD: U.S. Department of Health and Human Serivices; 2010/12// 2010. 51.

61. Rosário R, Oliveira B, Araújo A, et al. The impact of an intervention taught by trained teachers on childhood overweight. *Int J Environ Res Public Health.* 2012/04// 2012;9(4):1355-1367.

62. Mita SC, Li E, Goodell LS. A qualitative investigation of teachers' information, motivation, and behavioral skills for increasing fruit and vegetable consumption in preschoolers. *J Nutr Educ Behav.* Nov-Dec 2013;45(6):793-799.

63. Dour CA, Horacek TM, Schembre SM, et al. Process Evaluation of Project WebHealth: A Nondieting Web-based Intervention for Obesity Prevention in College Students. *Journal of nutrition education and behavior.* 2013/02/11/ 2013.

64. Stephenson J, Imrie J, Bonnel C. *Unpacking the "black box": the importance of process data to explain outcomes.* Oxford: Oxford University Press; 2002.

65. Rychetnik L, Frommer M, Hawe P, Shiell A. Criteria for evaluating evidence on public health interventions. *J Epidemiol Community Health.* 2002/02// 2002;56(2):119-127.

66. Oakley A. Process evaluation in randomised controlled trials of complex interventions. *BMJ.* 2006/02/18/ 2006;332(7538):413-416.

67. Luepker RV, Perry CL, McKinlay SM, et al. Outcomes of a field trial to improve children's dietary patterns and physical activity. The Child and Adolescent Trial for Cardiovascular Health. CATCH collaborative group. *JAMA: the journal of the American Medical Association.* 1996/03/13/ 1996;275(10):768-776.

68. Connell DB, Turner RR, Mason EF. Summary of findings of the School Health Education Evaluation: health promotion effectiveness, implementation, and costs. *J Sch Health.* 1985/10// 1985;55(8):316-321.
69. Cullen KW, Zakeri I. Fruits, vegetables, milk, and sweetened beverages consumption and access to à la carte/snack bar meals at school. *American journal of public health.* 2004/03// 2004;94(3):463-467.
70. Reynolds KD, Franklin FA, Binkley D, et al. Increasing the fruit and vegetable consumption of fourth-graders: results from the high 5 project. *Preventive medicine.* 2000/04// 2000;30(4):309-319.
71. Liquori T, Koch PD, Contento IR, Castle J. The cookshop program: outcome evaluation of a nutrition education program linking lunchroom food experience with classroom cooking experiences. *J Nutr Educ Behav.* 1998 1998;30(5).
72. Roseman M, Riddell M, Haynes J. Content analysis of kindergarten-12th grade school-based nutrition interventions: taking advantage of past learning. *Journal of Nutrition Education and Behavior.* 2011 2011;43(1):2-18.
73. Beatty PC, Willis GB. Research Synthesis: The Practice of Cognitive Interviewing. *Public Opin Q.* 2007/06/20/ 2007;71(2):287-311.
74. PURPOSIVE SAMPLING : SAGE Research Methods. http://srmo.sagepub.com/view/the-sage-dictionary-of-social-research-methods/n162.xml
75. Howerton MW, Bell BS, Dodd KW, Berrigan D, Stolzenberg-Solomon R, Nebeling L. School-based nutrition programs produced a moderate increase in fruit and vegetable consumption: meta and pooling analyses from 7 studies. *Journal of nutrition education and behavior.* 2007/08//Jul-undefined 2007;39(4):186-196.
76. Cullen KW, Baranowski T, Owens E, Marsh T, Rittenberry L, de Moor C. Availability, accessibility, and preferences for fruit, 100% fruit juice, and vegetables influence children's dietary behavior. *Health Educ Behav.* 2003/10// 2003;30(5):615-626.
77. Lefebvre RC, Olander C, Levine E. The impact of multiple channel delivery of nutriton messages on student knowledge, motivation, and behavior: results from the team nutrition pilot study. *Social Marketing Quarterly.* 1999 1999;5:90-98.
78. Lytle LA, Murray DM, Perry CL, et al. School-based approaches to affect adolescents' diets: results from the TEENS study. *Health Educ Behav.* 2004/04// 2004;31(2):270-287.
79. Perry CL, Bishop DB, Taylor GL, et al. A randomized school trial of environmental strategies to encourage fruit and vegetable consumption among children. *Health Educ Behav.* Feb 2004;31(1):65-76.
80. Hoelscher DM, Feldman HA, Johnson CC, et al. School-based health education programs can be maintained over time: results from the CATCH Institutionalization study. *Prev Med.* May 2004;38(5):594-606.
81. Agriculture USDo. Dietary guidelines for Americans 2010. 2010.

APPENDICES

APPENDIX A
MATERIALS AND METHODS

Project Overview

The purpose of this study is to identify nutrition education experts' opinions concerning best practices for childhood nutrition education interventions. In order to do so, practices that may influence intervention outcome were identified through a review of peer-reviewed articles, textbooks, and gray literature. Based on the identified practices, interview scripts were developed. Interviews included questions regarding specific characteristics of previously identified best practices. Face validation, content validation, and cognitive interviews were completed. In order to identify best practices, phone interviews were conducted with experts in nutrition education. After interviews were completed, emerging concepts were documented, and the collected data was complied and organized into notes regarding the corresponding best practice. Participants were then asked to rank the top 10 best practices that they believed were essential for effective childhood nutrition education.

Research Team

The research team was comprised of individuals with expertise in nutrition education interventions in children. The primary researcher has completed CITI training, and has served as a graduate research assistant and campus coordinator of the USDA iCook-4H research study; a program designed to promote health for 9-10 year olds and their parents through cooking, playing, and eating together. The primary researcher was involved with curriculum development for the iCook-4H program and has experience in educating 9 to 10 year olds about nutrition and culinary skills through the Mississippi State University Fun with Foods camp directed by Dr. Sylvia Byrd (1).

The research advisor, Dr. Sarah Colby, has 15 years of research experience with children, adolescents, college-aged individuals, and adults (2-4). In addition, she is a registered dietitian, and a member the Healthy Campus Research Consortium (HCRC). The HCRC is a USDA multi-state research group with expertise in food choice behavior, theory-driven health behavior education, exercise science, public health, and marketing. Over the past 20 years, this team has established an extensive multi-state, multi-institution publication record, and has received over ten million dollars of grant funding from the USDA, including an Initiative for Future Agriculture and Food Systems grant, and three National Research Initiative grants.

Dr. Karen Chapman-Novakofski served as co-author for this project. Dr. Chapman-Novakofski is interested in identifying and modifying food habits of people. She focuses on behavioral theories for developing community nutrition education research.

Dr. Marilyn Townsend also served as a co-author for this project. Dr. Townsend's research primarily focuses on childhood and adolescent nutrition education methodologies and program evaluation.

Procedures

Interview Script Development

Literature Review

Variables that may potentially affect childhood nutrition education interventions were gathered through reviewing current literature available on PubMed, through feedback from experts in nutrition education, and through textbooks. Google was utilized to identify documents, reports, or articles outlining best practices that have been established by other agencies or programs. Best practices were included if they pertained to nutrition education, and were published in the last ten years to ensure practices are current and relevant.

Variables included in the studies and documents gathered from the literature search were collected and recorded in a Microsoft Office Word document in a detailed outline format.

Content Review

HCRC members reviewed the content of the document and identified gaps, or missing potential variables, which have not been addressed. Revisions were made according to HCRC recommendations.

Cognitive Interviewing

The detailed outline was transformed into an interview script (Appendix B) that included major questions and prompts. The questions inquired about specific details for each previously identified best practice.

Face-to-face cognitive interviews were conducted with five different faculty members from the University of Tennessee Department of Nutrition and University of Tennessee Extension. All faculty members have experience in childhood nutrition education. National Institutes of Health define cognitive interviewing as administration of draft survey questions, and the verbal collection of additional information about survey responses. This technique is used to determine if the survey question is producing the information the author intended it to produce. It is also recommended that cognitive interviews be conducted with a sample that is relevant to and knowledgeable about the questionnaire topic (5). The primary researcher has been previously trained in cognitive interviewing protocols and has experience conducting cognitive interviews for survey development. After reading each question to the interviewee, the primary researcher asked, "In your own words, what is this question asking?" and "Are there any changes that should be made to the wording of this question?" After each cognitive interview, changes were made to the script according to feedback received through the cognitive interview.

In order to build a consensus and ensure all edits to the script are clear, an additional cognitive interview was conducted with the same interviewees.

Data Collection

All interviews were conducted by the primary researcher via telephone. The telephone interviews were recorded using a recording device, and the participants were asked to give verbal consent before continuing with the interview. The interview was voluntary, and the participant could choose to stop the interview at any time.

Purposive Sampling

The primary researcher used purposive sampling to recruit experts in childhood nutrition education (6). Purposive sampling allowed the primary researcher to include only participants who were knowledgeable in childhood nutrition education practices. This study defines a nutrition education expert as an individual having five or more years in childhood nutrition education experience, having received a PhD with a focus in nutrition education, and having five or more publications.

Interviews

Experts were first contacted via email to ask if they were willing to participate in this research project. Email addresses were obtained through publicly available online resources, such as university faculty webpages. If the expert agreed, he or she was emailed the list of previously identified best practices (Attachment 2), was asked to review the list, and scheduled an interview at his or her convenience. All interviews were recorded and conducted over the telephone. Interviews lasted no more than two hours.

At the beginning of the interview, the primary researcher began recording the conversation using the recording device. The participant was asked to give verbal consent.

Next, they were asked if any practice on the list of previously identified best practices should be added, omitted, or changed. Finally, the primary researcher conducted the interviews according to the interview script (Appendix B). The participant name and other identifiers were not used in the interview; however, the participants may be identified via voice recognition. All electronic files and recordings will be kept in a secure data file for the duration of the project and for at least three years thereafter at a location approved by the Institutional Review Board.

Emerging concepts about each practice were documented in notes during the interviews and again after listening to the recordings of the interviews. Concepts for each practice were compiled and summarized in narrative form. All experts that participated in the interview process received a document listing the practices, rankings and the corresponding narrative summaries provided by all four experts and were asked to verify that the rankings and summaries captured what they thought about each practice or if there were any changes they would like to make to their summary or rankings (Attachment 3).

LIST OF REFERENCES FOR APPENDIX A

1. Sylvia Byrd. Fun with Foods Summer Camp. 2012.

2. Ashley Person, Sarah Colby, Janie Eubanks. Nutritionopoly: Let Healthy Choices "Monopolize" Your Lifestyle. *J. Nutr. Educ. Behav.* 2011;43(4):303–305.

3. Ashley Person, Sarah Colby, Jessica Ann Bulova, Janie Whitehurst Eubanks. Barriers to particpation in worksite wellness program. *Nutr. Res. Pract.* 2010;4(2):149–154.

4. Colby S, Haldeman L. Peer-led Theater as a Nutrition Education Strategy. *J. Nutr. Educ. Behav.* 2007;39(1).

5. Beatty PC, Willis GB. Research Synthesis: The Practice of Cognitive Interviewing. *Public Opin. Q.* 2007;71(2):287–311.

6. Purposive Sampling : SAGE Research Methods. Available at: http://srmo.sagepub.com/view/the-sage-dictionary-of-social-research-methods/n162.xml [Accessed March 19, 2014].

APPENDIX B
INTERVIEW SCRIPT

Before I begin, I wanted to let you know that this conversation is being recorded. If that is not ok with you, please let me know and I will turn off the recording device and discontinue the interview process. Is it ok for us to continue with the recording?

If yes- Now I would like to obtain verbal consent to conduct this interview with you.

You are invited to participate in this study to learn about best practices in nutrition education. You are being interviewed because you are an expert in this area. This interview will last no more than one hour. If you agree to participate, you will receive emails asking your opinions about the findings from the interviews conducted. You will be asked to correspond with me via email until as a group, consensus has been reached between all interviewees about these best practices.

Findings of the study will be published in a peer-reviewed journal. You have the option of having your name included in the acknowledgements as a contributing expert.

There are minimal risks associated with participating in the study except time and inconvenience.

The information provided from you will be kept confidential. All collected data will be kept on a password protected computer and written data (including printed transcripts) will be locked in a file cabinet for seven years and then destroyed.

Participation in this study is voluntary. You can refuse to answer any questions and opt out of this study at any time.

If you have any questions or concerns about the research study please let me know and I will send you my contact information and the contact information for the University of Tennessee's Office of Research Compliance via email.

Would you like to participate in this research study?

If yes- Are there any changes or additions that you think are needed to the current list of best practices that you received via email?

If no-Would you be willing to tell me why you are not interested in participating in this study?

I am now going to say the best practice, and will then ask you a few questions about each specific practice.

Program Development

Theory-based
1. What theory or theories are most effective when working with 6-12 year olds?

Based on the interest of the population
2. What is the best model or process to use in order to understand the interests of the population?

Include multiple components of the Social Ecological Model
3. Ideally, what level or levels of the Social Ecological Model should the intervention target?

Appropriate duration
4. What is the optimal duration, frequency and total contact hours for a nutrition education intervention?

What is the optimal duration, frequency and total contact hours to change a dietary related behavior?

What is the optimal duration, frequency and total contact hours to change an anthropometric outcome?

Age range of participants
5. Among 6-12 year olds, what is the ideal age grouping for the intervention?

Curricula

Various teaching methods
6. What are the best teaching methods to utilize in order to get a successful outcome (i.e. experiential, auditory, visual)?

What are the added benefits to tailoring curriculum to specific learning styles?

Objectives
7. How many learner objectives should be set per lesson?

Clear instructions for program presentation
8. What should the leader material include to make the program instructions clear?

Organized and easy to read material
9. What should be done to make materials organized and easy to read?

What format or formats should the leader materials be in (i.e. online, paper, both)?

Activities

Culturally appropriate
10. What should be done to ensure that the intervention is culturally appropriate?

Caregiver involvement
11. How should the parent or caregiver be involved?

Should the parent or caregiver attend lessons together or separately from the child participant? Please explain.

In general, what kinds of activities should the parent or caregiver be involved in?

Utilize multi-media/technology

12. What are the most effective forms of multi-media and/or technology to utilize during the intervention?

    In which situations should the parent or caregiver and child participate in these activities together, separately, or a combination?

Goal setting

13. How should participants set goals in the intervention?

    How should participants track goals? (writing down goals, goal cards, online)

Utilize social marketing

14. How should social marketing be utilized in the intervention?

    What formats or techniques of social marketing have been effective?

Participant education materials

15. What format of education materials should be provided to the child participants? (i.e. participant worksheet, technology component)

    How often should these materials be provided to the participants?

    How much material should be provided to the participants?

Setting

Community/school involvement

16. What are effective ways the community and/or school could be involved in program implementation?

17. What are the most most effective ways to change the environment in these settings?

    Should the food availability or food pricing be changed in these settings?

Messages

Key messages

18. How many key messages should be presented at each lesson?

    What are the most important key messages that need to be used in nutrition education interventions?

Focus on behavior modification

19. What nutrition related behavior or behaviors should the intervention aim to modify?

Based on national dietary and physical activity guidelines

20. How should national dietary and physical activity guidelines be included in the intervention?

Leader characteristics

Trained nutrition educator or program staff that implemented nutrition education intervention

21. How should the leader be trained?
    What minimal credentialing should the nutrition educator or program staff that implemented the intervention have?

22. How long should the leader be trained for the specific program?

23. What is the optimal way to train the leader? (i.e. face-to-face training, self-teaching modules)

Appropriate leader

24. What are some characteristics the leader should have?
    How important is it that the leader is of similar racial/ethnic/socioeconomic background as participants?

Outcome/Evaluation

Analyze intermediate measures

25. What intermediate outcome should be measured? (i.e. FV knowledge)

Process evaluation

26. Who's feedback should the process evaluation include?

Are there any additional comments you would like to make?

APPENDIX C
EXPERT RANKINGS OF IDENTIFIED PRATICES

Rankings	Expert 1	Expert 2	Expert 3	Expert 4
1	Theory Based	Theory Based	Trained nutrition educator and/or program staff	Seeks to modify behavior
2	Based on national dietary and physical activity guidelines	Seeks to modify behavior	Based on the interest of the community	Based on the interest of the community
3	Based on the interest of the community	Based on national dietary and physical activity guidelines	Caregiver should be involved	Theory Based
4	Process evaluation should be included	Based on the interest of the community	Community/school involvement	Include objectives
5	Trained nutrition education and/or program staff	Activities should be experimental-*addition*	Seeks to modify behavior	Include goal setting
6	Caregiver should be involved	Include multiple components of the Social Ecological Model	Evaluations should be included (formative, process, outcome)-*addition*	Activities should be culturally appropriate
7	Seeks to modify behavior	Trained nutrition education and/or program staff	Utilize various teaching methods	Include multiple components of the Social Ecological Model
8	Include multiple components of the Social Ecological Model	Leader should be appropriate for audience	Include goal setting	Key messages should be included
9	Utilize various teaching methods	Appropriate duration	Activities should be culturally appropriate	Based on national dietary and physical activity guidelines
10	Include goal setting	Clear instructions for program presentation and easy to read	Theory Based	Community/school involvement

VITA

Kelsey Shanklin is from Corinth, Mississippi and graduated with a Bachelor of Science in Food Science, Nutrition, and Health Promotion from Mississippi State University in 2012. She began her Master of Science degree in Nutrition with a concentration in Public Health Nutrition at the University of Tennessee, Knoxville in 2012. At the University of Tennessee, Knoxville, Kelsey served as the project coordinator of iCook, a United States Department of Agriculture funded research project to promote health to 9 to10 year olds and their primary caregiver through cooking, playing, and eating together. Upon graduation, Kelsey hopes to become a Registered Dietitian.