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Increasing dark green leafy, yellow/orange, cruciferous vegetables, tomatoes, and physical activity in a low-income population: an evaluation of a critical thinking approach

Ingrid Richards-Adams
Iowa State University

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Increasing dark green leafy, yellow/orange, cruciferous vegetables, tomatoes, and physical activity in a low-income population: An evaluation of a critical thinking approach

by

Ingrid Richards-Adams

A dissertation submitted to the graduate faculty in partial fulfillment of the requirements for the degree of DOCTOR OF PHILOSOPHY

Co-majors: Nutritional Sciences; Family and Consumer Sciences Education

Program of Study Committee:
Suzanne Hendrich, Co-major Professor
Cheryl Hausafus, Co-major Professor
Beverly Kruempel
Gary Phye
Mary Jane Oakland

Iowa State University
Ames, Iowa
2006

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DEDICATION

Dedicated to my Lord and Savior Jesus Christ who has allowed me to finish this course.
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ABSTRACT

Intakes of dark green leafy, yellow/orange, cruciferous vegetables, and tomatoes (target vegetables), and involvement in physical activity have been shown to be protective actions against chronic diseases. Low-income individuals generally consume lower amounts of these target vegetables, engage in less physical activities, and experience higher incidences of chronic diseases. The study evaluated the effectiveness of a critical thinking approach in increasing (a) knowledge, (b) positive attitudes, (c) critical thinking skills of low-income parents related to vegetable offerings and physical activity, (d) the number of target vegetables low-income parents offer their children, and (e) the amount of time spent on physical activities in low-income children.

A two group randomized pretest posttest design was used. Participants were recruited from Drake University Head Start in Polk County, Iowa. The experimental group was exposed to two 45-minute sessions on vegetables and physical activity, one session per week, for two consecutive weeks. Sessions consisted of presentation of research findings on vegetables and physical activities, collaborative problem solving, goal setting, and recipe preparation. Participants in the control group did not receive any treatment.

A researcher developed questionnaire measured demographic information and the dependent variables knowledge, attitude, and critical thinking related to vegetables and physical activity, vegetable offering recall, and physical activity recall. Critical thinking scenarios and open-ended questions were used to measure participants’ critical thinking abilities. The instrument was tested for face and content validity and interrater reliability. Cronbach’s alpha for attitude and critical thinking ranged from .63 to .96.
Data were analyzed using descriptive statistics, ANCOVA, and content analysis. Most parents were Caucasian, female, between the ages of 19 and 39, and had a high school or above education. As a result of the critical thinking instructional approach, significant differences were observed between the experimental and control groups in offerings of the target vegetables, and total physical activities in which they engaged their children. No significant differences in positive attitudes and critical thinking related to vegetable intake and physical activities were observed. Future studies should be of longer duration, use larger sample sizes, and compare the effectiveness of the critical thinking approach with other educational approaches.
CHAPTER 1
GENERAL INTRODUCTION

Dissertation Organization

This dissertation is organized into six chapters. Chapter 1 provides a succinct introduction and delineates two problems that prompted this work: (a) the low intake of dark green leafy, yellow/orange, and cruciferous (cauliflower, broccoli, cabbage) vegetables in the American public but more so in low-income populations; and (b) the need for nutrition education approaches that allow individuals to examine their behavior, solve problems, and reflect on their actions. Critical thinking methodology was chosen as the means of resolving the latter need. The second chapter provides a robust review of literature related to both problem areas. The third, fourth, and fifth chapters are manuscripts prepared for publication in the *Journal of the American Dietetics Association, Journal of Nutrition Education and Behavior*, and *Journal of Family and Consumer Sciences*, respectively. The final chapter, chapter 6, contains a summary, general conclusions, and recommendations for future work in these areas. Individual lists of references are provided for each of the three manuscripts presented in chapters 3, 4, and 5; references cited in the introduction, review of literature, and general conclusions and recommendations are provided after the general conclusions. This dissertation reflects work completed for a double major in Nutritional Sciences and Family and Consumer Sciences Education. In order to adequately represent the Education aspect of this work, the Appendix shows the critical thinking curriculum, lesson plans, and assessment instruments developed and used in the study.
Description of Research Problem

Regular inclusion of vegetables in the diet is important because of the broad variety of essential and non-essential nutrients they provide. Among these are vitamin A, beta-carotene, vitamin C, potassium, folic acid, and dietary factors such as phytochemicals (glucosinolates and lycopene), flavonoids and complex carbohydrates (Baranowski et al., 1993; Ciliska et al., 2000; Dittus, Hillers, & Beerman, 1995; Johnson, Taylor, & Hampl, 2000). In addition, vegetables provide multiple health benefits including a decrease in the risk for some types of cancers and cardiovascular disease (Steinmetz & Potter, 1991). Protection extends to other chronic diseases such as cataracts, diverticulosis, chronic obstructive pulmonary disease, and hypertension (Steinmetz & Potter, 1996; Van Duyn & Pivonka, 2000). However, evidence identifies specific vegetables (particularly dark green leafy, yellow-orange, and cruciferous vegetables) as being leaders in the fight against chronic diseases (Hung et al. 2004; Joshipura et al. 1999, 2001; Liu et al. 2001; Van Duyn & Pivonka, 2000). These vegetables could significantly impact the public’s health if eaten more often (Nanney, Haire-Joshu, Hessler, & Brownson, 2004).

In spite of the apparent advantages of green leafy, dark yellow/orange, and cruciferous vegetables in reducing chronic diseases their intake in the general population is low (0.4 servings per day) compared to recommendations (Krebs-Smith & Kantor, 2001; Patterson, Block, Rosenberger, Pee, & Kahle, 1990). The Dietary Guidelines for Americans 2005 (U.S. Department of Agriculture & U.S. Department of Health and Human Services [USDA/HHS], 2005) recommends 2½ cups of vegetables per day for a reference 2,000-calorie intake, with higher or lower amounts depending on the caloric level. The Healthy People 2010 goals for vegetables suggest at least three daily servings, with at least one third
being dark green or orange vegetables (U.S. Department of Health and Human Services, Public Health Service [HHS/PHS], 1990). Only 8% of adults in the United States get the recommended daily one or more daily servings of dark green or orange vegetables (Krebs-Smith & Kantor, 2001). Three percent get both the recommended number of servings and at least one serving of a dark green or orange vegetable (U.S. General Accounting Office, 2002). An examination of CSFII 1994-1996 data showed that less than one in five Americans consumed a cruciferous vegetable during two 24-hour dietary recalls—0.2 servings per day (Johnson et al., 2000). Statistics are more glaring for low-income populations (Krebs-Smith & Kantor, 2001; Quan, Salomon, Nitzke, & Reicks 2000). These individuals spend a larger proportion of their income on food than higher income counterparts but tend to have poorer quality diets (Treiman et al., 1996) and experience higher levels of chronic diseases (Perry, Lytle, & Feldman, 1998).

There is need for interventions focusing specifically on dark green leafy, yellow/orange, and cruciferous vegetables (Nanney et al., 2004) targeting low-income individuals and their children (Kreb-Smith et al., 1996) because chronic diseases are highest among this group. Lohr and colleagues (1986) sampled adults 18 to 61 years old (N = 7,706) enrolled in the Rand Insurance Experiment, a ten-year randomized controlled trial. Results indicated that low-income men had a significantly higher prevalence of anemia, chronic airway disease, and hearing impairment than higher-income individuals. Low-income women had higher prevalence of congestive heart failure, diabetes mellitus, hypertension, hearing impairment, and visual impairment (Lohr et al., 1986). Interventions focusing specifically on vegetables may be necessary because it may be more challenging to increase intakes of these specific vegetables than intakes of fruits. Many cruciferous and dark green leafy varieties
tend to have a bitter taste whereas fruits are sweet. It has been suggested that 5-A-Day messages (U.S. Department of Health and Human Services, Centers of Disease Control and Prevention [HHS/CDC], 2006a) may be more successful in increasing fruits than vegetables (Nanney et al., 2004). A report on fruits and vegetables from the United States General Accounting Office suggested that the low consumption of dark green or orange vegetables could be due to people’s ignorance of the importance of eating deeply colored vegetables (U.S. General Accounting Office, 2000).

Even though the need to increase vegetable use in the adult population is urgent; it is imperative that interventions to increase the number of vegetable offerings commence early in life for several reasons: First, children are becoming increasingly predisposed to chronic and other diseases at an earlier age. Research conducted in six public schools in New York City estimated that by age 12, over 50% of children had modifiable risks for coronary heart disease (Harris et al., 1997). Second, a child’s food preferences are learned at an early age by repeated experiences with different foods (Birch, 1999). Third, eating patterns formed during childhood are important determinants of adult risk for certain diet-related cancers (Kreb-Smith et al., 1996). Some studies suggest that food preferences formed early in life may influence adult food selection (Birch, 1998; Hall & Holmberg 1974) therefore, eating many types of fruits and vegetables beginning in childhood is a significant positive predictor of fruit and vegetable intake among adults (Kreb-Smith et al., 1996). Fourth, it is also easier to establish healthful habits during childhood than to attempt to change eating habits later in life (Johnson, Guthrie, Smiciklas-Wright, & Wang, 1994)—an ounce of prevention is worth more than a pound of cure. Interestingly enough, even though parents are sometimes reluctant to adopt healthful eating habits, focus group research conducted in Maryland
(Treiman et al., 1996) and Iowa (Shafer & Nelson, 1999) indicate that most parents want to act in their children’s best interest.

Food behaviors are difficult to change and interventions to increase the number of vegetables in the diet have seen minimal results. Making the choice to increase the number of vegetable offerings in a child’s diet is by no means a simple task. Parents are faced with a host of contextual factors such as the needs, preferences, and health conditions of family members; the cost and availability of food items; and the skills of the homemaker, which must all be factored into their decision making schema. In making food decisions, parents are presented with ill-structured problems—problems for which there might not be one correct answer. They therefore need to be equipped with the prerequisite skills for solving such problems.

Nutrition education has been proposed as a means for dealing with many of the deficits in health and nutrition behavior facing populations. A monograph in the mid 1990s documented the effectiveness of nutrition in improving dietary practices especially when behavioral change is set as a goal and the educational strategies employed are designed with that purpose in mind (Contento et al., 1996). One goal of nutrition education is to provide adequate knowledge and skills necessary for critical thinking regarding diet and health so that individuals can make appropriate food choices from an increasing array of contextual factors (Devine, 1980).

Although this goal emphasizes preparing individuals to engage in critical thinking, little has been done to actually use critical thinking methodology in nutrition interventions. An instrument has been developed to assess critical thinking constructs in nutrition audiovisual materials (Nitzke, Harwood, & Way, 1992), and the effectiveness of a food
safety teaching strategy to promote critical thinking has been undertaken (Reicks, Bosch, Herman, & Krinke, 1994). However, no studies have used critical thinking theory specific to andragogy (adult learning) to bring about behavioral change. This study attempts to fill the gap in that area. The purpose of this research is to use critical thinking methodology and adult learning techniques to educate low-income parents on the importance of increasing (a) daily offerings of dark green leafy, yellow-orange, cruciferous vegetable and tomatoes in the diets of their 2- to 5-year-old children; and (b) physical activity in their 2- to 5-year-old children. We hypothesize that parents who receive the critical thinking mode of instruction would have greater knowledge, more positive attitudes, and enhanced critical thinking skills related to problem solving and therefore would offer more dark green leafy, yellow-orange, cruciferous vegetables or tomatoes to their children and would daily engage their children in more physical activity.
CHAPTER 2
REVIEW OF LITERATURE

This review of literature is divided into three main sections. The first section
examines the role of vegetables in the prevention of chronic disease, the second section
reviews the determinants of food behavior, and the third section focuses on critical thinking
methodology and adult education practices.

The Role of Vegetables in Chronic Disease Prevention

The role of vegetables in preventing chronic diseases is well established (Steinmetz &
Potter, 1996; Van Duyn & Pivonka, 2000). Chronic diseases are illnesses that are prolonged,
generally cannot be prevented by vaccines or cured by medication, nor do they just disappear
(Medicine Net, n.d.a). They include heart disease, cancer, diabetes, and strokes (HHS/CDC,
2006b). This section of the review is presented so as to highlight the benefits of diets rich in
vegetables. It begins with a definition of the different types of studies used to determine the
effects of vegetables on various chronic diseases. The role of vegetables in the prevention of
cancer, heart disease and strokes is presented. Attention is given briefly to the role of
vegetables in preventing other diseases such as cataract, diverticulosis, and hypertension.
Finally, the types of vegetables thought to be most protective in preventing chronic diseases
are presented along with their mechanism of action.

Definition of Studies

Many studies—epidemiological (Van Duyn & Pivonka, 2000), cohort, case-
controlled, studies of precursor conditions, prognosis studies, and animal studies (Steinmetz
& Potter, 1996)—show a strong link between increased fruit and vegetables consumption and
reduced risk for chronic diseases such as heart disease, cancer, and stroke (Steinmetz &
Potter, 1996). In cohort studies, large groups of healthy individuals provide information regarding some risk factor, and they are followed up (through questionnaires, death certificates, cancer registries) for several years to see which persons contract specific diseases (Steinmetz & Potter, 1996). In case-controlled studies, especially retrospective case controlled studies, individuals with a particular disease (case individuals) and those without the disease (control) are identified and asked about past diet and other potential risk for the disease. The diets of both the case and control individuals are compared (Steinmetz & Potter, 1996). In studies of precursor conditions, the precursor conditions for certain diseases are investigated. In the case of cancer, fruit and vegetables, fiber, and various phytochemicals may be examined to determine their effects on the disease. In prognosis studies the relationship of certain food items or substances in prognosis of the disease and survival is examined. Certain diseases are experimentally induced in laboratory animals in animal studies; they are then fed a particular diet to determine the effects of the diet on the disease (Steinmetz & Potter, 1996).

**Cancer**

Cancer refers to any one of a large number of diseases characterized by the development of abnormal cells that divide uncontrollably and have the ability to infiltrate and destroy normal body tissues (Mayo Clinic, 2006). Normal cells grow, divide, and die in an orderly fashion. Cancer cells are different from normal cells in that they do not die but continue to grow and divide therefore outliving normal cells. Cancer develops because of damage to deoxyribonucleic acid (DNA), the hereditary material in humans and almost all other organisms. In normal cells this damage to DNA is repaired but in cancer cells the damage is not repaired. Cancer can spread throughout the body where it begins to grow and
replace normal cells. This process is called metastasis. Cancer usually forms tumors but can also be involved with blood and blood forming organs in the case of leukemia, in this situation no tumors are formed. Different types of cancer behave differently, grow at different rates, and respond to different treatments. For example, lung cancer and breast cancers are different diseases (American Cancer Society, 2006).

The association between the consumption of carotene containing vegetables and subsequent five-year mortality was examined in a prospective cohort study of 1,271 elderly, Massachusetts residents. The relative risk of cancer mortality was calculated using intake of carrots or squash, tomatoes, salads or leafy vegetables, dried fruits, fresh strawberries or fresh melon, and broccoli or Brussels sprouts. After controlling for age and smoking behavior, those in the highest quintile of intake of these carotene-containing vegetables had a risk of cancer mortality which was 0.3% lower (95% confidence limits 0.10–0.96) than those in the lowest quintile. The trend of decreased cancer risk with increasing intake of carotene containing vegetables was significant ($p = .026$; Colditz et al., 1985).

Malin et al. (2003) conducted a case-controlled study with 1,459 incident breast cancer cases and 1,556 frequency-matched controlled with Chinese women. They found that although there was no association between breast cancer and total vegetable intake, the risk of cancer declined with intakes of dark yellow-orange vegetables (trend test, $p = 0.02$), Chinese white turnips (trend test, $p \leq 0.001$), and certain dark green vegetables (trend test, $p \leq 0.001$) with adjusted odds ratios in the highest quintile being 0.79 (95% CI = 0.60–0.98), 0.67 (95% CI = 0.53–0.85) and 0.65 (95% CI = 0.51–0.83), respectively. They concluded that high intake of certain vegetables (and fruits) may be associated with a reduced risk of breast cancer.
A review of an exhaustive collection of worldwide research commissioned by the World Cancer Research Fund and the American Institute of Cancer Research (AICR), and a report of the Chief Medical Officer’s Committee on Medical Aspects of Food and Nutrition Policy (COMA) showed a protective effect of vegetables on cancers of the mouth and pharynx, esophagus, lungs, stomach, colon and rectum. Results of these studies by AICR revealed that diets at the minimum goal of 5 servings of fruits and vegetables a day may be protective against chronic diseases. However, AIRC recommends intakes as high as 10 servings a day, based on energy levels, to reduce cancer risks (Van Duyn & Pivonka, 2000).

**Heart Disease**

Heart disease is a broad term that includes several more specific heart conditions. These include: coronary artery disease, or the hardening of the arteries that provide vital oxygen and nutrients to the heart; abnormal heart rhythms, or abnormally fast or slow beating of the heart; heart failure, congenital heart disease, in which the heart cannot pump enough blood and oxygen to meet the needs of other body organs; heart muscle disease, where the heart is abnormally enlarged, thickened and/or stiffened; pericardial disease, or inflammation of the thin fibrous membrane sac that surrounds the heart; and aorta disease, an abnormal bulge in the wall of an artery; and vascular disease (Medicine Net, n.d.b). The most common in the United States is coronary heart disease, which can lead to heart attack and other serious conditions (Centers for Disease Control and Prevention, 2006).

Liu and colleagues (2001) evaluated the relation between vegetable intake and coronary heart disease (CHD) risk of 15,220 men without chronic diseases at baseline who were part of the Physicians’ Health Study and found no association between fruit and vegetable intake and overall cancer incidence. A semiquantitative Food Frequency
Questionnaire (FFQ) was administered at baseline and the second, fourth, and sixth years. Vegetables included in FFQ were: broccoli, Brussel sprouts, carrots, spinach (cooked), spinach/dark green lettuce salad, yellow squash, tomatoes, and tomato juice. Vegetable intake was categorized into five groups: 1 servings/day, 1–1.49 servings/day, 1.5–1.99 servings/day, 2–2.49 servings/day, and 2.5+ servings/day. Incidence rate of CHD was calculated by dividing the number of incident cases by the person-years in each of the five categories of vegetables. Relative risk (RR) was estimated by dividing the number of incident cases by the person-years of follow-up. Results indicated that men who were slightly older and more physically active had a greater intake of vegetables. These men also had a lower prevalence of smoking but higher self-reported prevalence of hypertension and multivitamin supplement use. The mean intake of vegetables was 1.36 servings per/day. There was a graded inverse association between vegetable intake and risk of total CHD. The inverse relation between vegetable intake and CHD risk appeared more evident among men with a Body Mass Index (BMI) ≥ 25. High consumption of fruit and vegetable, especially green leafy vegetables, is associated with a small reduction in risk of major chronic disease, maybe due to lower incidence of cardiovascular disease. No association was found between fruit and vegetable intake and overall cancer incidence (Lui et al., 2001).

Hung et al. (2004) evaluated the relationship between fruit and vegetable intake and the incidence of cardiovascular disease, cancer, and of deaths from other causes in two prospective cohorts. They used participants from Nurses Health Study (71,910 female) and Health Professionals’ Follow-up Study (37,735). Baseline measures in the form of food frequency questionnaires were collected in 1986, 1990, and 1994 for women, and in 1990 and 1994 for men. Multivariable-adjusted relative risks were calculated with Cox
proportional hazards analysis. When compared with participants in the lowest quintile of total fruit and vegetable consumption, participants in the highest quintiles had slightly lower risks of major chronic diseases. Green leafy vegetables showed a statistically significant association with lower risk among participants in the highest quintile compared with the lowest RR = 0.94 (95% CI = 0.89–0.99 $P$ trend = .01). Total fruit and vegetable consumption was not associated with cancer incidence but higher fruit and vegetable intake showed a statistically significant inverse association with cardiovascular disease.

Ness and Powles (1997) reviewed the effects of fruit and vegetables on cardiovascular disease in ten ecological studies, three case-control studies, and 16 cohort studies. Results showed that nine of ten ecological studies, two of three case-control studies, and six of 16 cohort studies found significant protective associations with consumption of fruit and vegetables or surrogate nutrients.

**Stroke**

A stroke is caused when the blood flow to the brain is interrupted. When a stroke occurs, brain cells in the immediate area begin to die because they stop getting the oxygen and nutrients needed to function. Of the two major types of strokes, ischemic stroke is caused by a blood clot that blocks or plugs a blood vessel or artery in the brain, hemorrhagic stroke is caused by a blood vessel in the brain that breaks and bleeds into the brain. Ischemic stroke is more common of the two types of strokes (Medicine Net, 1999).

Stroke, the third largest cause of death in the US, kills more than 275,000 Americans each year. Almost every 45 seconds in the United States, a person experiences a stroke. The American Stroke Association, a division of the American Heart Association, estimates strokes cost the U.S. nearly $57 billion a year. (The Ohio State University, 2006). Ness and
Prowles (1997) reviewed three ecological studies, 1 case-control study, and 4 cohort studies, and found a stronger protective effect of fruit and vegetables on stroke than what was observed for coronary heart disease. Gillman et al. (1995) examined data from 832 men aged 45 to 65 in the Framingham Study to determine the effect of fruit and vegetable intake on risk of stroke. Three analytic strategies were used to determine the total number of daily servings of fruits and vegetables: (a) 20-year age-adjusted cumulative incidence rates by quintile of servings, (b) a Kaplan-Meier survival curve used to examine trends over quintiles, and (c) a Cox proportional hazards analysis used to obtain relative risk (RR). The effects of fruit and vegetables were examined separately. They found that the mean serving of fruit per day was 1.8 with a multivariate RR of stroke for an increment of three daily servings of fruit was 0.81 (95% CI, 0.56–1.19). The mean serving of vegetables was 3.3. The corresponding RR was 0.74 (95% CI, 0.54–1.02). For each increment of three daily servings of fruits and vegetables per day, the age-adjusted RR was 0.55 (95% CI, 0.29–1.05). Results suggested that fruit and vegetables may be protective against the risk of stroke (both ischemic and hemorrhagic) in men. The protective effect was apparently not mediated through effects on blood pressure.

Other Diseases

Evidence is mounting in terms of the protective effects of fruits and vegetables on other diseases such as cataract formation, chronic obstructive pulmonary disease (COPD), diverticulosis, and possibly hypertension (Van Duyn & Pivonka, 2000). Jacques, Chylack, and Taylor (1991) conducted a case controlled study involving 77 subjects with cataracts and 35 control subjects with clear lenses to determine the relationship between antioxidant nutrient status and senile cataract. Subjects were categorized into three groups according to
their plasma nutrient and nutrient intake levels, high (above the 80th percentile), moderate (between the 20th percentile) or low (below the 20th percentile). Results showed that persons with low and moderate levels of plasma vitamin C had increased risk of cataracts relative to persons with high plasma vitamin C levels. Subjects who consumed fewer than 3.5 servings of fruit and vegetables per day had an increased risk for both cortical cataract (odds ratio = 3.7, \( p < 0.10 \)) and posterior capsular cataract (odds ratio = 12.9, \( p < 0.01 \)). COPD is a collection of diseases in which there is chronic obstruction of the flow of air through the airways and out of the lungs (Medicine Net, 1999). The findings of studies indicate that high intake of fruits and vegetables enhance ventilatory function, thereby reducing the risk of COPD. Diverticular disease is the outward bulging of small pouches in the colons through weak spots. Aldoori and colleagues (1994) examined the association between dietary fiber, sources of fiber, other nutrients, and the diagnosis of symptomatic diverticular disease. They analyzed data from a prospective cohort of 47,888 men. They found the source of fiber to be related to diverticular disease. Vegetable fiber, not cereal fiber was associated with a decreased risk of the disease (Aldoori et al., 1994).

**Which Vegetables Are Most Beneficial?**

Steinmetz and Potter (1996) reviewed the literature to determine the relationship between vegetable and fruit consumption and risk for cancer. Of the 174 case control studies and 20 cohort studies reviewed, they found that of the studies that looked at raw vegetables and the effect on cancer, 85% reported a protective association against cancer. Seventy percent or more of the studies showed a protective association with allium vegetables (onions, garlic, and chive), carrots, green vegetables, cruciferous vegetables, and tomatoes. In an article, “Overview of the health benefits of fruit and vegetables consumption for the
dietetics professionals,” Van Duyn and Pivonka (2000) highlighted the role of dark green leafy, cruciferous, and yellow-orange vegetables in chronic disease prevention. They mentioned that microconstituents in fruit and vegetables such as carotenoids, flavonoids, and vitamin C may explain the protective effects of these vegetables.

**Mechanism of Action**

Cruciferous vegetables contain high amounts of dithiolthiones and isothiocyanates shown to increase activity of enzymes involved in the detoxification of carcinogens and other foreign compounds. Indole-3-carbinol also present in these vegetables affect estrogen metabolism in human beings (Steinmetz & Potter, 1996). Some cancers, for example, breast cancer, have receptors for the hormone estrogen and progesterone. These receptors are “like ears on breast cells that listen to signals from hormones and “turn on” growth in breast cells.” (breastcancer.org). Indole-3-carbinol found in cruciferous vegetables work by producing a less potent form of estradiol which may protect against estrogen-related cancers.

Green leafy vegetables contain lutein and folic acid. Lutein, a carotenoid without vitamin A activity, acts as an antioxidant. Its antioxidant activity allows it to block damage by free radicals. Folic acid prevents chromosomal damage at sites relevant to specific cancers (Steinmetz & Potter, 1996) and lowers homocysteine levels. High homocysteine level is a significant risk factor for cardiovascular and cerebrovascular disease.

Orange vegetables, such as carrots, sweet potatoes, winter squash, and pumpkin are good sources of beta carotene, a carotenoid and antioxidant that protect against free radical damage. Beta carotene is converted to vitamin A in the body and Vitamin A helps in the differentiation of normal epithelial cells. Lack of differentiation is a feature of cancer cells therefore vitamin A may prevent the development of cancer. Orange vegetables also contain
alpha carotene which may inhibit cell proliferation. Cancer cells divide or proliferate rapidly therefore the alpha carotene in yellow vegetables may prevent cancer cells from dividing (Steinmetz & Potter, 1996).

Anticarcinogenic substances in vegetables are not limited to a particular vegetable or fruit. Vegetables are good sources of selenium (amounts proportional to the soil content), Vitamin E, flavonoids, and dietary fiber. Selenium protects against oxidative tissue damage by its role as cofactor for glutathione peroxidase. Vitamin E protects polyunsaturated fatty acids in cell membranes from oxidation and flavonoids such as quercetin, kaempferol, tangeretin, nobiletin, and rutin act as antioxidants, inhibit blood clot formation, and may exhibit anti-inflammatory action. Dietary fiber binds and dilutes carcinogenic substances through the digestive tract, helps control diabetes and serum cholesterol level, and prevents diverticulosis (Steinmetz & Potter, 1996).

**Recommendations for Vegetable Intake**

*The Dietary Guidelines for Americans*

The Dietary Guidelines for Americans is published jointly every five years by the Department of Health and Human Services (HHS) and the U.S. Department of Agriculture (USDA). The Guidelines provide advice for people two years and older about good dietary habits and how they can promote health and reduce risk for major chronic diseases (USDA/HHS, 2005).

The 2005 Dietary Guidelines in the section, Food Groups to Encourage provided the following guidelines concerning fruits and vegetables.

- Consume a sufficient amount of fruits and vegetables while staying within energy needs. Two cups of fruit and 2½ cups of vegetables per day are recommended for a
reference 2,000-calorie intake, with higher or lower amounts depending on the calorie level.

- Choose a variety of fruits and vegetables each day. In particular, select from all five vegetable subgroups (dark green, orange, legumes, starchy vegetables, and other vegetables) several times a week.

**MyPyramid Food Plan**

The MyPyramid food plan was released by the USDA’s Center for Nutrition Policy and Promotion. It is designed for healthy Americans and its goals apply to healthy individuals over age 2 years. The recommendations in MyPyramid are based on an individual’s energy requirements and are given for (a) amounts to be eaten from each food group each day, (b) foods to emphasize, and (c) foods to deemphasize.

MyPyramid states that any vegetable or 100% vegetable juice counts as a member of the vegetable group. It also states that vegetables may be raw or cooked; fresh, frozen, canned, or dried/dehydrated; and may be whole, cut-up, or mashed. Vegetables are divided into five main groups as shown in Table 1. The amount of vegetables eaten depends on the age, sex, and level of physical activity of an individual. In general, 1 cup of raw or cooked vegetables or vegetable juice, or 2 cups of raw leafy greens can be considered as 1 cup from the vegetable group (U.S. Department of Agriculture, 2005).

**Healthy People 2010**

Healthy People 2010 provides a framework for prevention for the nation. It is a statement of national health objectives designed to identify the most significant preventable threats to health and to establish national goals to reduce these threats (HHS/PHS, 1990). The Healthy People 2010 states the need to increase the proportion of persons aged 2 years and
Table 1

*Main Vegetable Groupings*

<table>
<thead>
<tr>
<th>Dark green vegetables</th>
<th>Starchy vegetables</th>
<th>Other vegetables</th>
</tr>
</thead>
<tbody>
<tr>
<td>bok choy</td>
<td>corn</td>
<td>artichokes</td>
</tr>
<tr>
<td>broccoli</td>
<td>green peas</td>
<td>asparagus</td>
</tr>
<tr>
<td>collard greens</td>
<td>lima beans (green)</td>
<td>bean sprouts</td>
</tr>
<tr>
<td>dark green leafy lettuce</td>
<td>potatoes</td>
<td>beets</td>
</tr>
<tr>
<td>kale</td>
<td></td>
<td>Brussels sprouts</td>
</tr>
<tr>
<td>mesclun</td>
<td></td>
<td>cabbage</td>
</tr>
<tr>
<td>mustard greens</td>
<td></td>
<td>cauliflower</td>
</tr>
<tr>
<td>romaine lettuce</td>
<td></td>
<td>celery</td>
</tr>
<tr>
<td>spinach</td>
<td></td>
<td>cucumbers</td>
</tr>
<tr>
<td>turnip greens</td>
<td></td>
<td>eggplant</td>
</tr>
<tr>
<td>watercress</td>
<td></td>
<td>green beans</td>
</tr>
<tr>
<td><strong>Orange vegetables</strong></td>
<td></td>
<td>green or red peppers</td>
</tr>
<tr>
<td>acorn squash</td>
<td></td>
<td>iceberg (head) lettuce</td>
</tr>
<tr>
<td>butternut squash</td>
<td></td>
<td>mushrooms</td>
</tr>
<tr>
<td>carrots</td>
<td></td>
<td>okra</td>
</tr>
<tr>
<td>hubbard squash</td>
<td></td>
<td>onions</td>
</tr>
<tr>
<td>pumpkin</td>
<td></td>
<td>parsnips</td>
</tr>
<tr>
<td>sweet potatoes</td>
<td></td>
<td>tomatoes</td>
</tr>
<tr>
<td><strong>Dry beans and peas</strong></td>
<td></td>
<td>tomato juice</td>
</tr>
<tr>
<td>black beans</td>
<td></td>
<td>vegetable juice</td>
</tr>
<tr>
<td>black-eyed peas</td>
<td></td>
<td>turnips</td>
</tr>
<tr>
<td>garbanzo beans (chickpeas)</td>
<td></td>
<td>wax beans</td>
</tr>
<tr>
<td>kidney beans</td>
<td></td>
<td>zucchini</td>
</tr>
<tr>
<td>lentils</td>
<td></td>
<td></td>
</tr>
<tr>
<td>lima beans (mature)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>navy beans</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pinto beans</td>
<td></td>
<td></td>
</tr>
<tr>
<td>soy beans</td>
<td></td>
<td></td>
</tr>
<tr>
<td>split peas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>tofu (bean curd made from soybeans)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>white beans</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* Adapted from U.S. Department of Agriculture (2005).
older who consume at least three daily servings of vegetables, with at least one-third being
dark green or orange vegetables.

**Vegetable Intake in the United States**

In spite of the apparent benefits of vegetables and the current recommendations, a
large proportion of adults in the United States eat no vegetables on a given day (Patterson,
Block, Rosenberger, Pee, & Kahle, 1990). Consequently, vegetable intake is low in children.
The National Health and Nutrition Examination Survey II (NHANES) used a representative
sample of the civilian non-institutionalized population, ages six months to 74 years. This
survey found that the mean number of servings of vegetables in the U.S. population was less
than two (1.77, SE = .02; Patterson et al., 1990). The Continuing Survey of Food Intake by
Individuals (CSFII) also indicated that boys and girls two to eleven years old eat slightly less
than two servings of vegetables a day. In addition, nearly one-fourth of all vegetables
consumed by youths were French fries, which are high in fat and carbohydrates and low in
vitamins. This makes the intake of dark green and deep yellow vegetables particularly low
compared to recommendations (Krebs-Smith et al., 1996).

Results from the 1994–1996 CSFII showed consumption of deeply colored vegetables
to be less than one-tenth of a serving during the 1989–1991 and the 1994–1996 periods of the
survey. Only 8% of Americans get the recommended daily one or more servings of dark
green or orange vegetables. Only 3% get both the recommended number of servings of and at
least one serving of a dark green or orange vegetable (U.S. General Accounting Office,
2002).

Low vegetable intake patterns transcend cultural groups. Data from the Hispanic
Health and Nutrition Examination Survey (HHANES) also showed that more than 95% of
the children of all ages failed to consume four daily servings from the fruit and vegetable group (Murphy, Castillo, Martorell, & Mendoza, 1990).

Vegetable use is even lower among low-income populations. These individuals spend a larger proportion of their income on food than their higher income counterparts but they tend to have poorer quality diets (Dinkins, 1997; Treiman et al., 1996).

The Behavioral Risk Factor Surveillance System (BRFSS), a telephone survey conducted annually in Iowa, indicated that only 15% of Iowans consumed the recommended servings of vegetables a day. This ranks Iowa lower than the national average of 23% (Voss, 1997). Results of the BRFSS for 2005 showed Iowa to be the fourth lowest of all states (in the U.S.) whose residents consume fruits and vegetables fewer than five times a day (Iowa Department of Public Health, 2005). The need to develop and implement programs that would increase vegetable use among Iowans is essential.

Chronic disease such as heart disease, cancer, and diabetes are the major causes of death in the United States. These diseases account for 7 of every 10 deaths and affect the quality of life of 90 million Americans. In 2003, 10,496,000 individuals were diagnosed with invasive cancer (Department of Health and Human Services, Centers for Disease Control and Prevention, 2006a). The 2006 update from the American Heart Association indicates that there are 13,200,000 cases of coronary heart disease and 65,000,000 cases of high blood pressure. Over 20 million people have diabetes. One in three children born in 2000 will contract Type II diabetes (National Center for Chronic Disease Prevention and Health Promotion, 2005). Children born today are expected to have a shorter life expectancy than their parents. Chronic diseases have significant social and economic costs and are therefore, significant public health issues (Mullis, Owen, & Blaskovich, 1995). In 2006 the cost of
cardiovascular disease and stroke alone was estimated at 403.1 billion (U.S. Department of Health and Human Services, 2006a). Although chronic diseases are among the costliest health problems, they are also among the most preventable. Adopting healthy diets is a means whereby the devastating effects of chronic diseases can be curtailed (Department of Health and Human Services. Centers for Disease Control and Prevention, 2006a).

**Determinants of Food Behavior**

A child’s food preference or his or her selection of one item over another is formed at an early age with repeated exposures to food (Birch, 1999). Studies show that early food preferences may influence adult food selection (Birch, 1998; Drewnowski, 1997) and eating patterns formed during childhood are important determinants of adult risk for certain chronic diseases (Kemm, 1987; Nicklas, Farris, & Smoak, 1988). This section of the review presents information on children’s food preferences (likes and dislikes), the factors related to the development of food preferences, and changes that occur in preferences over time. Information of this nature is critical in planning nutrition interventions for children (Skinner, Carruth, Bounds, Ziegler, & Reidy, 2002) as it provides the background needed to guide such efforts.

**Early Food Preference**

Beginning at birth, there are specific unlearned responses to sour, bitter, salty, and sweet tastes (Steiner, 1977) with an innate preference for sweet (Desor, Maller, & Turner, 1973; Drewnowski, 1997; Le Magnen, 1997; Lipsitt, 1997). The unlearned preference for salt occurs around four months after birth (Beauchamp, Cowart, Mennella, & Marsh, 1994; Harris & Booth, 1987), with children being able to tolerate higher levels of salt than adults. Children also show preferences for high fat and high carbohydrate foods (Beauchamp,
Cowart, & Moran, 1986; Birch, 1999; Desor et al., 1973). Results of studies in which children were given high and low calorie drinks in a series of conditioning trials revealed that children developed preference for a more calorie dense drink and not for the low-calorie drink (Birch, McPhee, Steinberg, & Sullivan, 1990; Johnson, McPhee, & Birch, 1991). Similar results were reported by Kern and colleagues (1993). They divided 27 three- to four-year-olds into an exposure group (only tasted a small amount of the target drink without significant ingestion; \( n = 15 \)) and a conditioned group (ingested 150 g of the yogurt drink; \( n = 12 \)). Subjects were fed two versions of yogurt drinks (high fat and fat free) in six pairs of conditioning trials. On one day a high fat version of the yogurt drink was consumed and on the other day the fat-free version. After conditioning, children were made to participate in ad lib snacks to determine if there were differences in caloric compensation in response to the energy densities in the preloads. Preferences were assessed before and after conditioning, when the children were hungry, and at post-conditioning when the children were full. Results indicated that children in the conditioning group increased their preference for the high fat flavor yogurt over the low fat and increased their preference for the high-density flavor from pre to post-conditioning. Preference for the high fat drink was decreased by satiety. Children in the exposure group, who only tasted a small amount of the target drink, showed positive shifts in preference for both high and low fat versions of yogurt. These results were observed even though participants were younger (three to four years old), preloads were smaller, and the time delay between preload and ad lib snacks was increased to 90 minutes (Kern, McPhee, Fisher, Johnson, & Birch, 1993).
Neophobia

Neophobia, the “built-in desire” to respond negatively, be fearful, or express dislike to novel taste (Birch, 1999) has been known to occur very early in life. However, preference for a particular food or flavor increases with repeated exposures. Thirty-six infants (4–6 months old) were fed a novel vegetable by their mothers on ten occasions for a 10-day period. Intake was measured before, during, and after opportunities to eat the food. Infants showed dramatic increases in vegetable intake from 30 to 60 g. Breastfed infants showed the most dramatic increases. The increased intake by breastfed infants was shown to be related to the different volatile flavor compounds from the mother’s diet that passed into the breast milk (Sullivan & Birch, 1994).

Mennella, Jagnow, and Beauchamp (2001) found that flavor in amniotic fluid or breast milk modifies the infants’ acceptance and enjoyment of similarly flavored foods at weaning. They randomly assigned 46 pregnant women who were planning on breast feeding to one of three groups. Mothers in group one consumed 300 ml of carrot juice during the last trimester of pregnancy and water during the first months of lactation. Group two mothers consumed water during pregnancy and 300 ml of carrot juice during lactation. Group three mothers, the control, consumed water throughout the time of the study. At the time of introduction to solid foods, infants’ mealtime behavior was videotaped to determine facial acceptance in response to a carrot flavored and plain cereal. Infants who were previously exposed to carrot juice either through amniotic fluid (mother’s pregnancy), or lactation, exhibited fewer negative facial expressions during feeding of the carrot flavored cereal. Additionally infants exposed to the carrot juice were perceived by their mothers as enjoying the carrot flavored cereal more than the plain.
Studies showed that initial neophobia changes to acceptance of the food with repeated exposure, even though the food was initially rejected (Birch, 1979; Birch & Marlin, 1982; Birch, McPhee, Shoba, Pirok, & Steinberg, 1987). Neophobia also changes during development (Birch, 1999). Fifty-one 2 to 5 year olds were exposed to seven novel fruits by two methods: (a) tasting or (b) looking at and smelling the food. Children’s initial response to novel foods was assessed, as well as the effects of exposure. Children were divided into three groups: two-year-olds \( n = 16 \), three-year-olds \( n = 16 \), and five-year-olds \( n = 19 \). The majority of the two-year-olds (11 of 16) refused to taste the novel food on the initial exposure. Three of the 16 three-year-olds showed initial rejection to the food, while none of the 19 five-year-olds displayed rejection. The youngest subjects displayed the greatest degree of neophobia. It should be noted that once the initial rejection was overcome, no age differences in terms of preference were observed. It is important to emphasize that acceptance is not an immediate response—it may take as many as 8 to 10 exposures to the food. Exposure refers to the actual tasting of the food. Looking at and smelling was not sufficient to bring about acceptance (Birch et al., 1987).

Individual and gender differences may be experienced in the strength of the neophobic response. Results from a large population-based study in Sweden \( n = 722 \) reported that males displayed greater neophobia than did females, both among adults and children (Hursti & Sjoden, 1996, Koivisto & Sjoden, 1996).

Children’s preferences for sweet, salt, high fat and high carbohydrate foods are developed in early life. Along with this early development of food preferences comes a neophobic tendency, which can be alleviated by repeated exposure with a particular food. Neophobia also seems to become less pronounced with age. These research findings are
important and suggest that interventions seeking to promote vegetable intake in children should commence at pregnancy—when the first introduction to flavors occurs. Additionally, this information is valuable for individuals responsible for feeding children. Parents have an important role to play in increasing vegetable use in their children and could benefit from such information. They must provide their children with opportunities to experience and become familiar with a variety of vegetables at an early age. In providing opportunities for children to experience vegetables, parents must be aware that it may take 8 to 10 exposures before children begin to accept a particular vegetable; therefore, persistence is the key in this regard.

**Influences on Children’s Food Preferences**

Many individuals in the home environment interact with the child. Initially, the child has most contact with the mother especially if breast fed. As the child gets older, there is more contact with other family members who may influence their food preferences. The extent of the family’s influence on children’s food preferences is debatable (Skinner et al., 2002). Studies show influences of the mother and father on the child’s food preferences. Family members also influence each other in terms of food preferences. The father can exert influence on the mother, and likewise, children exert influence on parents’ food selection by stating their preference for certain foods. This section of the review examines the influence of different family members on food preference and selection. The influence of the mother and father is examined as they are usually the main decision makers. Brief consideration is given to which parent exerts more influence on the child’s preferences. The role of peers is also considered.
Mother. The mother is usually the meal planner in many families. She is usually the principal decision maker concerning food purchasing and menu planning (Cosper & Wakefield, 1975; National Pork Producers Council, 2000; Schafer, 1978). She is also the one who eats with the child most of the time (Burt & Hertzler, 1978) and has been termed the gatekeeper of the child’s food habits (Lewin, 1943).

The Kitchen Report studied a representative sample of the U.S. population \( n = 930 \) to provide insight into food behavior of Americans with emphasis on family dinners. In this report, meal planners (57%) indicated that their own preference took pre-eminence when planning meals and making food decisions for the family (spouse’s preference won out 21% of the time; National Pork Producers Council, 2000). Schafer (1978) examined food behavior and the factors affecting the quality of husbands’ and wives’ diets. Data for this study were part of a larger study designed to examine the influences of certain social-psychologic factors on nutrition. Respondents, husband and wife pairs, were randomly chosen from two non-metropolitan Midwestern cities \( n=116 \). Results indicate that the single most important influence on food consumption for both husband and wife were their own personal preferences with wives perceiving themselves as being more influential than their husbands in determining what to eat.

Father. A study of the food preferences of 61 preschoolers (2.11 to 4.11 years of age) and their fathers was conducted to determine fathers’ influence on the food preferences of their children. Fathers rated 36 foods (12 vegetables, 8 fruits, 2 fats, 3 breads and cereals, and 11 protein foods) as like, accept, or refuse. Mothers supplied preference data for the child because it was decided that information from children of this age group was not reliable. Results showed that vegetables were the least favored of the food groups for children
whereas breads and cereals were the least favored by fathers. No vegetable was listed among the twelve most preferred foods for both father and children. Only the correlation for the vegetable group ($r = 0.28$) was significant at $p < .05$ (Bryan & Lowenberg, 1958). Again, in this study, the percentage of food that both father and child liked or disliked in the same food category was assessed. There was no indication as to whether father and child liked or disliked the same vegetable (or any other category of food). A significant relationship was not mentioned for protein foods, fruits, or all food categories combined. Therefore conclusions cannot be made that the father’s dislikes for vegetables are responsible for similar dislikes in the child. Each vegetable would have to be examined to determine the reasons for the dislike (Birch, 1980b).

Studies also show that the father exerts influence on the wife’s food decisions. Even though a woman’s preference for certain foods has a strong influence on the food choices she makes, the desire to please her spouse and other family members also affects her food choices. Results from a random, representative sample of 591 women’s households studying food behavior and choice indicated that the father’s likes and preferences is a strong influence on the food decisions made by the mother. Family and personal preference were the two most dominant factors that accounted for food choice in 64% of respondents. Attitudinal data showed that husbands had the greatest influence on the decision of the wife to try a new food. Motivational factors for women selecting a certain vegetable were: my family likes it (31%); I like it (23%); it is good for you (20%; Cosper, & Wakefield, 1975).

Work by Bryan and Lowenberg (1958) indicates that husbands exert a strong influence on wives’ food decisions. They also found that 89% of mothers in this study stated that they served food their husbands did not like infrequently or not at all. Earlier work by
Eppright, Fox, Fryer, Lamkin, & Vivian, (1969) with five Agricultural Experiment Stations (Illinois, Iowa, Kansas, Nebraska, and Ohio) and the Cooperative State Research Service–USDA examining the eating behavior of preschool children found similar results. Mothers were asked to identify factors that influenced their meal planning decisions. Most mothers identified nutritive value of food as being the most important factor. However, this result may be biased since the purpose of the study was known. The following list shows the frequency with which other factors were checked: Husband’s likes = 81%; likes of other family members = 72%; food cost = 68%; family health problems = 68%; child’s likes = 58%; preparation time = 48%. Results indicate that fathers’ likes highly influenced mothers’ meal planning decisions. Even though mothers had the major responsibility in planning and preparing family meals, priority ranking of factors influencing menu planning for mother and father showed the father’s likes were mentioned as first priority in meal planning by both mother and father. Therefore, it appears that the father indirectly affected the family’s preference by having the mother, the primary menu planner, cater to his likes (Burt & Hertzler, 1978).

Bryan and Lowenberg (1958) also noted that preference varied depending on the food item to be chosen. It was observed that various food items were chosen differentially based on family preferences. For example, about 50% of women chose a specific meat product because of family’s preference, while a little over one-third leaned toward a certain vegetable (39%), bread (36%), dairy product (31%), or dessert (31%), because of family preferences. Personal preference rather than family preference was responsible for the choice of fruit (Eppright et al., 1969). The Cosper and Wakefield (1975) study unlike Schafer (1978) showed that when it comes to vegetables, family preference was the most important factor.
that determined selection. Personal preference and nutrition were listed as second and third, respectively. However, Cosper and Wakefield (1975) examined only the food preference of women, whereas Schafer (1978) examined influence of both husband and wife.

Which Parent Exerted More Effect on the Child? A study of 46 families in two rural communities in South-Central Kansas examined which parent was more influential in shaping the preference of the child. Each parent provided information on his or her own preferences through food preference questionnaires. Children were asked by an interviewer to provide information on preferences based on three facial hedonic responses “Like,” “O.K.,” “Dislike,” and “Don’t know.” Parents responded via written questionnaires. Chi square tests of the relationship of each of the 32 foods were not significantly different from zero indicating that both mother and father exerted similar influence on the child’s preference. However, two of the foods, chicken noodle soup and pizza were significant at the 0.10 levels, showing the mother as having more influence over the child’s preference (Burt & Hertzler, 1978). It should be noted that correlations for only a small percentage of the 50 foods were rated. In addition, the degree of agreement between specific mothers and their children was not reported; instead data reflected the percentage of likes of all mothers and all children for a particular food.

In order to alleviate methodological problems (data reflecting likes of all mothers and all children for a particular food, rather than reflecting likes of each parent-child pair) identified in previous food preference studies, a study involving 128 preschoolers and their parents examined the relationship between children’s food preferences and those of their parents. Food preference data were assessed directly from the children and each parent. Coefficient of agreement was obtained for each mother-child and father-child pair in the
family. Four different sets of foods were used in the preference assessment: eight fruits, eight sandwiches with different spreads, nine vegetables (broccoli, carrots, peas, green beans, cauliflower, mushrooms, corn, beets, and celery) and eight snack foods. Results indicated that 10% of mother-child and 6% of father-child preferences were correlated. When children were paired with an unrelated adult there was 8% significance in the correlations (Birch, 1990). Results suggest that parents influence children’s preferences by limiting the set of foods to which their children are exposed. In other words, modeling and commonality of exposure may have produced family resemblances (Rosin, Fallon, & Mandell, 1984).

Effect of Peers. Birch (1980a) examined the effect of peers on vegetable choices made by preschoolers. Thirty-nine preschoolers (19 males and 20 females) attending morning nursery school at the Child Development Laboratory, University of Illinois at Urbana-Champaign were asked to rank their preference for nine vegetables: raw carrot slices, celery sticks, cooked green bean pieces (frozen), cooked kernel corn (frozen), cooked peas (frozen), cooked beets (canned), cooked broccoli (fresh), raw cauliflower, and raw mushroom slices. A target child who had preference for vegetable “A” was seated with three to four other children who had preference for vegetable “B.” The pairs of vegetables were served during four consecutive lunches with the target child choosing first on day one. On the other three days, the target child chose last. Choice data revealed that target children shifted their choice from day 1 to day 4. Fifteen of the 17 target children (88%) chose their preferred food on day 1, but 10 changed to the non-preferred food on day 4. Post influence assessment revealed that the target children showed an increased preference for the initially non-preferred vegetable, while their peers did not.
Other Factors. Schafer (1978) found that an important factor influencing food decisions of both husbands and wives was the health of other family members. The health of other family members was considered slightly more important than personal health for both husbands and wives. The only influence external to the family that influenced food behavior was cost of food. However, cost of food was negatively related to the quality of the wives’ diet. The more wives allowed cost to influence the food eaten, the more calories they ate and the lower the overall quality of their diets.

In the home, the woman is usually the principal meal planner. Reports and studies show that in this capacity, she tends to plan meals based on her personal preferences. However, the woman’s preference is not the sole determinant in her meal planning decisions. Her desire to please her spouse and other family members bears heavily on her food decisions. It has been shown that in the area of serving vegetables family preferences rather than personal preference wins out.

Studies designed to discover which parent exerts more influence on a child’s food decisions have shown conflicting results. Disagreements in results may be due to methodological problems. When these issues are eliminated in studies, results indicate that the parents’ influence was no different from that of an unrelated adult. It seems that parents influence children’s choices by limiting the foods they offer them. It seems that the child’s food dislikes more closely resemble those of the father. Peers have been shown to exert strong influences on a child’s food behavior. Children are more willing to try new foods or try foods originally disliked if their peers are trying them.

In planning interventions targeting children it quickly becomes apparent that many individuals influence the food choices of the child. Interventions that target the entire family
may be beneficial as the influence of all family members are factored into the food decision equation.

**The Meal Environment**

The meal environment takes into consideration parenting style and the feeding relationship. The degree of control parents exert when communicating with their children is often related to food intake. In some homes, children are required to sit at the table until they have “cleaned” their plate; whereas in others, children have freedom over what and how much food is eaten. The meal environment can influence the quantity and types of foods eaten by children. This is especially so in the area of vegetables where children are told by parents to “eat your vegetables” and they use a range of strategies to accomplish this goal. This section of the review focuses on parenting style and the feeding relationship. It also examines how they combine to affect food intake.

**Parenting Style**

Parenting style consists of the attitudes that parents communicate to their own children and the emotional climate in which these attitudes are expressed. In 1967, Baumrind described styles of parenting based on the control parents exerted over their children (Hoff, Lauren, & Tardif, 2002). Maccoby and Martin (1983) conceptualized parenting style based on two dimensions, the number and type of demands parents make of children and the level of responsiveness parents show toward children. Four parenting style results from these two dimensions, authoritative and authoritarian (similar to Baumrind) and indulgent and neglectful. See Figure 1.
**Figure 1.** Four styles of parenting (adapted from Maccoby and Martin, 1983).

**The Feeding Relationship**

The feeding relationship is the complex interactions that take place between parent and child as they engage in food selection, ingestion, and regulation behaviors (Satter, 1987). In this relationship, parents and child have different responsibilities. Parents are responsible for providing what the child is offered to eat while the child is responsible for how much, and even whether, he or she eats. If parents and children get into struggles about eating, it can interfere with the child’s ability to accept a variety of food or eat the right amount of food. If children are picky about eating, the problem may be too much pressure or too little support from parents. Children eat best when parents follow their lead, set appropriate limits, and feed in a smooth, comfortable, and emotionally satisfying fashion. Children eat worst when parents are either domineering or neglectful in feeding. In helping the child to eat as well as possible, parents should do their job of offering food and should think in terms of division of responsibility. The focus of feeding should not be on getting food into the child but on the parent-child relationship (Satter, 1987). Eppright et al.’s (1969) study of the eating behavior...
of preschool children \(n = 3,444\) showed that mothers tend to be preoccupied with the fact that their children are eating too little. As a result, they tend to overfeed and use negative strategies (punishment or threats) with children who are reluctant to eat. Such behavior can have negative psychological consequences on the child. Being aware of the developmental changes of the preschooler and how these changes relate to eating behavior helps parents reduce feeding problems. Research by Koivisto, Fellenius, & Sjoden, (1994) indicated that children’s food intake was positively related to parental encouragement to eat and negatively related to parents’ negative behavior.

Experiments were conducted by Birch (1992) to determine how feeding practices affect the child’s response to meal size and the energy content of food. In one of two feeding methods, parents focused on their child’s internal hunger and satiety cues. In the second, parents focused children on cleaning their plate, rewarded them for doing so, and fed them at specific times. Results indicated that children who were focused on internal cues of hunger and satiety were able to adjust energy intake in response to the energy content of foods.

The feeding relationship is an important aspect of the child’s feeding behavior. In this relationship, the parent and child have specific roles and mealtimes are best when both parent and child stick to their specific role. The parent’s role is to offer food to the child, and the child’s role is to decide the quantity of food to be eaten. When parents engage in extreme behaviors such as forcing the child to eat, threatening, or offering rewards, children tend to be more reluctant to eat. Parents need to have realistic expectations and appropriate knowledge regarding the child’s developmental stage and serving sizes.
Lifestyle

This concept of lifestyle is useful in the examination of dietary behavior. Lifestyle is commonly taken to mean the way people live. In this review, lifestyle will be limited to income, economic status, educational level, mother’s employment status, household size, residence, and nutrition knowledge.

Income

In the Engel demand curve, the relationship between income and food consumption is often measured as the monetary value of food consumed. Engel’s law states that “when there is an increase in personal income, there is a decrease in the relative importance of the sum of money spent on food purchases as compared to other expenses, but it may result in an absolute increase in expenditure (Swagler, 1975). This relationship is known as income elasticity or the marginal propensity to consume. It can also be thought of as how much the demand for food increases when income increases. Income elasticity is the percentage change in food consumption resulting from 1% change in income, while the marginal propensity to consume is the change in food consumption resulting from a $1 increase in household income (Price, 1982). In the U.S. the income elasticity for food is low ranging from .17 to .36, meaning that a 1% increase in household income produces a .17% to .36% increase in food expenditure. Income elasticity is used to classify goods as normal or inferior. For normal goods, as income increases, the demand increases. For inferior goods as income increases, the demand decreases. Normal goods can be further subdivided into necessity and luxury. As income increases by 1%, the demand for necessity goods increases < 1%, while the demand for luxury goods increases > 1%. Most foods are categorized as normal goods with income elasticity of < .05. Generally, grain products are cited as inferior products.
Vegetables have higher income elasticities, with income being positively related to this product (Axelson, 1986; Popkin & Haines, 1981). The Nationwide Food Consumption Data (NFCD) collected during 1977–1978 showed that the estimated income elasticity for total food is about 0.32, meaning that a 10% increase in household income is associated with a 3.2% increase in food expenditure (Smallwood & Blaylock, 1981).

Studies have indicated that households with higher incomes spend more on vegetables (also beef, beverages, and baking products) and less on pork, eggs, and cereals. Expenditures for vegetables (and fruits) account for 14% of the average food budget (Smallwood & Blaylock, 1981). The NFCD collected during 1977–1978 revealed that fresh vegetables (and fruits) averaged 8% of at-home expenditures. Fresh vegetables accounted for 52.0% of the weekly expenditures on fresh fruits and vegetables. Deep yellow vegetables had the highest, positive income elasticity meaning that an increase in household income causes an increase in expenditures on these items (Table 2). Canned vegetables and fresh potatoes had negative income elasticities, indicating that expenditures on these commodity groups declined as income increased. Frozen vegetables were quite responsive to income change. The larger the magnitude of the income elasticity, the more responsive household expenditures are to a change in household income (Smallwood & Blaylock, 1981).

An analysis of the NFCD 1977–1978 found that based on 19 nutrients, income level had no statistically significant effect upon the nutritional quality of diets of children and their families (Windham, Wyse, Hansen, & Hurst, 1982). Other studies also reported similar results (Chemichovsky & Coate, 1979; Johnson et al., 1994; Touliatos, Lindholm, Wenberg, & Melbagere, 1984). In the Windham et al. (1982) analysis of Food Consumption Data, it is proposed that reasons for income not having an effect on quality of diets could be due to the
Table 2

*Effect of Household Income on Vegetable Expenditure*

<table>
<thead>
<tr>
<th>Product</th>
<th>Income elasticity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetables, fresh</td>
<td>0.18</td>
</tr>
<tr>
<td>Dark green</td>
<td>0.05</td>
</tr>
<tr>
<td>Deep yellow</td>
<td>0.27</td>
</tr>
<tr>
<td>Light green</td>
<td>0.17</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>0.10</td>
</tr>
<tr>
<td>Other vegetable</td>
<td>0.30</td>
</tr>
<tr>
<td>Canned vegetable</td>
<td>-0.10</td>
</tr>
<tr>
<td>Frozen vegetable</td>
<td>0.43</td>
</tr>
<tr>
<td>Potatoes, fresh</td>
<td>-0.15</td>
</tr>
</tbody>
</table>

*Note. Source: Nationwide Food Consumption Data (Smallwood & Blaylock, 1981)*

The fact that the parents of these children were not at the income level where starvation takes place. Once families come above this level, it seems that the amount of money spent on food is unrelated to its nutrient composition. In addition, many of the children in this sample were privy to financial assistance from programs such as WIC, Food Stamps, and School Lunch and Breakfast programs. Involvement in such programs allows low-income individuals to participate more equitably in the food supply (Windham et al., 1982). However, in this sample, the lowest income households (homeless and unemployed) may not have been adequately represented.
Quan et al. (2000) examined behaviors of low-income mothers related to fruit and vegetable consumption. Face-to-face interviews were conducted with 218 low-income mothers chosen by consecutive sampling in a pediatric clinic serving low-income women in Minnesota and Wisconsin over a 4-month period. Women were divided into groups of low or high consumption of fruit, vegetables and vegetables and fruit combined. Two or more servings of either fruit or vegetable and four servings of fruit and vegetables were considered as high consumption. Mean vegetable intake was $2.2 \pm 1.5$ servings per day; median serving of vegetables was 1.9 servings. This study suggested that behaviors that predicted higher levels of vegetable consumption in low-income women and their children were keeping several forms of vegetables around the house, eating vegetables as snacks, eating a vegetable at dinner, eating two different vegetables at dinner, and eating salad. Few women reported eating vegetables for a snack; eating two different vegetables at dinner or eating salads or other vegetables at lunch most days.

Havas et al. (1998) examined factors associated with fruit and vegetable consumption among women enrolled at 15 WIC sites in Baltimore and 6 counties in Maryland ($n = 3,122$). They studied socio-demographic variables (age, race, education, marital status, working status, pregnancy status, and smoking status) and psychosocial variables (self-efficacy, knowledge, attitudes, social support, and perceived barriers) to consuming five or more servings of fruit and vegetables). They found that socio-demographic variables were not powerful predictors of fruit and vegetable consumption. The $R^2$ for most of the variables was quite small ($< .01$). Psychological variables were more closely related to consumption (shown by a higher $R^2$ than the socio-demographic variables). The psychological variables associated with higher consumption included knowledge of how many servings one should
consume (0.87 servings more than those without such knowledge), self-efficacy (1.1 servings more per standard deviation above the mean standardized score), attitudes (0.73 servings more per standard deviation above the mean standardized score), and perceived barriers (0.87 servings fewer per standard deviation above the mean standardized score).

Reicks, Randall, and Haynes (1994) conducted five focus groups with 30 participants of EFNEP to identify factors of fruit and vegetable selection, purchase, and consumption of fruit and vegetables. Women in this group were between 19 and 39 years of age, predominantly White (n = 27), low-income, and half had above high school education with some technical and college education. Results showed that availability of fruits and vegetables in low-income households is limited by the amount of money that can be budgeted for food and the storage space available. Food-related barriers included whether fruits and vegetables were preferred because of taste, appearance and preparation time. Participants cited modeling of behavior by an adult male presence in the home as an important factor in encouraging children to eat vegetables and they mentioned their need for ideas on how to serve vegetables creatively. Specifically, they wanted to know how to adapt vegetables to disguise the taste and how to cook vegetables so they taste good. Individuals wanted recipes that could be prepared with ingredients on hand and that were fast, easy, and tasty.

**Single Parent Families**

The economic status of a family has an impact on the well being of children. Poverty has been known to affect children in greater proportions than adults. In 1992, 21% of children under 18 and 25% of children under six (one in four) suffered from poverty. Racial and ethnic differences in poverty are evident, with Blacks (39%) and Hispanics (32%)
experiencing higher levels of poverty than Whites (14%). In 1993, 9 million (15.1%) of the total American population lived below the poverty line (U.S. Bureau of Census, 1993). A major function underlying incidences of poverty is single parent or female-headed households. Households headed by single mothers spend less money but a greater percentage of their income on food than two parent households. This is due primarily to lower income and education of these women. Women in single headed households tended to have less formal education. Education is strongly related to earnings and, therefore, to food expenditures (Frazao, 1993). Households in which the female head had not completed high school spent less per person per month on food than in similar households where high school was completed (Frazao, 1993). Factors contributing to the lower per person food expenditures of female-headed households included fewer household members, different household composition (such as large proportion of preschoolers and a lower proportion of adults in the household), and the preponderance of black households. Because women may have different preferences than men, female-headed households may allocate their money differently than do two-parent households. Data from individuals who completed both the basic survey portion of the 1977–1978 Nationwide Food Consumption Survey (NFCS) and three days of food record indicated that mean frequency of reports of vegetable use was higher at the $20,000 or more level for dark green and deep yellow vegetables, tomatoes and other vegetables, with other vegetables being significant at the 0.1 level (Cronin, Krebs-Smith, Wyse, Ligut, 1982).

**Educational Level**

The steady increase in the education level of women in the U.S. population have led to changes in the composition of household food budgets even after the effects of income and
other factors are considered. This increase in education leads to an increase in female employment outside the home, reduces amount of time available for traditional homemaking, and determines the nutritional well-being of children (Abdel-Ghany & Schrimper, 1978).

Level of formal education has been used as a predictor variable when examining aspects of food related behavior (Axelson, 1986). Education of female head of household is positively related to total food expenditure. It has been postulated that with higher education women may have greater potential household purchasing power and consequently may consume products with higher income inelasticities (Abdel-Ghany & Schrimper, 1978) such as meats, and fresh fruits and vegetables (Popkins & Haines, 1981). In addition, higher education may result in increases in nutrition knowledge and greater concerns about factors affecting the health of household members and may affect preferences and general lifestyle (Abdel-Ghany & Schrimper, 1978).

The nutritional well being of children is influenced by the educational achievement of their parents. According to the 1992 U.S. Bureau of the Census report, poverty rates of children in young families (those headed by someone younger than 30 years) were directly proportional to the years of education attained by their parents. Education of the female head of household is also strongly related to earnings and to food expenditures. Households headed by a female who had not completed high school spent less per person per month on food than did similar households in which the female head had completed high school (Frazao, 1993). The level of education attained by the head of household affects more than just income and wage potential; it also affects the attention and response given to educational materials and informational programs by members of the household (Frazao, 1993). A number of studies have found a positive, significant relationship between mothers’
educational levels and diet quality (Schorr, Sanjur, & Erickson, 1972; Yperman & Vermeersch, 1979). Studies have also shown a positive relationship between women’s educational levels and their dietary intake (Schafer, Roger, Gillespie, & Roderick 1980; Sims, 1978).

The relationship between household consumption expenditures for various food products and homemakers’ education was examined in the 1965–1966 USDA Household Food Consumption Survey. Other determinants of consumption behavior were taken into account. In addition, the income elasticities and the effects of homemakers’ education for selected food products were examined. Results indicated that meat, poultry, and fish (.26), fruits (.25), and grain products not enriched (.23) had the highest income elasticities ($p = .05$) with higher levels of homemakers’ income with changing expenditure of these products. In the area of elasticities of the education variable, cream, ice cream (.41); fruits (.32); and cheese (.31) had the highest positive income elasticities suggesting a strong effect on their consumption ($p = .05$). Vegetables had an education elasticity of .11 ($p = .05$), lower than that of fruits, suggesting a moderate to weak effect on their consumption (Abdel-Ghany & Schrimper, 1982).

In order to determine whether an increase in education resulted in the likelihood to consume preferred and healthier foods, the association between adult (male and female) education level and food consumption patterns in Chinese households was examined. The assumption underlying this study was that education as an instrument of change will lead to alterations in people’s eating habits and their demand for food (Bhandari & Smith, 2000). Multistage, random cluster was used to draw the sample households from eight northern and southern Chinese provinces so as to reflect variations in socioeconomic factors and
demographic measures. Multiple logistic regressions estimated the relationship between education and the likelihood of consuming different foods. The following questions were addressed:

1. What is the role of education in determining the likelihood of a household consuming a particular food?
2. Does an increase in female education, as opposed to male education, increase the likelihood of consuming certain foods as compared with others?
3. Of all the 22 food groups which are the ones most associated with an increase in education?
4. Which sociodemographic characteristics (income, rural-urban residence, province, and household size) reliably distinguish between households likely to consume a particular food and those not likely to? (Bhandari & Smith, 2000, p. 216).

Results indicated that almost all households consumed cereal and leafy vegetables. Seventy-three percent of households consumed vegetables, whereas 60% of the households consumed meats. Increase in household income was significantly associated with an increase in the likelihood of consuming vegetables (and fruits; \( p \leq .0001 \)).

A study of 113 preschool children and their families from a well baby clinic was conducted to investigate factors affecting their dietary status. Multiple regression analysis showed that both the homemaker attitudes and the dietary diversity score were dependent on the mother’s nutrition education (Lund & Burk, 1969). Multidisciplinary analysis also showed mothers’ educational achievement to be related to children’s food habits. Fruit and vegetable intake among adults in 16 states revealed that median fruit and vegetable intake increased with age and education. It was somewhat higher in Whites than Blacks. A mail
survey conducted in 1990 among Washington State residents \((n = 1069)\) indicated that individuals in low-income and low-education categories had significantly higher scores measuring barriers to fruit and vegetable intake compared to the highest income and education groups (Dittus, Hillers, & Beerman, 1995).

**Mother’s Employment Status**

From 1960 to 1990, the number of all children under six years of age whose mothers were employed grew from 19% to 57% (U.S. Department of Health and Human Services, Health Resources and Services Administration, 2001). In 2004, 62% of all mothers with preschool-aged children (younger than 6 years) were in the labor force (working or seeking employment). Over 57% of mothers with preschool-aged children were actually employed. (U.S. Department of Health and Human Services, Maternal and Child Health Bureau, 2005). This continual rise of women in the workforce is attributed to a greater demand for female labor, a rise in female wages, lower birth rates, and shifting cultural norms making it acceptable for women to work (Blau & Feber, 1986). The more hours women spend employed outside the home, the fewer hours they spend in meal preparation (15–20 minutes less per day equaling 1.75 hours/week). It was also observed that even though a woman is employed outside the home, she typically fulfills the primary role of homemaker (Robinson, 1977; Walker & Woods, 1976). Children of employed mothers also ate significantly more meals away from home. However, the meals eaten away from home were not necessarily restaurant meals but more often lunches at school and day care centers.

Data from the Wisconsin sample of a multistage time-use study \((N = 210\) families) were used to study the effect of homemakers’ employment on meal preparation time, meals at home, and meals away from home. The amount of time a homemaker spent on food
preparation was significantly related to her employment. Unemployed women spent more
time on food preparation tasks than women who were employed part time or full time. The
age of the youngest child was related to the amount of time spent in food preparation, with
women with one-year olds spending more time in food preparation than women with infants.
Studies have found that women who are employed outside the home used convenience foods
to a greater extent than did non-employed women (Dickens, 1958). Time spent in work
outside the home had no effect on meals eaten together at home. However, in this study,
families were more likely to eat together if the homemaker had a college degree. The
coefficient for homemakers who were employed full time was highly significant and
positive, showing that these families ate a large proportion of meals away from home.

Studies have also shown that no difference exists between women’s employment and
the quality of the family’s diet. The nutrient intake and meal patterns of 123 adolescents with
employed mothers were compared with those of 88 adolescents with non-employed mothers.
Results revealed few differences between adolescents with employed and non-employed
mothers. Comparison of types of foods consumed for the evening meal showed that 30% of
respondents with employed mothers had vegetables in this meal compared to 38% of
respondents with non-employed mothers. Results were not statistically significant (Skinner,

The USDA 1985 Continuing Survey of Food Intakes of Individuals (CSFII) was used
to study the effect of maternal employment on the quality of young children’s diets. The
sample consisted of 250 children (2–5 years old) and their mothers. Children’s dietary quality
was assessed using 4 non-consecutive days of dietary intake collected by 24-hour recall over
a 1-year period. At the bivariate level, maternal employment status was significantly related
to mean household income, number of meals the children ate away from home, and household size ($p < .001$). Bivariate relationships between employment status and the dietary variable were not significant. Maternal employment did not seem to have any detrimental effect on the nutrient adequacy of young children’s diets as measured by mean adequacy ratio 3 score (Johnson et al., 1994). Similar results were obtained using a sample of 442 children (2–5 years old) from the 1987–1988 Nationwide Food Consumption survey (Johnson et al., 1994). It was shown that the male and female heads of households’ age and number of hours employed were not significantly related to nutrient intake of 14 essential vitamins and minerals.

**Household Size**

Household size elasticity is the percentage change in food expenditure resulting from a 1% change in household size (Smallwood & Blaylock, 1981). If household size elasticity is greater than 1%, then it is to be assumed that greater than 1% increase in food expenditure is to occur. Likewise, if household size elasticity were less than 1%, then less than 1% increase in food expenditure would result. An inverse relationship exists between income and household size because an increase in household size with no (resulting) increase in income is taken to be a decrease in income. Additionally, food items not responsive to income would be more responsive to changes in household size. Likewise, food products more responsive to income tend to exhibit lower household size elasticity (Axelson, 1986; Smallwood & Blaylock, 1981). As household size increases, purchases of food consumed at home, rather than purchases of food away from home, occur. Larger households are therefore more likely to spend more eating in than eating out and less money per person on food. Negative household size elasticity indicates that purchases decline as household size increases and a
household size elasticity value of 1.00 indicated that expenditures are proportional to household size. The larger the magnitude of the household size elasticity, the more responsive household expenditures are to change in household size (Smallwood & Blaylock, 1981).

The NFCD collected during 1977–1978 revealed which vegetable purchases changed as a function of household size. Table 3 shows that all household size elasticity values were positive indicating that an increase in household size is associated with higher household expenditures on these items. The value of canned vegetables (0.89) and fresh potatoes approximated 1.00, showing that expenditures on these items are proportional to household

Table 3

*Effect of Household Size on Vegetable Expenditure*

<table>
<thead>
<tr>
<th>Product</th>
<th>Income elasticity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetables, fresh</td>
<td>0.45</td>
</tr>
<tr>
<td>Dark green</td>
<td>0.48</td>
</tr>
<tr>
<td>Deep yellow</td>
<td>0.34</td>
</tr>
<tr>
<td>Light green</td>
<td>0.46</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>0.53</td>
</tr>
<tr>
<td>Other vegetable</td>
<td>0.40</td>
</tr>
<tr>
<td>Canned vegetable</td>
<td>0.89</td>
</tr>
<tr>
<td>Frozen vegetable</td>
<td>0.35</td>
</tr>
<tr>
<td>Potatoes, fresh</td>
<td>0.87</td>
</tr>
</tbody>
</table>

*Note.* Source: Nationwide Food Consumption Data (Smallwood & Blaylock, 1981)
size. Windham et al. (1982) found household size affected nutrient density composition of
fat, carbohydrate, vitamin B6 and vitamin C.

**Area of Residence**

Locality of residence has been shown to have an effect on dietary status. Data from
1,392 children (ages 1 to 10 years) in the 1977–1988 Nationwide Food Consumption Survey
were examined to (a) determine how their diets compared with current recommendations and
(b) identify those sociodemographics factors associated with the greatest risk for not meeting
the recommendations. Results revealed that level of urbanization affected most nutrient
intake variables (Johnson et al., 1994). Children in urban areas had the lowest caloric intakes.
Children living in rural areas and inner-city areas suffer from poverty and poor health in
greater numbers than children living in “suburban” areas (Crockett & Sims, 1995).

**Nutrition Knowledge**

The relationship between nutrition knowledge and dietary behavior has not been clear
in the literature. Some studies have shown a relationship between dietary behavior and
nutrition knowledge, while others have not. A meta analysis of nine studies (statistical
analysis of a collection of findings from independent studies for the purpose of integrating
these findings) examined whether there is a relationship between dietary intake and (a)
nutrition knowledge and (b) food-and-nutrition related attitudes and what the strength of the
relation revealed. Results revealed a significant relationship between both nutrition
knowledge and dietary intake and food-and-nutrition-related attitudes but the effect size
estimates of these relationships were relatively small ($r = 0.10$). The small effect size may be
due to lack of specificity in measurements (Axelson, Federline, & Brinberg, 1985).
Income elasticity is the percentage change in food consumption resulting from a one dollar increase in household income. Households with higher incomes spend more on vegetables. Increases in household incomes cause an increase in expenditures on fresh vegetables with deep yellow vegetables having the highest income elasticity. However, increased income leads to a decrease in expenditure on canned vegetables and fresh potatoes.

Due to lower income and education, female-headed households spend less money but a greater percentage of their income on food than two parent households. Educational level is an important factor in determining income level of single parent families and the amount of money spent on food. Female-headed households with higher education tend to consume products with higher income inelasticity, for example, vegetables. This may be due to increase in nutrition knowledge and greater awareness of health concerns that comes with increased education. Studies have shown a positive relationship between women’s educational level and their dietary intake (Abdel-Ghany & Schrimper, 1978; Cronin, et al., 1982; Frazo, 1993).

There has been an increasing number of women entering the labor force from the early 1960s to the present time. Sixty-two percent of all preschool aged children have mothers in the labor force. Even though women are employed outside the home, they still fulfill their homemaking roles. Employed women tended to use more convenience foods, and their children ate more meals away from home. This did not mean they ate more restaurant meals per se, because some of these meals were school lunches. There were no differences in nutritional status between children of employed or unemployed mothers. An inverse relationship exists between income and household size. Food items not responsive to income tend to be responsive to household size. Food items more responsive to income tend to
exhibit lower household elasticity (Abdel-Ghany & Schrimper, 1978; Cronin, et al., 1982; Frazo, 1993).

**The Effects of Culture on Food Behavior**

*Development of Culture*

Culture establishes how people use food and this affects food intakes (Kittler & Sucher, 1995; Lowenberg Todhunter, Wilson, Savage, & Lubawski, 1974). Food is always used to satisfy hunger and to meet nutritional needs. Food is used to promote family unity when members eat together. It can denote ethnic, regional and national identity. It is used socially to develop friendships, provide hospitality, as a gift, and as important part of holidays, celebrations and special family occasions. . . . Food can be used to show status or prestige, make one feel secure, express feelings and emotions, and to relieve tension, stress or boredom. Food controls the behavior of others when used as reward, punishment or as a political tool in protests and hunger strikes. (Asp, 1999, p. 289)

Culture is viewed as an integrated sense-making system comprising six different characteristics: (a) is continually changing based on the foods that are available to the consumer at a particular time, (b) has a value system or standards of “good” and “bad” that are transmitted to successive generations and modified through cultural changes, (c) consists of learned behavior that is transmitted through enculturation—from one generation to the next through nonverbal behavior, informal and formal education, (d) provides for reasonable, efficient interaction among people, (e) contains symbols that are understood by the group, and (f) emphasizes specific activities (cited in Bass, Wakefield, & Kolasa, 1979 p. 4).

The functions of food in culture include to: (a) satisfy hunger and nourish the body; (b) initiate and maintain personal relationships and business associations; (c) determine and
demonstrate the nature and extent of relationships; (d) focus and bring people together for a specific purpose; (e) express love and concern; (f) set individuals apart from their peers; (g) set a group of people apart or signify that a person belongs to a particular group of people; (h) help people cope with psychological and emotional stresses; (i) reward, punish, and otherwise influence the behavior of others; (j) denote status; (k) bolster self-esteem or to gain recognition; (l) prevent, diagnose, and treat physical illness; and (m) heighten emotional experiences (Bass et al., 1979).

**Cultural Changes Due to Migration**

Although food patterns are fairly well engrained they are susceptible to change. Such changes are observed during migration. Table 4 shows various cultural groups and highlights their cultural perspectives. Vegetables traditionally eaten by these groups are identified, as well as the changes that were made in vegetable use as a result of living in the U.S. for many years (from post modification contact with different ethnic groups or due to migration).

**Food Habits of Cultural Subgroups in the U.S.**

Axelson (1986) suggested that an examination of cultural subgroups in the U.S. could be divided according to the following questions: (a) what are the food habits of a particular ethnic group in the U.S.? (b) How does a particular ethnic group’s food ways in the U.S. differ from the group’s food ways in their culture of origin? and (c) How does a particular ethnic group differ from the dominant cultural group? In studying changes in the types and amounts of foods consumed by individuals who immigrate to the U.S., a tripartite food categorization system was used. This includes: (a) traditional foods—those more common in the culture of origin, (b) basic foods—those common in both cultures, and (c) new foods—those common in the host culture (Dewey, Strode, & Fitch, 1984). Research of Mexican
Table 4

*Post Modification Contact of Different Ethnic Groups*

<table>
<thead>
<tr>
<th>Cultural group</th>
<th>Cultural perspective</th>
<th>Common vegetable</th>
<th>Post-contact modifications</th>
</tr>
</thead>
</table>
| Native Americans   | ▪ Worldview and approach to life reflect harmony in spiritual, social, and physical needs  
▪ Primary social unit is extended family.  
▪ All blood relatives are considered equal  
▪ Children are highly regarded | Camass root, cacti (nopales), chilies, fiddleheads, Indian breadroot, Jerusalem artichokes, lichen, moss, mushroom, nettles, onions, potatoes, pumpkin, squash, squash blossom, sweet potatoes, tomatoes, wild greens, wild potatoes, wild turnip | ▪ Some traditional vegetables eaten when available.  
▪ Green peas, string beans, instant potatoes common.  
▪ Intake of vegetables low  
▪ Potato chips and corn chips popular as snacks |
| Europeans          | ▪ Groups from northern, southern, and central Europe and Russia and Scandinavians  
▪ Groups formed model of the typical American family  
▪ Slight variations among groups | Artichokes, asparagus, beets, Brussels sprouts, cabbage, carrots, cauliflower, celery, celery root, eggplant, cucumbers, green beans, green peppers, leeks, lettuce, mushroom, peas, parsnips, potatoes, spinach, tomatoes, turnips, watercress | ▪ First and second generations generally eat only fresh vegetables.  
▪ Vegetables reflect general American food habits by the third generation. |
| Africans           | ▪ Religion essential in this group  
▪ Extended family important | Beets, broccoli, cabbage, corn, greens, green peas, okra, potatoes, spinach, squash, sweet potato, tomato, yams | ▪ Green leafy vegetable (greens) popular in all regions; other vegetables eaten according to availability.  
▪ Intake remains low |
| Latinos            | ▪ Often live in culturally homogeneous communities  
▪ Many are Roman Catholics | Cactus, chilies, corn, jicama, onions, peas, potatoes, squash, squash blossom, tomatoes | ▪ Starchy fruits and vegetables still frequently consumed.  
▪ Low intake of leafy vegetables often continues. |
| Asians             | ▪ Religious practice eclectic | Amaranth, asparagus, bamboo shoot, banana squash, bean sprouts, bitter melon, broccoli, burdock root, cauliflower, celery, cabbage, chili peppers, Chinese long beans and mustard, chrysanthemum greens, cucumbers, eggplant, flat beans, fuzzy melon, garlic, ginger root, green pepper, kohlrabi, leeks, lettuce, lily blossom, lily root, lotus root and stems, luffa, dried and fresh mushrooms | ▪ More raw vegetables eaten |

*Note. Adapted from Kittler and Sucher, 1995.*
(Dewey et al., 1984), Puerto-Rican (Immink, Sanju, & Burgos, 1983), and Chinese (Grivetti & Paquette, 1978; Yang & Fox, 1979) immigrants and non immigrants revealed that migration was accompanied by a decreased use of traditional foods and an increase in basic or new foods. Grivetti and Paquette (1978) examined 77 traditional and nontraditional foods consumed by Chinese immigrants before and after arrival in the U.S. Results indicated that Chinese immigrants maintained a wide diversity of vegetable use after arrival in America. However, the consumption of broccoli, lettuce, potato, squash, and zucchini were found to increase sharply. Vegetables exhibiting a sharp decline in consumption included bok choy, green onions, lotus root, mushroom, tree ears, and water chestnuts (availability did not account for the decline in use). Vegetables whose frequency of use was mentioned included bell pepper, cabbage, carrots, celery, onions, peas, and string beans. Yang and Fox (1979) found that Chinese persons living in Lincoln, Nebraska incorporated more American foods in the diet while decreasing the consumption of Chinese foods. This shows that a continuous process of change in food habits is taking place. Dietary data obtained from 71 migrant and 69 non-migrant low-income first generation Mexican American families in California reported that vegetable consumption among migrants stayed the same, while non-migrants reported increase in their consumption.

Culture provides the guidelines for the way individuals behave. It is responsible for the food choices that individuals make. Cultural traditions are passed on from one generation to another and tend to be fairly well engrained. Changes can occur in these traditions and are seen when individuals migrate or interact with other cultural groups. The diets of ethnic groups who migrate consist of a broad spectrum of foods that result from the blending of traditional and non-traditional foods.
In working with ethnic groups, advice on dietary issues must be given with thoughts of the ethnic background of these individuals (Grivetti & Paquette, 1978). To bring about change in the food choices common among ethnic groups, the target food must be fitted into the existing cultural patterns, which contain the core beliefs which guide meaning to the group’s existence (Niehoff, 1969).

**Environmental Influences on Food Behavior**

Environmental factors impact food behavior. In this section, environmental factors will be defined as barriers, grocery store environment, availability and accessibility. The behavioral systems approach proposes reciprocal relationships among the environment, individual knowledge and attitudes, and individual behavior (Bandura, 1977). The desire to change behavior must be accompanied with an understanding of the factors that cause the behavior (Ajzen & Fishbein, 1980). Social cognitive theory (SCT) previously termed Social Learning Theory by Miller and Dollard (1941) emphasizes that a person’s behavior and cognitions affect future behavior. In SCT, three forces, behavior, personal factors (including cognitions), and the environment interact to explain and predict changes in behavior. The interaction of these three forces is termed reciprocal determinism, inferring that a change in one area undoubtedly produces changes in another area (Bandura, 1986).

The use of a SCT principle (reciprocal determinism) was used in a focus group discussion (FGD) with 4th and 5th graders, their parents, teachers, and school food service workers prior to an intervention to increase fruit and vegetable consumption. Reciprocal determinism states that there is continuous interaction between the environment, characteristics of the person (including cognition), and the person’s behavior (Baranowski et al., 1993). Results indicated that the primary environments in which families purchase,
prepare, select, and/or consume fruit and vegetables include grocery stores and supermarkets, convenience stores, open air farmer’s markets, restaurants/cafeterias/fast food places, home (personal, relative, friend), day care or after school programs, school, social clubs/organizations/churches and outside (walking with a friend). In SCT, an aspect of liking/preference (affect) and a cognitive component concerning expectancies (whether it is “good” for one or not) are examined. In the area of affect, children disclosed liking one or a small number of vegetables (corn being the favorite). Most children did not like most vegetables. There was wide variability in the vegetables that were liked. The method of preparation determined liking for vegetables. Children expressed a greater liking for vegetables prepared at home rather in a restaurant or at school. Short term and long term expectancies that might have been related to vegetables included: makes you healthy (healthy seems to mean strong and beautiful); helps you remain slender; live long; have good eyes and teeth; grow taller. In the area of long term expectancies, results indicate that although cognitively a predominance of positive expectancies was stated, children perceived 5 servings of fruit and vegetables daily as an unreasonably high goal (Baranowski et al., 1993).

Barriers

Focus groups conducted with low-income participants in Iowa indicated that inconvenience in terms of the preparation that is involved before vegetables can be eaten was a major barrier. The fact that many vegetables need some preparation before eating is somewhat of a disadvantage since many snack foods (cookies, chips and candy) can be eaten directly out of the package. Fear of spoilage was another barrier stated. Focus group participants were reluctant to purchase vegetables because they were not used quickly or frequently enough to prevent spoilage. Even though low-income participants in Iowa did not
state cost as a barrier to vegetable use, cost was a major issue for focus group participants in Georgia. Focus group participants in Virginia indicated that barriers were not a top priority in learning about nutrition when compared to financial obligations of purchasing vegetables (Schafer, 1999).

Dittus et al. (1995) surveyed Washington state residents \( N = 1069 \) to identify attitudes regarding the nutritional benefits of cancer-preventing attributes of fruit and vegetables and the barriers to fruit and vegetable intake. They found that barriers to fruit and vegetable consumption were negatively correlated to benefits of intake, nutrition concern, and nutrition behavior \( r = -0.24, r = -0.24, r = -0.27 \), respectively. They also found that individual of low-income, low-education and male subjects had higher mean scores in terms of barriers for fruit and vegetable intake. Females identified significantly more benefits for fruit and vegetable intake. They found that all respondents had high nutrition concerns despite income and education levels.

**Grocery Store Environment**

The store environment (by presenting health-education information and greater availability of healthful foods) can directly influence dietary behavior, as well as dietary knowledge and attitudes of its patrons. The assessment of the food marketplace is an important component in the evaluation of efforts to change dietary behavior (Cheadle et al., 1991). Baseline data was used as part of the evaluation of the Henry J. Kaiser Family Foundation Community Health Promotion Grant Program to examine the relationship at the community level between individual dietary practice and the grocery store environment. Positive significant correlations were found between the availability of healthful products in the store and the reported healthfulness of individuals’ diets. Positive but not significant
correlations were also found between measures of the amount of health education information provided by stores and the healthfulness of individual diets (Cheadle et al., 1991).

**Availability and Accessibility**

Environmental influences such as food availability and accessibility are important determinants in a child’s food consumption. Availability refers to whether the food is present in the home. Accessibility deals with how the food is prepared, presented, and/or maintained in a form that enables or encourages children to eat it (Hearn et al., 1998).

Hearn et al. (1998) used data from two school-based intervention projects to determine whether availability and accessibility of selected foods were correlated with the consumption of fruit and vegetables. In the first data set, Gimme 5, telephone interviews with parents of 3rd grade children were conducted to determine whether the availability and accessibility of selected foods were correlated with the consumption of fruit and vegetables. Psychosocial characteristics were controlled. Results indicated that consumption of fruit and vegetables was related to home availability and accessibility. No associations were found between the availability and accessibility scales and demographic variables such as ethnicity, parent’s marital status, or parent’s education status. In the second study, the data set from Teach Well was used. An assessment was made as to whether the servings of fruit and vegetables offered in the school lunch were related to the average servings of fruit and vegetables consumed in students’ diet as indicated in the students’ seven day food record. Socioeconomic status was controlled. Results indicate that students ate more fruit and vegetables for lunch at schools that offered more fruit and vegetables.
There are many determinants that affect food behavior. These determinants may be of a psychosocial, cultural, or environmental nature. In addition, a number of lifestyle factors and personality and parenting styles impact food behavior. The determinants of food behavior have varying effects on the food choices made in families. It is important to include these determinants in a review since they provide background information useful for planning interventions. These strategies will surround the critical thinking approach that will be used in this intervention. This information will be used as the foundational knowledge in nutrition that will form the basis for critical thinking and problem solving.

**Critical Thinking Approaches**

Critical thinking is by no means a novel concept, and its roots can be traced as early as Socrates who used a probing method of questioning to get authorities to provide rational claims to their knowledge (Paul, 1985). In 1933, John Dewey stated the goal of education as developing individuals capable of reflective thinking. In the early 1940s Edward Glaser proposed that good citizenship in a democracy requires more than just being good, keeping the law, and being a good neighbor. He mentioned that “in addition, good citizenship calls for the attainment of a working understanding of our social, political, and economic arrangements and for the ability to think critically about issues for which there may be an honest difference of opinion” (Glaser, 1941, p. 5).

During the last three decades, there has been increasing emphasis on critical thinking skills. The 1980s saw an increased interest in critical thinking in areas of education and industry (Facione, 1990; Halpern, 1993; Sternberg & Baron, 1985). Factors such as declining test scores in the nation’s schools, reports which cast blame on schools for students lack of critical thinking skills (Sternberg & Baron, 1985), and the increasing complexity and
changing demands of the workplace (Brookfield, 1987; Glaser & Resnick, 1991) all led to increased demands for critical thinking. By early 1980, education scholars argued that instruction must help students develop critical thinking skills, that is, encourage them to ask questions about what they learn, invent new ways of solving problems, connect new knowledge to information they already have, and apply their knowledge and reasoning skills in new situations (Glaser & Resnick, 1991). Similarly, the marketplace also stated that employees in various levels of an organization must be able to think and act independently, use judgment, and figure out what is the nature of a problem rather than just applying a set of predefined rules (Vaske, 1998). The educational goals for the year 2000 announced by the President of the United States and state governors included the attainment of critical thinking skills (Corrallo, 1991). Critical thinking still remains one of the most widely discussed intended outcomes (Erwin & Sebrell, 2003) and will continue to hold its place of importance in education and in the lives of individuals due to the changing complexity of the world.

In reviewing the literature on critical thinking, two things quickly become evident: one, that there is no shortage of definitions for critical thinking (see Appendix 1) and two, little consensus exists in terms of definition (Adams, Stover, & Whitlow, 1999; Garrison, 1991; Hicks, 2001; Lipman, 1985; Sternberg, 1985; Tucker, 1996). Some definitions have focused on the nature of the thought process involved in critical thinking while others have equated critical thinking with the use of logic or the science of correct reasoning. Asking the right question, identifying fallacies in a line of reasoning, proposing lucid arguments and evaluating ideas and claims are included in this area. The literature presents both narrow views of critical thinking where the concept is defined as a list of skills and abilities, and broad views of critical thinking that include both disposition and skills. Other definitions
view reflection as an integral part of the concept. Terms such as emancipatory learning, reflective thinking, practical reasoning, and dialectical thinking also suggest the use of critical thinking.

Endeavors to develop critical thinking skills in individuals must begin with a clear definition of the concept. Such a definition will serve as a guide for the development, implementation, and assessment processes. This section of the review on critical thinking begins with definitions of critical thinking. The objective is to present various conceptualizations of critical thinking so an overview of the concept is provided. The presentation of different views of critical thinking allows one to see the complexity involved in defining the concept but more importantly, allows one to determine which definition best serves the purpose of one’s efforts. Vaske (1998) mentions that the way critical thinking is defined determines what will be measured through critical thinking assessments. Attention will be given to the ways in which critical thinking is assessed, with specific reference to nutrition.

**Definitions of Critical Thinking**

**Nature of the Thinking Process**

Definitions that focus on the nature of the thinking process state that critical thinking is skillful, responsible thinking that is conducive to good judgment because it: relies upon criteria; is self-correcting in that it aims to discover its own weaknesses and rectify what is at fault in its own procedures; and is sensitive to context. In other words, it takes into account exceptional or irregular circumstances and conditions, special limitations, and the possibility that some meanings do not translate from one context or domain to another (Lipman, 1988). Halpern (1996) describes critical thinking as purposeful, reasoned, and goal directed. She
also sees critical thinking as an internal process whereby new information is combined and stored with the information in memory and the final products of this process become something more than and different from what was stated (Halpern, 1984). Norris (1985) views critical thinking as a process in which one decides rationally what or what not to believe. These definitions suggest the types of thought processes involved in critical thinking and allude to the outcome of the process.

**Logic and the Art of Questioning**

In the literature, critical thinking is associated with the science of correct reasoning or in connection with logics, that is, analyzing arguments and appraising their correctness or incorrectness. To this end, logicians discuss claims and arguments, evaluate premises, repair arguments, suggest counter arguments, gather evidence (both verbal and physical), and detect fallacies in reasoning. In this context, critical thinking is seen as: analyzing what is said; assessing it carefully; seeking evidence when it is appropriate; putting various pieces of information together in a coherent way; attempting to avoid mistakes in thinking; questioning things that do not make sense; and making decisions and plans in the light of the best available information (Dauer, 1989; Epstein, 2000).

Other definitions state that critical thinking is asking the right questions (Brown & Kelley, 2001; Noisch, 2001). Some of these questions include: (a) What are the issues and the conclusions? (b) What are the reasons? (c) Which words or phrases are ambiguous? (d) What are the value conflicts and assumptions? (e) Are there any fallacies in the reasoning? (f) How good is the evidence? (g) Are there rival causes? (h) Are the statistics deceptive? (i) What significant information is omitted? and (j) What reasonable conclusions are possible? Noisch (2001) proposed a three-part model of critical thinking that also includes asking the
right questions; trying to answer those questions by reasoning them out; and believing the results of the reasoning.

**Critical Thinking as a List of Skills or Abilities**

Some individuals conceptualize critical thinking in a “narrow sense,” meaning that critical thinking includes a list of specific skills and abilities. Dressel and Mayhew’s (1954) conceptualization of critical thinking consisted of a list of skill relating to problem solving. Later, Ennis (1962) and Beyer (1985) identified skills that were related to the correct assessment of a statement (logics). Burnard (1989) and the APA Delphi study use a broader range of skills to denote critical thinking.

Dressel and Mayhew (1954) viewed critical thinking as problem solving and used the following list of critical thinking abilities: defining a problem; selecting pertinent information for the solution of a problem; recognizing stated and unstated assumptions; formulating; selecting relevant and promising hypotheses; drawing valid conclusions; and judging the validity of inferences. Later theorists also equated critical thinking with (or included) problem solving. Kurfiss (1988) viewed critical thinking as a form of problem solving but stated that critical thinking involves reasoning about ill-structured questions while problem solving was narrower in scope. D’Angelo (1971) also associated critical thinking with problem solving but stated that critical thinking included skills such as intuition and creativity.

Ennis (1962) identified twelve critical thinking abilities that included grasping the meaning of a statement and judging whether: there is ambiguity in a line of reasoning; certain statements contradict each other; a conclusion follows necessarily; a statement is specific enough; a statement is actually the application of a certain principle; an observation
statement is reliable; an inductive conclusion is warranted; the problem has been identified; something is an assumption; a definition is adequate; and a statement made by an alleged authority is acceptable. Later, Ennis (1985b) grouped certain abilities into elementary and advanced clarification. Elementary clarification consisted of the following abilities: analyzing arguments, asking and answering questions of clarification and challenge, judging the credibility of a source, observing and judging observation reports, inferring, inducing, and judging inductions. Advanced clarification included: defining terms and judging definitions (form, definitional strategy), identifying assumptions, deciding on an action, and interacting with others.

Beyer (1985) stated that critical thinking cannot be viewed as a process in the same way that decision making and problem solving are viewed as processes. Instead he envisioned critical thinking “in a narrow sense” as a composite of nine discrete skills that included: (a) distinguishing between verifiable facts and value claims, (b) determining the reliability of a source, (c) determining the factual accuracy of a statement, (d) distinguishing relevant from irrelevant information, claims, or reasons, (e) detecting bias, (f) identifying ambiguous or equivocal claims or arguments, (g) recognizing logical inconsistencies or fallacies in a line of reasoning, (h) distinguishing between warranted or unwarranted claims, and (i) determining the strength of an argument.

Burnard (1989), in proposing the need to develop a critical thinking ability in nursing education, stated that this ability to think critically is one of the keys to successful education. Thinking critically was envisioned as generating options, seeing other possibilities, and intelligently discriminating and identifying new ideas.
A panel of 46 experts in critical thinking (scholars, educators, and leading figures) convened to work toward a consensus on the theory and assessment of critical thinking. Using a qualitative research methodology, the Delphi Method, they participated in several rounds of questions that require thoughtful and detailed responses. (The APA Delphi study is used in future reference to this work.) As a result of this work, a list of skills (and subskills) that comprise critical thinking was proposed. These included: Interpretation (categorization, decoding significance, clarifying meaning); Analysis (examining ideas, identifying arguments, analyzing arguments); Evaluation (assessing claims, assessing arguments); Explanation (stating results, justifying procedures, presenting arguments); and Self-Regulation (self-examination, self-correction) (American Psychological Association, 1990). These skills included those that related to logic (analysis, evaluation and explanation) but also listed those that justify procedures (evaluation) and those that contained a self-correcting element (explanation).

**Critical Thinking as Including Both Dispositions and Skills**

Some scholars also conceptualize critical thinking in the “broad” sense, including both abilities or skills and dispositions. Growing consensus now exists that a complete approach to developing good critical thinkers must include the nurturing of the disposition toward critical thinking (Facione & Facione 1992). Critical thinking is more than the successful use of particular skills; it includes the attitude or disposition to recognize when a skill is needed and the willingness to apply it (Halpern, 1998). This disposition toward critical thinking has also been defined as a critical spirit (Norris, 1985), and as certain affective dispositions or habits of mind (Facione, Sanchez, Facione, & Gainen, 1995).
Having a critical spirit has been considered as important as thinking critically. The critical spirit requires one to think critically about all aspect of life, as well as one’s own thinking and to act on the basis of what one has considered (Norris, 1985). As early as 1943, Edward Glaser suggested that critical thinking is more that a composite of skills. He included an attitudinal aspect or disposition in his definition, as well as, knowledge and skills. Glaser (1941) stated that critical thinking involves three principal elements: (a) an attitude of being disposed to consider in a thoughtful perceptive manner the problems and subjects that come within the range of one’s experiences, (b) knowledge of the methods of logical inquiry and reasoning, and (c) skills in applying those methods. The knowledge and skill components of critical thinking involve the examination of stated belief to see if the evidence or reasoning presented supports it or further conclusions to which it leads. The attitudinal components involve being disposed to listen to another person’s opinion or argument whether one agrees or disagrees with it.

Ennis (1985a) in his later writing of critical thinking proposed that critical thinking involves certain dispositions similar to those mentioned above. He stated that the following broad dispositions characterize critical thinkers: seek a clear statement of the thesis or question; seek reasons; try to be well informed; use credible sources and mention them; take into account the total situation; try to remain relevant to the main point; keep in mind the original or basic concern; look for alternatives; be open-minded; consider seriously other points of view than one’s own (dialogical thinking); reason from premises with which one disagrees—without letting the disagreement interfere with one’s own reasoning (supposition thinking); withhold judgment when evidence and reasons are insufficient; take a position (and change a position) when evidence and reasons are sufficient to do so; seek as much
precision as the subject permits; deal in an orderly manner with the parts of the complex whole; be sensitive to the feelings, levels of knowledge, and degree of sophistication of others.

The APA Delphi study also attested to the disposition of critical thinking by stating that there is a characterological profile, a constellation of attitudes, a set of intellectual virtues, a group of habits of mind that is referred to as the overall disposition to think critically (Facione et al., 1995). These dispositions included: inquisitiveness with regard to a wide range of issues; concern to become and remain generally well-informed; alertness to opportunities to use critical thinking, trust in the processes of reasoned inquiry; self-confidence in one’s own ability to reason; open-mindedness regarding divergent world views; flexibility in considering alternatives and opinions; understanding of the opinions of other people; fair-mindedness in appraising reasoning; honesty in facing one’s own biases, prejudices, stereotypes, egocentric, or sociocentric tendencies; prudence in suspending, making, or altering judgments; and willingness to reconsider and revise views where honest reflection suggests that change is warranted (Facione et al., 1995).

Critical Thinking as Reflective Thinking

The term critical thinking is used synonymously with reflective thinking (Dewey, 1933; Ennis, 1985a; Lipman, 1988). In fact, Ennis (1985a) defined critical thinking as reasonable, reflective thinking. Boyd and Fales (1983) defined reflective learning as a process whereby an individual internally examines and explores an issue of concern. They see such a process as being triggered by an experience and which leads to the individual’s classifying meaning in terms of self. The result of the process of reflective learning is a changed conceptual perspective. Kitchener and King (1994) studied the development of
reflective judgment. They defined a reflective thinker as one who is aware that a problematic situation exists and is able to bring critical judgment to bear on the problem. They proposed a model of reflective judgment that describes a developmental approach to how individuals come to know and make reflective judgments. The epistemological basis for their work was influenced by Perry (1970) and Broughton (1975). Their model describes changes in both assumption and the certainty of knowledge and how decisions are justified in light of these assumptions.

Kitchener and King (1994) argued that, although critical thinking is equated with reflective thinking, the latter deviates from critical thinking in two main areas: the epistemic assumptions on which the thinking person operates and the structure of the problem being addressed. Taking the stance that critical thinking consists of a set of skills or general principles used to solve problems, Kitchener and King equated critical thinking with logic. From this perspective, they argued that logic alone (critical thinking) cannot account for naturally occurring problem solving in individuals. They stated that it is important to consider an individual’s epistemology or what he or she believes about what can be known and how knowing occurs. Many individuals believe that the source of truth lies in an authority. When such individuals are faced with a problem, the tendency is to seek out an authority for the solution to the problem because they are of the opinion that this authority figure knows the answer and can provide the solution. When individuals act in this manner, they are of the opinion that uncertainty does not exist; therefore, they do not see the need to evaluate the evidence or generate a solution for a problem. Reflective thinking takes the aspect of knowing (epistemology) into consideration, an aspect that is neglected in critical thinking. Secondly, the type of problem distinguishes critical thinking from reflective
thinking. Kitchener and King proposed that critical thinking tends to focus on well-structured problems—problems that can be described with a high degree of completeness and certainty and for which experts usually agree on the correct solution (again, critical thinking is being considered from a logical standpoint). In contrast, they proposed, reflective thinking concerns ill-structured questions for which there is no one correct answer. While important distinctions are made regarding critical thinking and reflective thinking, it is important to mention that there are other views espoused in the literature where critical thinking is not seen as logic, and it should be noted that logic alone does not represent critical thinking (McPeck, 1981).

**Critical Thinking as Emancipatory Learning**

Habermas (1984) identified three types of rationality: technical, hermeneutic or interpretive, and emancipative. Each of these modes of rationality has a conceptual structure which can be identified by the questions that mode of rationality raises or does not raise.

Technical rationality is a way of thinking that makes use of rules or universally accepted scientific knowledge derived from theoretical empirical science to explain cause and effect. The goal of technical rationality is to control and master the environment, individuals, and groups. The type of questions proposed in this mode of rationality deals with how to reach certain goals (e.g., how to prevent osteoporosis through the use of diet). Technical rationality does not examine whether a goal is worthy of seeking or which goal among competing goals is best.

In hermeneutic rationality, the goal is to reach intersubjective agreement on meaning and on norms of conduct. Because agreement is important in this mode of rationality, dialogue or knowledge produced through interaction is important.
Emancipatory rationality seeks to uncover the relationship among norms, meaning, and power in a particular historical and social context in which there is domination in social relations and self-misunderstanding (Brown, 1985). The goal of this mode of rationality is a freeing of those who are dominated or have a self-imposed misunderstanding brought about by existing social conditions. A freeing of the dominated is brought about by a critique which shows: (a) the societal source of the ideology and the consequences of it and (b) an alternative way of thinking or acting that leads to better consequences (Brown, 1985). Emancipatory learning is viewed as a form of critical thinking because individuals engage in analysis and reflection of their situation. This reflection should lead the individual to take action and results in a freeing from dominant forces. It also contains critical pieces such as recognizing assumptions underlying one’s beliefs and suggesting alternative ways of acting and reflection.

**Critical Thinking as Dialectical Thinking**

The dialectic perspective dates back to the time of Socrates whose use of it is exemplified in Plato’s Socratic dialogues. The term dialectic has evolved. The Greek meaning of the word is to converse or to argue. In later years, dialectic came to be equated with the examination of conflicting conceptions and views. In this context, an individual presented one view as a thesis, advanced another view as antithesis, and united what both the thesis and antithesis established in synthesis. Logic is associated with the dialectic perspective, but it is not related to formal logic where there are set formulas and prescribed sets of steps to follow. On the contrary, the logic of the dialectic is that of argumentative reasoning which is concerned with the reasons or grounds on which a belief or an action is based. Individuals therefore engage in reflection concerning concepts, beliefs, and actions
and the underlying reasons which support or oppose them. In the dialectic perspective, there is the movement of thought between the parts and among the whole to differentiate meaning, as well as to integrate the parts together to develop new insights. This type of thinking also involves criticism, not in a negative sense but suggesting a concern for truth, rightness, truthfulness, and comprehensibility. Dialectic reasoning involves subjecting all positions to critical analysis (Brown, 1985).

Dialectical reasoning is used to reconcile conflicting views (Baldwin, 1999; Brown, 1985) and this perspective is often compared with individualism and holism. Proponents of the holistic perspective believe that individuals must submit to society because society is superior to individuals and groups (Baldwin, 1999). The individualistic perspective is antithetical to holism. Whereas holism focuses on society, individualism emphasizes self-determination and self-preservation in the interest of “freedom.” Individualists believe that the existence of society is due mainly to the activities of individuals in control of their own destinies. Dialectical theorists view individualism and holism as two extremes. Proponents of the dialectical viewpoint are politically oriented toward freedom, justice and participation in community in the interest of the common social good (Brown, 1985).

It is not difficult to see why dialectic thinking is considered a form of critical thinking. This perspective allows individuals to examine their lives and make judgments and alterations whenever and wherever appropriate. Individuals are called upon to examine, judge, make changes, and reflect on the process. Daloz (1986) suggested that change is an integral aspect of dialectic thinking.
Critical Thinking as Practical Reasoning

Practical reasoning is a process whereby individuals or groups reason about the desirability of actions, practices, policies, and programs of action or perennial problems (Coombs, 1997; Olson, 1999) to deliberately choose the most appropriate course of action (Knorr, Schmalzel, & Van de Bogart, 1981). Practical perennial problems are ill-structured and usually involve an ethical dilemma. Five types of reasoning skills are involved in this process. They include reasoning about a goal or desired state of affairs; the context of a particular possible problem; possible means or strategies for reaching goals; about consequences of alternative actions; and a correct judgment for action (Knorr et al., 1981).

Individuals engaging in practical reasoning examine a problem in four categories:

1. Context. This includes asking background questions that relate to cultural, historical, and political or economic factors; considering the goals and values held by those individuals involved with the situation; and considering all aspects that might affect the existing problem.

2. Valued ends envisioning the desired state of affairs.

3. Means needed to reach the desired end. In this area one must consider who will take action; the resources available and what should be used; and the steps or actions need to work toward resolving the concern.

4. Consequence. This includes how potential action will affect individuals, families, and society. The negative and positive aspects of the situation, the long range effect, and the risk involved with potential courses of action must be assessed.

For example, if an individual is to use practical reasoning to solve the problem of what should be done about increasing the number of vegetable offerings in a child’s diet,
context questions may include: What other family members live in the home? Is the child in
day care? Are there supermarkets nearby with a good range of vegetables? What is the
economic standing of the family? What facilities are available in the home? Who is
responsible for planning and preparing food in the home? What are the skills (meal
preparation and planning) skills of the meal planner? Is the meal planner employed outside
the home? What do parents believe about the child’s nutritional needs?

   Valued ends questions may include what does the meal planner believe would be the
best way to increase vegetables in the child’s diet? What does society want to see in terms of
vegetable offerings in children? Means questions would include what knowledge does the
meal planner need to select, prepare, and serve vegetables? How will the family afford more
vegetables in the diet? What changes need to be made to the meal planner’s routine to
facilitate this increased vegetable offering in the child’s diet? Consequence questions include
what are the advantages and disadvantages of offering vegetables to children? How will all
family members be affected by the decision to increase vegetable offerings in the child’s
diet?

*Evaluating the Thought Process*

Evaluation of the thought process or reflection is also included in some definitions of
critical thinking. It is said that critical thinking includes an examination of the thought
process to determine if there is faulty reasoning. Paul, Binker, Adamson, and Martin (1989)
defined critical thinking as the art of thinking about your thinking while you are thinking in
order to make your thinking better; clearer; more accurate; or more defensible. Chaffee
(1994) also suggests that critical thinking is an evaluation of the thought process. He
mentioned that critical thinking is an active, purposeful, organized cognitive process used to
carefully examine our thinking and the thinking of others, in order to clarify and improve our understanding. Andolina (2001) suggested that so much attention is given to developing critical thinkers that individuals rarely take time to reflect on the thinking process itself. This statement suggests the important place that evaluation occupies in the process of critical thinking.

**Social Nature of Critical Thinking**

The social nature of critical thinking is evident in situations where individuals discuss ideas and problems. This collective thinking process (in which individuals discuss and argue) leads to many advantages including a pooling of information, experiences, and ideas to form a richer mix. Individuals have opportunity to observe divergent views and this tends to stimulate exploratory thinking. Competing views can stimulate a search for evidence. The overall alertness of the group may be increased because the individuals come from varying backgrounds and bring different experiences. Metacognition is also achieved as individuals articulate their thoughts to communicate and make their patterns of thinking more salient and subject to examination. This social nature of critical thinking results in richer and more productive thoughts and solutions than when a lone individual engages in the thinking process. Others have attributed a social nature to critical thinking and have stated that critical thinking occurs only when there is sharing and interaction with others (Vaske, 2000). Friere (1989) believed that in the process of dialogue, critical thinking is generated.

**Other Conceptualizations of Critical Thinking**

Many theorists are in agreement with the various conceptualizations and definitions of critical thinking in the literature (Brookfield, 1987; Vaske, 2000). Brookfield (1987, p. 11) synopsis of definitions for critical thinking included:
1. Development of logical reasoning abilities (Hallet 1984; Ruggiero, 1975)
2. The application of reflective judgment (Kitchener, 1986)
3. Assumption hunting (Scriven, 1976)
4. The creation, use, and testing of meaning (Hullfish & Smith, 1961)
5. Analytical and argumentative capacities (Ennis, 1985b)
6. Attributes that are prerequisites for critical thinking (D’Angelo, 1971)
7. The ability to distinguish bias from reason and fact from opinion (O’Neill, 1985)
8. Rational and purposeful attempts to use thought in moving toward a future goal (Halpern, 1984)
9. Emancipatory learning (Habermas, 1979)

**Reason for Differences in Definition**

One reason for lack of consensus in definitions is due to different schools of thought from which the definitions originate—philosophical, psychological, educational, or cognitive development theory. Proponents of the philosophical viewpoint include founders such as Dewey, Plato, Aristotle and modern day individuals such as Ennis, Lipman, and Paul. These individuals adopt a traditional approach to critical thinking. They focus on skills of argument analysis and formal logical systems (McPeck, 1981; Sternberg, 1985). In the psychological tradition, proponents include Bruner (1960), and Sternberg (1985). This approach emanates from the social and behavioral sciences and emphasizes processes such as decision making and scientific reasoning. The educational tradition has proponents such as Bloom (1956), Perkins (1981), and Renzulli (1976). These individuals focused on the skills needed by children in the classroom for problem solving, decision making, and concept learning.
Educational theories tend to draw from both the psychological (specifying what people actually do) and philosophical traditions (highlighting competence and specifying what people can do). Educational theories are subjected to the logical tests that both psychological and philosophical theories tend to be subjected to. Yet another approach originates in cognitive developmental theory. In this area, critical thinking and courses involving critical thinking are structured around theories of cognitive development. For example, Piaget’s theory of cognitive development and skills associated with formal operational thinking are employed (Inhelder & Piaget, 1958). Critical thinking disposition, rather than the skills associated with critical thinking, form the foundation for this cognitive development theory and are used in this approach (Kurfiss, 1988; Nummedal, 1991).

Critical thinking has been defined differently based on the context and discipline in which it occurs. Some individuals state the nature of the concept and its results while others have associated elements such as abilities, skills and disposition in the definition. Focus has also been given to processes that comprise critical thinking (problem solving, decision making) and reflection and to the social nature of the concept.

McPeck (1981) shed light on this somewhat darkened path of definitions. He stated that critical thinking involves more than the correct assessment of statement or the use of logic. When an individual engages in critical thinking he or she is thinking about something specific, a problem, an activity, or a subject area and it is therefore logically connected to what is being thought about specifically. He further stated that only such things as problems, activities, or subject areas can be thought about critically. Just as there are innumerable activities and types of activities that can be thought about critically, there are also innumerable ways in which critical thinking can be manifested. This line of reasoning is
important to acknowledge because repeatedly in the literature, the view is espoused that
critical thinking is and only is related to logic (correct assessment of statements and the
detection of fallacies). Although critical thinking includes these activities, the definition
entails a lot more, and many more activities (including an act requiring physical strength and
dexterity, problem solving, chess playing, soccer, cooking, and so on) could be included in
the definition of critical thinking. This perspective provides a broader scope for viewing the
concept of critical thinking. Ennis (1962) stated that critical thinking consists of three
dimensions: a logical dimension, criteriological, and pragmatic dimension. Even though the
first dimension makes reference to logic, the latter two dimensions refer to specific
knowledge of a subject area (McPeck, 1981).

McPeck (1981) mentioned that the most notable characteristic of critical thinking is
that of skepticism, or suspension of assent towards a given statement, established norm or
mode of doing things. This is more the judicious use of skepticism, not an indiscriminate
questioning to every view or problem that is proposed. It is a fact that not every situation
warrants skepticism (Kitchener & King, 1990; McPeck, 1981). Critical thinking is the
propensity and skill to engage in an activity with reflective skepticism. This implies that
basic knowledge in a field or subject area is needed.

The term critical thinking has an identifiable meaning. However, the criteria for its
correct application vary from field to field (McPeck, 1981). Brookfield (1987) mentioned
that manifestations of critical thinking vary according to the context in which it occurs.
Nutrition as a discipline examines the relationship of food to the well being of the human
body. Nutrition education is concerned with providing adequate knowledge and skills
necessary for critical thinking regarding diet and health so that individuals can make
appropriate food choices from an increasing array of contextual factors (Devine, 1980). Who then decides what constitutes legitimate and worthwhile problems in the area of nutrition? More so, who decides what should count as critical thinking or what should be prerequisite skills? Professionals in a field are most suited to make these decisions based on the data available. The skills, like critical thinking in general, are parasitic upon detailed knowledge of, and experience in, parent fields and problem areas. Judgments about when the use of critical thinking is appropriate are best made by specialists in the field in question (McPeck 1981).

**Richards-Adams’ Conceptualization of Critical Thinking**

The critical thinking model used for this study will consist of the following components: Stimulus; Empowerment; Critical Response; Outcome; Action; and Reflection. This model begins with the individual who encounters a stimulus and is empowered. This elicits the critical response when the individual examines the basis for his or her behavior and considers alternative courses of action (Brookfield, 1987). This leads to an outcome and some action to be taken by the individual. Reflection is a central component of this model and at every step of the critical thinking process, the individual is presented with opportunity to reflect.

The stimulus for critical thinking normally takes the form of a statement, claim, problem, issue, or argument. It is important to note that for critical thinking to take place, the stimulus must be one that would elicit the critical thinking thought process. Brookfield (1987) referred to this as a trigger event. He stated that this could be either bereavement, unemployment, or some event which leads to a sense of inner discomfort. Statistics on the low intake of vegetables, facts on the benefits of vegetables, as well as various scenarios will
be used for participants to examine the stimulus (problem). This stimulus will be framed around parents being a good role model for their children. Focus group research indicates that being a good role model for their children is the key motivation for many low-income women.

Empowerment is included in this model because it provides a strategy for helping individuals and families. The philosophical underpinnings of empowerment suggest that individuals have the strength and competencies to solve their own problems (Cochran, 1986; Rappaport, 1981; Vanderslice, 1994). The assumption is that people have valid and valuable knowledge of their own needs, values, and goals (Sigot, 1996). At the empowerment stage, the strengths and competencies of individuals will be brought to the forefront and recognized.

The critical response is that part of the model that varies based on the definition of critical thinking and context in which critical thinking is operationalized. In this study, critical response will consist of the presentation of a problem situation that will be solved collaboratively. Questions will be asked to help define the problem, identify alternative courses of action, and identify the best solution based on the context.

The outcome of this process should lead to a decision or to some plausible solution to the problem. Parents should examine their situation and decide what will or will not work for them.

Action is included in this model because it allows individuals to identify the steps they will take to solve the problem of increasing vegetable offerings in their 2- to 11-year-olds. This component is provided so that individuals are empowered to do something about their situation. Based on the assumptions identified and the alternatives that are proposed, parents set goals for increasing vegetable offerings to be achieved within a specified period.
Reflection involves the examination of actions and behavior and evaluation of the thought process to determine if there is faulty thinking. Reflection is not reserved for the end of the critical thinking process, but it is infused throughout as shown in the model (Figure 2; Richards-Adams, 2006).

**The Adult Learner and Critical Thinking**

A considerable portion of the literature on critical thinking focuses on school age-traditional students; however, increasing emphasis is given to the development of critical thinking in adults. Although initially the emphasis for critical thinking was not on adults, adulthood is a stage which predisposes one to critical thinking and critical thinking in adults is commonplace and directly observable (Brookfield, 1987). This predisposition toward critical thinking is due to the fact that adult learners are individuals who are at different stages in their physical, social, and psychological, ego, and moral development. Each adult learner who enters the educational arena has experienced different events, transitions, roles, and crises (Galbraith & Zelenak, 1991) that facilitate this disposition for critical thinking. It is important at this stage to ask the question, if critical thinking is commonplace in adults, what does the process look like? Brookfield (1987) views critical thinking as consisting of two processes: (a) identifying and challenging assumptions and (b) imagining and exploring alternatives. In many instances, one of these two processes is engaged in and not the other. He also views critical thinking as a continuous action process composed of alternating phases:

- Reflecting on a problem or theme
  1. Testing new solutions, strategies, or methods on the basis of that reflection
  2. Reflecting on the success of these actions in particular contexts
**Stimulus**  
Present issues, statements and problems

**Empowerment**  
Emphasize an individual's strengths and competencies to solve problems.

**Reflection**  
Examine and explore internally an issue of concern...which may lead to change of conceptual perspective

**Critical Response**  
- Define problem
- Select pertinent information
- Select relevant and promising hypothesis
- Draw valid conclusions
- Judge validity of inferences

**Outcome**

**Action**  
Decide to take steps to solve a problem

*Figure 2. Critical Thinking Model (Richards-Adams, 2006).*
3. Further honing, refining, and adapting these actions according to alternative contexts

Before a discussion of critical thinking in adulthood is embarked upon, it seems reasonable to examine the concept of how adults come to know.

**How Individuals Come to Know**

An examination of the way in which adults come to know is important. An individual’s epistemic orientation could determine what that particular individual believes can be known and how knowing occurs. One’s epistemic assumption plays a central role in recognizing a problem situation. Some individuals believe that the answer to their problems lies in an authority, and these individuals tend to look to an authority to provide the solution to their problems. To these individuals, uncertainty does not exist (because some authority has the answer), and they do not see the need to evaluate the evidence or generate the solution for a problem (Kitchener & King, 1994). Other theorists, Perry (1970) and Belenky, Clinchy, Goldberger, & Tarule (1986), seem to suggest that individuals are at different points in their epistemic development.

All of the proposed theories of knowing suggest a progression in terms of an individual’s epistemology. In Perry’s intellectual development, students move from notions of all knowledge being known and views of the world in black and white to a stage of development where decisions are made with contextual factors in mind and where the context of a situation bears heavily on the individual’s thought and judgments. A similar progression is seen in the reflective judgment model where individuals make the progression from a single-belief system, where what is seen can be believed to where individuals believe that knowledge is uncertain and subject to interpretations. Belenky et al. (1986) also
proposed a similar theory. They suggested that individuals move from silence, to believing in an authority as the source of all wisdom and truth to where they learn to trust their inner voice. Individuals also integrate the aforementioned modes together with reflection. Adult learners are at different stages of their development. When attempting to introduce or use critical thinking with various adult learners two things become important: (a) to recognize and identify this variability in epistemic positions and (b) to seek to move individuals along to where they are more comfortable with other modes of knowing. It seems likely that individuals at higher stages of epistemic development would be, to say the least, more ready to engage in critical thinking and the activities associated with critical thinking—identifying assumptions, creating alternative ways of thinking, and reflecting.

The theorists above suggest a developmental basis to knowing or making critical decisions. Kitchener and King (1994) proposed that it is the missing element in critical thinking. The important aspect of their theory is that individuals may be at the stage where they believe that the answer lies in an authority and may fail to search for answers for themselves. These individual may also not engage in critical thinking or critical reflection.

**Components of Critical Thinking in Adults**

Individuals who engage in critical thinking are involved in an active process in which the processes of analysis and action take place repeatedly. In describing the process of critical thinking, Brookfield (1987) stated that the process starts with an individual realizing that there is “a certain discomfort in one’s life, that things could be better, that a societal situation could be different, and that certain policies are not working properly.” (p. 24). In the process of becoming a critical thinker, individuals pass through some common phases. Brookfield (1987) mentioned four such stages: (a) trigger event occurs when an unexpected
event leads to an inner discomfort and perplexity; (b) appraisal is a period of scrutiny of self and of the situation; (c) explanation occurs when new ways are sought to explain discrepancies or ways of living with them; and (d) developing alternative perspectives is seen as a transition phase.

There are two integral components of critical thinking in adulthood: (a) identifying and challenging assumptions and (b) exploring and imagining alternatives (Brookfield, 1987). Identifying and challenging assumptions takes place when individuals examine events and situations that occur in their lives and those of others so as to arrive at their inherent assumptions. Assumptions are our most fundamental (taken-for-granted) beliefs about the world and our place in it. They give meaning and purpose to who we are and what we do. Three classes of assumptions exist: the paradigmatic, prescriptive and causal. Paradigmatic assumptions are the “basic structuring axioms used to order the world into fundamental categories” (Brookfield, 1995). These tend to be the hardest of all assumptions to change. Prescriptive assumptions are extensions of our paradigmatic assumptions and relate to what we think should be happening in a particular situation. Causal assumptions are stated in predictive terms and they help us “understand how different parts of the world work and the condition under which processes can be changed” (Brookfield, 1995). Identifying assumptions allows one to see the importance of the context within which these assumptions and the actions that result from them are formed. Understanding the context of these assumptions leads to contextual awareness or an understanding that the ideas and behavior that we display are due to cultural and historic factors. Exploring and imagining alternatives allow us to see that ways of thinking other than what we believe are possible and do in fact exist. Engaging in this behavior leads to a “critical cast of mind” (Brookfield, 1987).
Guidelines for Developing/Incorporating Critical Thinking

Galbraith (1991) suggested that because of the complexity and orientation of the adult learner, there is no magic formula that will ensure that each individual endeavor will culminate in success. In adult learning, individuals are often looking for materials and techniques that can be used immediately to solve a problem or explain a phenomenon. They respond to learning situations that are highly related to their profession, employment, and self-development and life stage. They are interested in learning how to manage themselves, others, and resources.

A set of guidelines have been developed for teaching critical thinking or higher order thinking skills: (a) offer a rationale for learning the skills, (b) actively involve students in the learning, (c) allow sufficient time for students to reflect on the questions asked or problems posed, (d) ask open-ended questions, (e) promote interaction among students as they learn, (f) model problem solving techniques, (g) provide practice of thinking skills in multiple settings, (h) use multiple learning strategies, (i) use examples that are similar to the situations in which the skills will be used, (j) teach for transfer, (k) use intrinsic motivational techniques; and (l) promote metacognitive attention to thinking (Halpern, 1984; Kerka, 1993; Kurfiss, 1988). To facilitate adult learning, a transactional process is suggested as a means of fostering a more meaningful, rewarding, and cooperative activity.

In order to incorporate critical thinking into the adult teaching/learning situation, it is important to begin with the reality of the learner. Brookfield (1987) mentioned that the experiences of the learner could be used to question and reassess long held values and attitudes. This undoubtedly changes the way that educators have principally been taught to do business. In this context, teachers have to view themselves not as giver of information, but
they must see the education process as one in which both parties bring knowledge and understanding into the teaching/learning situation and in which each must be willing to learn from the other. This calls for teachers understanding themselves and developing a rationale for how they perceive and practice their roles as adult educators.

**Guidelines for Structuring Adult Learning Environments**

Many theorists have prescribed ways in which adults learn (Brundage & Mackeracher, 1980; Darkenwald & Merriam; 1982; Gibbs, 1960; Smith, 1982). There is considerable overlap in the suggestion of ways to foster learning in adults. The following is a collation of the various authors and their suggestions and/or theories:

1. Learning must be both problem and experience centered (Gibb, 1960).

2. The learning experience must be meaningful to the learner because adults learn from past experiences (Brundage & Mackeracher, 1980; Darkenwald & Merriam, 1982; Gibb, 1960). Learners may need help establishing meaningfulness in new material. This could be done by means of a pattern or in relation to the previous experiences of learners.

3. Goals must be set and pursued by the learner (Gibb, 1960).

4. Regular and adequate feedback must be given to the learner in regard to the progress made toward the goal (Brundage & Mackeracher, 1980).

5. The environment for learning must be of such that change is supported and the learner valued (Brundage & Mackeracher, 1980).

6. Collaborative modes of teaching and learning must exist (Brookfield, 1986; Brundage & Mackeracher, 1980).
7. Material to be learned must be presented in an organized and sequential fashion (Darkenwald & Merriam, 1982).

8. Mutual respect must exist between the learner and facilitator (Brookfield, 1986).

9. Critical reflection (the fostering of a healthy skepticism) and praxis (the alternating process of reflection and action) should exist.

10. Self-direction is favored. This helps individuals enhance and expand their learning skills (Brookfield, 1986).

11. Opportunities must be provided for learners to practice the behaviors that were learned. This can be done by encouraging application of new materials in a practical way (Dickinson, 1973).

**Adult Learning Methods and Techniques**

In the area of adult learning, there is no panacea. Adult learners have different styles of learning. One way to accommodate such differences is to determine various methods that will be effective in delivering information and skills. Knowles (1978) mentioned the importance of using the experiences of the adult learner. He suggested that as individuals mature they accumulate a wealth of experiences that allow them to become a resource for learning. These experiences provide an expanding base to which adults can relate new experiences (Knowles, 1978). Even before entering the discussion of what andragogical methods are most suitable to adult learning, we find the commonly upheld belief that adult experiences should provide the foundation upon which methods of instruction are built (Feuer & Geber, 1988; Knowles, 1980; Lanese, 1983; Merriam & Caffarella, 1999). There is no shortage of methods for engaging adults in learning. However, not all methods align with the adult learning transactional process or adhere to the essential characteristics of
collaboration, challenge, critical reflection, and praxis. These methods were suggested as being suitable for adult learning: discussion, simulation, laboratory, field experience, team project, and other action learning techniques (Knowles, 1978). However, attention will be given to the discussion method because this method of teaching will be used in the intervention.

**Discussion**

Discussion has been cited as the ideal teaching method for use in adult education and it has become enshrined as the adult educational method “par excellence” (Brookfield, 1991). The exalted methodological status given to discussion is due in part to its inclusionary and participatory nature it offers participants. This method claims to be most respectful of learners. The discussion method had been stated as being useful in achieving particular cognitive and affective ends, particularly those of problem solving, concept exploration, and attitude change. Problem solving discussions are used to understand the nature of a particular problem, and then to investigate alternative solutions. In addition, such discussions encourage active participatory learning. The following purposes are cited as the most compelling cognitive purposes for use of discussions: (a) to expose learners to a diversity of perspectives on an issue, topic, or theme; (b) to help learners externalize the assumptions underlying their values, beliefs, and actions; (c) to assist learners in perspective taking, that is, in coming to see the world as others see it; and (d) to introduce learners to elements of complexity and ambiguity in an issue, topic or theme. The overarching purpose of a discussion is to help learners explore their experiences so that they become more critical thinkers (Dixson, 1991; Brookfield, 1987). Discussion is a form of group method of instruction. Group methods are beneficial in that they tend to have a powerful influence on
behavior. In addition, individuals can learn information by participating in these groups (Dickinson, 1973).

**Facilitated Group Discussion**

This is a method of education in which group members determine the topic to be addressed and through discussion they share their knowledge with members of a group. Facilitated group discussion (FGD) was used in the Special Supplemental Nutrition program for Women, Infants and Children (WIC) in the State of New Mexico (Abusabha, Peacock, & Achterberg, 1999). The procedure was as follows:

1. At the first WIC contact with the client, problems (s) in diet are identified and a choice is made as to date of attendance at a FGD.
2. The client attends the FGD with his or her peers. The three parts of the discussion are:
   a) Choosing a topic and gathering view points
   b) Sorting and evaluating different views
   c) Summarizing and finding solutions

The facilitator has the important role of keeping the discussion on track and correcting misconceptions when they occur. Quantitative results from the FGD revealed that this method was at least as effective as lectures in developing clients’ self perceived skills. It was found to be better than lectures in terms of positive effect on clients’ self-efficacy.

Quantitatively, “positive effects” (laughter, clients smiling at each other, and client-initiated conversation and questions) were more common in FGD than in lectures (Abusabaha et al., 1999).
Critical Thinking in Nutrition Research

Critical Thinking in Audiovisual Materials

“Educational methodologies to foster critical thinking is an area with many unanswered questions that can provide a fertile ground for further research” (Nitzke et al., 1992, p. 134). Even though this challenge was issued over a decade ago, not many in the field of nutrition have taken up the challenge to conduct research in critical thinking. Two main studies, one by Nitzke et al. (1992) and the other by Reicks, Bosch, et al. (1994) will be highlighted in this area of critical thinking in nutrition research.

Nitzke et al. (1992) used critical thinking principles and strategies to develop an instrument to assess critical thinking components in nutrition education audiovisual curriculum materials. They defined critical thinking in their context as the process by which a person makes reasonable and reflective decisions that are focused on what to believe or do. They developed a conceptual framework for critical thinking by combining theories from Robert Ennis’ “Taxonomy of Critical Thinking Disposition and Abilities” and Robert Sternberg’s “Triarchic Theory of Human Intelligence.” A conceptual framework consisting of main constructs with corresponding skills and disposition was developed. The four constructs included:

1. Metacognitive components (the executive components, based on Sternberg’s Triarchic Theory) include processes such as recognition of a problem, defining the nature of a problem, choosing the steps necessary to solve these problems, and creating a problem-solving strategy and monitoring the problem-solving process.

2. Performance components (the nonexecutive processes) are used to carry out the Metacognitive components. Processes that would foster the performance
components include: examining of assumptions, evaluating arguments, avoiding oversimplification, distinguishing facts from ideals and opinions, and exploring the implications and complications of information presented.

3. Knowledge acquisition components include determining what information is relevant or irrelevant to a particular problem, putting the relevant information together, and relating new information to old. These components included the processes of selective encoding, selective combination, and selective comparison, respectively.

4. Critical spirit or critical disposition includes favorable attitudes and attributes of the learner that predispose critical thinking. The authors mentioned that the critical disposition can be cultivated if the material in question models and encourages independent thinking, develops in learners the ability to cope with novel situations, and encourages an approach of open-mindedness as new ideas are approached (Nitzke et al., 1992 p. 131-132).

The overall mean critical thinking scores (obtained by calculating each of the four critical thinking components) for the 13 videocassettes on nutrition and osteoporosis ranged from 2.7 to 3.9. Only 33% of the videocassettes obtained a rating of 3.5 or above. Mean critical thinking scores were highest for knowledge-acquisition components (median = 3.8) and lowest for critical spirit (median = 2.9). It was concluded that the sample of videocassettes in this study gave limited attention to some of the critical thinking constructs. This is not surprising as the definition, conceptualization of critical thinking, and the instrument assessing critical thinking were constructed after the development of the audiovisual material. Generally in assessment, the conceptualization of critical thinking, the
definition, and the instrument to assess critical thinking should be developed prior to, or alongside, the development of the audiovisual materials. Laster (1998) and others (Brookfield, 1997: Halpern, 1993) lent support to this approach.

**Critical Thinking in Food Safety**

Reicks, Bosch, et al. (1994) compared the effectiveness of a critical thinking approach and a didactic approach to teaching food safety. The critical theory proposed by Paul (1990) stated that for transfer of knowledge to take place, the following must be present: (a) there must be focus on meaningful experiences, (b) value must be attached to the knowledge sought, personal knowledge must be incorporated into content processing, and (c) the responsibility for learning must rest in the hands of the student. Instructional strategies such as role playing, critical analysis, and scenarios were used to focus the learner on meaningful experiences. The didactic approach is in direct contrast to that of the critical theory. In this approach, the transfer of learning to real-life situations is considered to be automatic, knowledge is believed to be gained without first valuing it, personal experiences in the learning context are not seen as vital or integral to the learning process, and the teacher is the one responsible for the student’s learning. The didactic approach consisted of food safety lessons presented in lecture format followed by discussion questions.

Two groups of leaders (women trained by extension home economists to take information back to informal settings) received food safety instructions based on the critical theory or the didactic theory. Leaders in both groups were given identical pre-and-posttests before and after the lesson. Multiple choice questions were used to assess food safety knowledge. A 5-point Likert-type scale evaluated the change in attitude concerning food safety and self-efficacy in dealing with food safety issues.
The experimental group (critical thinking) increased their scores significantly in knowledge compared with the control group (didactic approach). However, the knowledge pre-scores for the case group were much lower than the control group. The individuals in the case group were older than individuals in the control group. There were no changes in attitude between the case and control groups. The authors concluded that due to the short duration of their study (one food safety education session) it may be unrealistic to expect changes in attitudes—attitude change results after much longer periods of instruction.

Assessing Critical Thinking

Many authors have indicated that instruments assessing critical thinking need to be context specific (Brookfield, 1997; Halpern, 1993; Laster, 1998). This premise is based on the notion that critical thinking is context specific. This idea was developed in the conclusion of the critical thinking section of this review. Brookfield (1997) stated:

If critical thinking is context and person specific, if its manifestations are irrevocably embedded in its cultural surroundings, then an intelligent approach to assessment requires that it be grounded in local conditions. Assessment of critical thinking really has to be locally crafted by those integrally involved with the process. It makes no sense to import formal tests devised from outside the immediate context in which the critical thinking to be assessed is taking place. (p. 19)

When developing an instrument to assess critical thinking construct in nutrition audiovisual material Nitzke et al. (1992) developed a conceptual framework for critical thinking. The first step in this process was the drafting of an operational definition of critical thinking in nutrition. She then created a 29-item instrument consisting of metacognitive processes (3 items), performance components (13 items), knowledge-acquisition components
(9 items), and critical spirit (4 items) based on the conceptual framework for critical thinking she developed. Each item was a declarative statement to which raters could specify strength of agreement or disagreement using a Likert-type scale.

Laster (1998) mentioned that assessing practical reasoning is not an easy task and stated that the initial questions should be centered on trying to understand what is to be evaluated in problem solving and critical thinking. These initial questions led to implementation of thinking skills in a specific context. Following implementation is the need to find instruments to assess critical thinking. In the process of identifying instruments to suit their purpose in assessing practical reasoning, Laster (1998) decided that an effective approach would be to refine or develop instruments for assessing dimensions of practical reasoning. Eight characteristics of assessment instruments were used to guide their test selection and development efforts. The first four characteristics were derived from McPeck’s (1981) recommendations to test critical thinking. Laster (1998) further reviewed assessment approaches and eventually settled on four approaches for thinking skill assessment.

1. The test is subject specific in an area (or areas) of the test taker’s experience or preparation. This is required because knowledge and information are necessary ingredients of critical thinking.

2. The answer format permits more than one justifiable answer. Thus an essay might better fit the task, awkward and time consuming as things might be.

3. Good answers are not predicated on being right, in the same sense of true, but on the quality of the justification given for a response.

4. Test results measure learning resulting from specific training or experience, not innate capacity or ability.
5. Test items are examples of real-life practical problems faced by FCS students.

6. Test items are valid, reliable, and usable by FCS teachers.

7. Test results lead to improvement of instruction.

8. Test results enable school districts and teachers to assess practical reasoning gains of their students (Laster, 1998, p. 57).

Laster (1998) identified instruments that had potential for their purposes and later decided that due to the complexity of this concept (practical reasoning) a variety of assessment devices may be appropriate depending on the dimension of the concept to be emphasized. For example, it was concluded that multiple choice tests might be an adequate method for assessment of knowledge while open-ended questions and scaling techniques might be more suitable for the assessment of thinking processes and abilities.

Conclusion

Chronic diseases such as cancer, heart disease, stroke, diabetes, and hypertension are serious cause for concern as they lead to prolonged illness, disability and a decrease in the quality of life for over 25 million Americans. The medical care cost of people with chronic disease accounts for more than 75% of the nation’s $1.4 trillion medical care costs. Chronic diseases are among the most prevalent and costly of diseases but they are also among the most preventable of all health problems. Adopting healthy diets is a means whereby the devastating effects of chronic diseases can be curtailed.

Dark green leafy, yellow/orange, cruciferous vegetables and tomatoes have been shown to be helpful in the prevention of coronary heart disease, cancer, and stroke. Continued research shows that the protective role of these vegetables is being observed in diseases such as cataract formation, chronic obstructive pulmonary disease, diverticulosis,
and possibly, hypertension. The broad variety of essential and non-essential nutrients such as vitamin A, beta-carotene, vitamin C, potassium, folic acid, and dietary factors such as fiber, flavonoids and complex carbohydrates are responsible for the health benefits of dark green leafy, yellow/orange, cruciferous vegetables and tomatoes.

Despite the protection afforded by these vegetables intake is low in the general public and more so in low-income individuals. There is a need to increase the consumption of dark green leafy, yellow/orange, cruciferous, and tomatoes in all individuals but especially among those with limited income. These individuals generally experience higher incidences of chronic diseases. Even though the need to increase vegetable consumption in the adult population is urgent; it is imperative that vegetable interventions make young children the target of its focus. Research shows that children’s food preferences are learned at an early age by experiences with different foods and early food preferences may influence adult food selection. Therefore early intervention may help establish healthful eating at young ages that could continue on into adulthood.

Parents have an important role to play in increasing vegetable use in their children’s diet. They must provide their children with opportunities to experience and become familiar with a variety of vegetables at an early age. In providing opportunities for children to experience vegetables, parents must be aware that it may 8-10 exposures before children begin to accept a particular vegetable. Persistence is the key in this regard. Parents often become frustrated by a child’s rejection of food. In such situations, threats are made and foods are often tied to rewards such as dessert, treats, or activities that children love (television and play). These unproductive behaviors lead to negative consequences in the child. The context in which food is offered is therefore important in children’s acceptance of
food. Non-threatening, comfortable, and relaxed environments are conducive to the acceptance of food.

Food behaviors are difficult to change and making the choice to increase the number of vegetable offerings in a child’s diet is by no means a simple task. Parents are faced with a host of contextual factors such as the needs, preferences, and health conditions of family members; the cost and availability of food items; and the skills of the homemaker. The context in which food decisions are made is also entwined with cultural/religious, psychosocial, personal, environmental, and lifestyle factors that affect these decisions. In making food decisions, parents are presented with ill-structured problems—problems for which there might not be one correct answer. They therefore need to be equipped with the prerequisite skills for solving such problems.

Learning to think critically, one of the most significant activities of adult life and the most relevant tasks faced by adults, include decision-making and problem solving. The many life experiences that individuals encounter predispose them to critical thought. However, instruction must be provided to develop critical thinking skills and abilities in individuals.

A critical thinking approach calls for change in the way nutrition education is delivered. Traditional strategies in nutrition include lecture or one-on-one sessions that do not allow individuals to think critically about information and situations they are experiencing. There is a need to develop critical thinking methodology specific to nutrition. An important aspect in this development includes decisions on how critical thinking will be assessed. Preexisting instruments assessing critical thinking are not applicable in all contexts and on many occasions instruments for assessing critical thinking need to be developed. The use of scenarios is appropriate in problem solving situations.
Few studies have used critical thinking methodology in nutrition settings. However this approach provides individuals with skills needed to solve problems and make fully informed decisions on vegetable offerings in their children’s diet. Such informed actions stand to improve the children’s nutritional status and quality of life. This study is therefore a step in the right direction.
CHAPTER 3

A CRITICAL THINKING APPROACH INCREASES OFFERINGS OF DARK GREEN LEAFY, DARK YELLOW ORANGE, CRUCIFEROUS VEGETABLES AND TOMATOES IN A LOW-INCOME (HEAD START) POPULATION

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Ingrid K. Richards-Adams, Suzanne Hendrich, Cheryl O. Hausafus

ABSTRACT

Objective To evaluate the effectiveness of a critical thinking instructional approach in increasing offerings of dark green leafy, yellow/orange, cruciferous vegetables, and tomatoes in the diet of Head Start children.

Design A two group, randomized, pretest-posttest design. A critical thinking definition, critical thinking model, curriculum and lesson plans were developed for the study.

Subjects Seventy-seven parents recruited from Drake University Head Start in Polk County, Iowa. Complete data were obtained from 49 parents (64%). Most parents were Caucasian, female, married, between the ages of 19-39, and most had a high school or above education.

Intervention Two 45-minute sessions on vegetables occurring one session per week for two consecutive weeks where participants solved problems collaboratively and reflected on their thought processes. Two vegetable recipes were prepared at the end of each session.

Main outcome measures Knowledge, attitudes, critical thinking, and vegetable offerings measured by a questionnaire developed by the researcher. A scenario assessed participants’ critical thinking and a vegetable offering recall identified vegetables participants offered their children during the past week.

Statistical analysis Analysis of Covariance was conducted with the posttest scores for each dependent variable. Group (experimental versus control) was used as the independent
variable and the pretest score of each dependent variable was used as the covariate. A $p$-value less than or equal to .05 was used as the criterion for statistical significance.

**Results** Statistically significant differences were found between the experimental and control groups in mean posttest scores for vegetable knowledge (3.73 experimental group versus 2.99 control group) and vegetable offerings of dark green leafy, yellow/orange, cruciferous vegetables, and tomatoes (3.73 versus 2.90). The partial $\eta^2$ of .08 for vegetable knowledge and .12 for dark green leafy, yellow/orange, cruciferous vegetables, and tomatoes suggests a moderate effect size of instruction using the critical thinking method. There was no change in attitudes towards vegetables during the study. Participants possessed very positive attitudes towards vegetables before the intervention. No change was observed in participants’ level of critical thinking.

**Conclusion** A promising instructional approach for increasing nutrition knowledge; beginning to change dietary behavior, and developing critical thinking skills. More contact time is needed for developing participant’s level of critical thinking.

**INTRODUCTION**

Americans are in a national nutrition crisis: (1) Chronic diseases such as cancer, heart disease, and diabetes are leading causes of death and disabilities (2). In 2003, 10,496,000 individuals were diagnosed with invasive cancer. The 2006 update from the American Heart Association indicates that there are 13,200,000 cases of coronary heart disease and 65,000,000 cases of high blood pressure. From 1980 through 2004, the number of Americans with diabetes more than doubled (from 5.8 million to 14.7 million) (3, 4). Children are not exempt as they are predisposed to chronic diseases at an earlier age (5-7). One in three children born in 2000 will contract Type II diabetes. The impact of chronic disease in
children is enormous whether it is measured in terms of mortality and morbidity or economically (8). Chronic diseases have significant social and economic costs and are therefore significant public health issues. In 2006 the cost of cardiovascular disease and stroke alone was estimated as $403.1 billion (9). Although chronic diseases are among the most costly health problems, they are also among the most preventable. Adopting healthy diets is a means whereby the devastating effects of chronic diseases can be curtailed (2).

Evidence from cohort studies suggests that the consumption of fruit and vegetables reduces chronic diseases such as stroke (10, 11) and cardiovascular disease (12-14). Protection extends to other chronic diseases such as cataracts, diverticulosis, chronic obstructive pulmonary disease, and hypertension (15, 16). However, evidence identifies specific fruits and vegetables as being leaders in the fight against chronic diseases, particularly dark green leafy, yellow-orange, and cruciferous vegetables (11-15). Raw vegetables have shown protective effects in 85% of studies. Carrots, dark green leafy vegetables, cruciferous vegetables (cabbage, cauliflower, Brussels sprouts, bok choy, kale, kohlrabi, broccoli, and watercress), and tomatoes have shown protective associations in 70% or more of studies (11). By contrast, legumes and potatoes were not associated with lower ischemic stroke risk (13).

In spite of the apparent benefits of green leafy, yellow/orange, and cruciferous vegetables in reducing chronic diseases their intake is low in the American public (17)—0.4 servings per day compared to recommendations of 4-5 servings or 2 ½ cups based on a 2000 kcal diet (18) or at least three daily servings, with at least one-third being dark green or orange vegetables (19). Only eight percent of adults in the US get the recommended daily one or more servings of dark green or orange vegetables (20). Three percent get both the
recommended number of servings and at least one serving of a dark green or orange vegetable (21). An examination of CSFII 1994-1996 data showed that less than one in five Americans consumed a cruciferous vegetable during two 24 hour dietary recall periods—0.2 servings per day (22). Statistics are more disappointing for low-income populations. These individuals spend a larger proportion of their income on food than higher income counterparts but tend to have poorer quality diets (23-27) and experience higher levels of chronic diseases.

There is a need for interventions focusing on dark green leafy, yellow/orange, cruciferous vegetables, and tomatoes among low-income individuals and their children. A child’s food preferences are learned at an early age by experiences with different foods (28) and may influence adult food selection (29). It is also easier to establish healthful habits during childhood than to attempt to change eating habits later in life (30) supporting the adage that an ounce of prevention is worth more than a pound of cure. Interestingly enough, even though parents are sometimes reluctant to adopt healthful eating habits, focus group research conducted in Maryland (24) and Iowa (31) indicate that most parents want to act in their children’s best interest.

One goal of nutrition education is to provide adequate knowledge and skills necessary for critical thinking regarding diet and health so that individuals can make appropriate food choices from an increasing array of contextual factors (32). Although this goal emphasizes preparing individuals to engage in critical thinking, little has been done to actually use critical thinking in nutrition interventions. An instrument has been developed to assess critical thinking constructs in nutrition audiovisual materials (33), and the effectiveness of a food safety teaching strategy to promote critical thinking has been undertaken (34). There is
a need to develop instructional methodologies to nurture the development of critical thinking skills (33, 35). This study attempts to fill the gap in this area. The purpose of this research is to use critical thinking methodology to educate low-income parents on the importance of increasing daily offerings of dark green leafy, yellow-orange, cruciferous vegetables or tomatoes in the diet of their 2- to 5-year-old children. We hypothesized that parents who receive the critical thinking mode of instruction would have increased knowledge, attitudes, and critical thinking skills related to problem solving and would offer more dark green leafy, yellow-orange, cruciferous vegetables or tomatoes to their children.

**METHODS**

**Participants**

Parents of children enrolled in the Drake University Head Start (DUHS) program in Polk County, Iowa were recruited for the study. DUHS serves 550 low-income families through 16 centers under six different program options. Program options include: Full day (full year), 6-hour (full year or school year options), three-and-a-half hour (school year), a toddler program (2 ½ hour, full year), and a home visiting program (an Early Head Start program offering pregnancy services and infant and toddler services). DUHS teachers and Recruitment Advocates assisted in the recruitment of parents. Flyers in English and Spanish were used to inform parents about the study and invite them to participate. Spanish translations were checked for readability and by two different bilingual speakers. The Iowa State University (ISU) and Drake University Institutional Review Boards: Human Subjects approved the study.
Research Design

A two group randomized pretest-posttest design was used. Random assignment of 16 centers by program options ensured that all program options were equally represented in both the experimental and control group. Student’s \( t \)-tests used to compare experimental and control groups on the dependent measures assessed prior to the intervention indicated that the random assignment succeeded in equating the two groups of participants. Parents in the experimental group completed the pretest and posttest questionnaire, collected two weeks of grocery receipts at the beginning and end of the study, and were exposed to two 45-minute sessions occurring one session per week for two consecutive weeks. Twelve parents completed both sessions of the intervention, seven parents completed session one only, and nine parents completed only session two. Parents in the control group completed similar information as the experimental group but they were not exposed to the intervention.

Data Collection

Data were collected during a four month period (October 2005 to January 2006). The decision to limit the study to a four month period was due to the high drop-out rate and fluidity of low-income populations. Attempts were made to recruit a total of 75 individuals based on a sample size calculation that assumed a mean difference (effect size) of 1, variance of 3 (and standard deviation of 1.73), power of .80, and Type I error (alpha) of .05. This yielded a value of \( \text{delta} = 2.80 \) (delta is the relationship between sample size and effect size). A 50% drop-out-rate was factored into the calculation based on previous research with a low-income audiences (24).
**Critical Thinking Definition**

There are many definitions of critical thinking in the literature, however, these did not fit either the context or the tasks needed to be performed by this group of individuals. It has been suggested that the manifestation of critical thinking varies according to disciplines and the context in which it occurs (36, 37). As the context varies, the activities that depict critical thinking also vary. Therefore, the way critical thinking is defined and the criteria for the correct application of the term are unique to a particular field or discipline (37), context, or situation. In this study, critical thinking was viewed as the process whereby individuals analyze and evaluate information, a situation, or their behavior in order to make fully informed decisions while reflecting on their thought processes. This definition reflected the tasks needed to be performed by parents in the intervention group.

**Critical Thinking Model**

A five-part critical thinking model guided the development of the curriculum, lesson plans, and implementation of the intervention. The model consisted of stimulus, empowerment, critical response, action, and reflection. The stimulus for critical thinking can take the form of a statement, claim, problem, issue or argument. For this study the stimulus was in the form of statements, problems and issues. Brookfield (36) referred to a similar concept called a “trigger event” that leads to a sense of inner discomfort and so initiates the critical thinking process Empowerment is defined as increasing one’s capacity to define, analyze, and act on his or her own problem (38). The philosophical underpinnings of empowerment suggest that individuals have the strength and competencies to solve their own problems (39-41). The assumption is that people have valid and valuable knowledge of their own needs, values and goals (42). Critical response consisted of the presentation of a
problem situation to be solved collaboratively. Questions were asked to help define the problem, identify alternative courses of action, and identify the best solution based on the context. In action, steps to increase vegetable offerings were identified. Reflection was a central component in the model and was presented after each step in the model. The use of critical questions helped in this process of reflection. See Figure 1 for a description of the model.

Use of the Critical Thinking Model in Curriculum and Lesson Plans

A two-lesson critical thinking curriculum was developed for the study. It contained objectives, background information, and rationales for focusing on young children, specific vegetables, and critical thinking (43). In Lesson 1, the stimulus included statistics on vegetable use in Iowa and among low income individuals, the importance of interventions targeting children, the benefits of dark green leafy, yellow/orange, cruciferous vegetables and tomatoes, and vegetable serving sizes. MyPyramid was presented to emphasize that the vegetables recommendation was part of a larger plan that also included fruits, milk, meat and beans, and grains. Research findings based on adults being natural critical thinkers were shared with parents at the empowerment stage. They were told that they have the tools to examine their situation, solve problems and make decisions in the best interest of their children. For the critical response phase, parents solved a vegetable-related problem. They were asked to identify a problem, suggest ways to solve the problem, and determine which solution best suits their context. During the action phase, parents identified two steps they will take to increase offerings of vegetables in their 2- to 5-year-old children. At the end of the session, parents prepared two food items using dark green leafy, yellow-orange,
cruciferous vegetables and tomatoes. The format for Lesson 2 resembled that of Lesson 1 but focused on the positive environment in which vegetables should be offered.

**Measure: Knowledge, Attitude, and Critical Thinking Questionnaire (KACQ)**

An eight-section questionnaire was developed that contained a demographic section and six measures of the dependent variables, that is, knowledge, attitude, and critical thinking related to vegetables and physical activity, a vegetable recall and a physical activity recall. The physical activity aspect of this study is presented elsewhere.

**Demographics.** Demographic variables included gender, marital status, ethnicity, and educational level. Information was also collected on the person who shops for and cooks meals, and who eats with the Head Start child.

**Vegetable Knowledge.** This section consisted of four multiple choice questions. One question listed eight vegetables and asked parents to circle those that would best help their child avoid chronic diseases. One point was awarded for each correct response. The scores on question one ranged from 0 to 4. The other three multiple choice questions focused on vegetable serving size for a two-to-four year old child, the approximate time it may take for children to accept a new vegetable, and the best environment in which to offer vegetables. One point was awarded for each of the correct multiple choice response. Total scores ranged from 0 to 7.

**Vegetable Attitude.** Parents rated the importance of offering their children vegetables daily, finding new ways of offering their children vegetables, purchasing vegetables instead of candies and snacks, and purchasing vegetables when limited finances were available, on a four-point Likert-type scale (1 = very unimportant to 4 = very important). Responses to the four attitude statements were summed to obtain a composite score for attitude with each
statement carrying equal weight. Total scores ranged from 4 to 16 with higher scores denoting more positive attitudes. Cronbach’s alpha used to measure the reliability of the set of attitudinal items was high for both the pretest (.92) and posttest measures (.86).

*Vegetable Critical Thinking.* The following scenario was used to determine the level of critical thinking. *At the WIC clinic, Joan was told that she needed to offer her children more vegetables. Joan mentioned that she is afraid that she would not have enough money to do this.* Parents were asked to identify the problem, state other information needed to solve the problem, offer solutions to the problem, identify the best solution to the problem, and state why that particular solution was best. A rubric was developed by the researcher to measure levels of critical thinking. The rubric contained three levels (I, II, and III) with corresponding scores. Level I indicated that an individual has not engaged in critical thinking. Level II indicated that participants have engaged in some critical thinking. Level III indicated that a higher level of critical thinking was displayed in solving problems related to vegetable use and offering vegetables to children. Cronbach’s alpha for vegetable critical thinking at pretest was .78 and .70 at posttest indicating the measures were reliable. Interrater reliability was conducted for the grading of the critical thinking responses.

*Vegetable Offering Recall.* Participants selected the vegetables they offered their child during the previous week from a list of 36 vegetables. The 2005 Dietary Guidelines for Americans (18) was used as a guide for the vegetables selected on the vegetable recall measure.

*Validity of Instrument.* Four professors in education at ISU examined the KACQ for clarity and readability. Four low-income individuals not related to the study completed the KACQ and provided information on the time taken to complete the instrument and any
ambiguous areas. An expert in curriculum and evaluation at ISU examined the critical
tinking section of the KACQ to determine whether the content adequately assessed critical
tinking. The study was piloted with a group of parents at the Child Development Laboratory
School at ISU.

Data Analysis

The data were analyzed using SPSS computer software (version 13.0). In analyzing
the data, descriptive statistics were first computed. Analysis of Covariance (ANCOVA) was
conducted with the posttest scores of each outcome variable as the dependent variable. Group
(experimental versus control) was used as the independent variable and the pretest score of
each dependent variable was used as the covariate. A \( p \)-value less than or equal to .05 was
used as the level of significance.

RESULTS

Of the 77 individuals who participated in the study, 28 did not have complete data
and were excluded from the analysis. Results of a 2x2 ANCOVA, group (experimental versus
control) by data (complete versus incomplete) revealed there were no significant differences
in mean pretest scores on the dependent measures (knowledge, attitude, critical thinking, and
vegetable offerings) between those who completed the posttest and those who did not. Most
parents were Caucasian, female, between the ages of 19 and 39 and had a high school or
above high school education. Approximately half were married. Generally, the mother alone
ate with the child. See Table 1 for demographic statistics.

The ANCOVA results for knowledge indicated a statistically significant difference in
average posttest scores on vegetable knowledge between the experimental and control groups
after adjusting for the pre test score, \( F(1, 46) = 4.04, p \leq .05, \eta^2 = .08 \). The adjusted means
were 3.73 (SE = 0.26) and 2.99 (SE = 0.26) for the experimental and control groups, respectively. The partial η² of .08 suggests a moderate effect of instruction using the critical thinking method. This is consistent with prediction that parents who receive instruction related to vegetable offerings using the critical thinking method will have greater levels of knowledge following the intervention.

Analysis of variance rather than ANCOVA was conducted on the dependent measure attitude. When the homogeneity of the regression lines for vegetable attitude was examined there was a significant interaction between the pre-attitude scores in the experimental and control groups. Such an interaction suggests that the relationship between the pretest scores and the posttest scores for each group was different. The results of the analysis of variance revealed no significant differences between the experimental and control groups in post attitude score toward vegetables, F(1,46) = 1.22, p > .05.

The analysis of covariance results for levels of critical thinking indicated no statistically significant difference in mean posttest scores between the experimental and control groups, F(1,44) = 0.77, p > .05, η² = .02. The adjusted means with (standard errors) for the two groups were, experimental = 5.19 (0.52) and control = 4.56 (0.48). The null hypothesis, that the adjusted mean score between experimental and control group is equal, was retained.

Parents in the experimental group reported significantly more offerings of dark green leafy, yellow/orange, cruciferous vegetables and tomatoes than the control group following the intervention, F(1, 43) = 5.74, p < .05, η² = .12. The adjusted means (with standard errors) were 6.17 (0.44) and 2.99 (0.42) for the experimental and control groups, respectively. The
partial $\eta^2$ of .12 suggests a moderate effect on offerings of dark green leafy, yellow/orange, cruciferous vegetables, and tomatoes using the critical thinking method. This is consistent with prediction that parents who receive instruction related to vegetable offerings using the critical thinking method will offer more dark green leafy, yellow/orange, cruciferous vegetables, and tomatoes to their children.

The analysis of covariance indicated no statistically significant difference in mean posttest scores on other vegetable $F(1, 43) = .338, p > .05, \eta^2 = .01$. The adjusted means with (standard errors) for the experimental group was 6.81 (0.36) and the control group was 6.51 (0.35). See Table 2 for results of ANCOVA and ANOVA.

**DISCUSSION**

The study employed a critical thinking instructional approach to increase offerings of dark green leafy, yellow/orange, cruciferous vegetables and tomatoes in the diets of Head Start children. Some positive results were achieved from this approach. Parents in the experimental group increased their knowledge of dark green leafy, yellow/orange, cruciferous vegetables, and tomatoes following the intervention. Similar results were observed in a study of Head Start mothers in New York City and Maryland ($N = 171$). The 89 mothers in the treatment group received 13 weekly nutrition sessions and had the opportunity to attend four two-hour nutrition workshops. Knowing the recommended number of servings of vegetables was found to be a predictive factor in vegetable consumption and it was suggested that mothers in the treatment group used knowledge obtained from the intervention to include these dark green and yellow vegetable choices in their children’s diet. A report of the U.S. General Accounting Office (20) indicated that one of the reasons the consumption of dark green vegetables or orange vegetables falls below what is recommended
for disease prevention is because many individuals may not be aware of the importance of eating these deeply colored vegetables (22). This intervention provided information on the benefits of specific vegetables in preventing chronic diseases and the environment in which vegetables should be offered. It succeeded in increasing knowledge of the vegetables shown to be protective against chronic diseases among parents in the experimental group following the intervention.

There was no improvement in attitudes toward vegetables in either the experimental or control groups following the intervention. However, it should be noted that on a response scale from one to four baseline pre attitudes toward vegetables were relatively high in both the experimental (3.34, $SD = 0.54$) and control groups (2.99, $SD = 1.08$). Parents of Head Start had very positive attitudes toward vegetables on the following measures: (a) offering the recommended vegetables everyday, (b) finding new ways to serve vegetables, (c) purchasing vegetables instead of candies and snacks, and (d) purchasing vegetables when there is limited income. In the study assessing psychosocial factors and dietary habits associated with vegetable consumption ($n= 838$), Satia and colleagues found that participants reported positive attitudes towards vegetable consumption (44). Of the four psychosocial factors related to vegetable consumption, the importance of eating vegetables dimension was most strongly and positively related to dietary habits and vegetable intake. Similarly, Dittus, Hillers, and Beerman (1995) found that all respondents had high levels of concern regarding nutrition despite income or educational level when they examined attitudes toward nutrition in 1069 Washington State residents (45). Focus group research conducted with Iowa’s low income families showed that these individuals had strong positive attitudes toward healthful
behaviors but did not see themselves, neighbors, or friends as being able to adopt recommended behaviors.

Parents in the experimental group reported significant more offerings of dark green leafy, yellow/orange, cruciferous vegetable, and tomatoes to their children in the week of data collection. Similar increases in dark green vegetables (0.27 to 0.58 servings per day and dark orange vegetables (0.3 to 0.3 servings per day) were observed in the treatment group in the study of Head Start parents in New York City and Maryland. These increases were marginal but statistically significant. Joshipura et al. (1999) showed that an increment of 1 serving per day was associated with a 7% lower risk among women and a 4% lower risk among men; for the combined population there was a 6% lower risk of ischemic stroke ($p = .01$, test for trend) (11).

The need to increase consumption of these dark green leafy, yellow/orange, and cruciferous vegetables is so intense that even small increases are steps in the right direction. Food supply data showed that these vegetables increased slightly with the introduction of the Food Guide Pyramid, the education tool that provides general guidance for consumers to choose a healthy diet (46, 47). Nanney et al. (2004) mentioned that part of reason these small increases in consumption were observed over time is that national vegetable and fruit messages are vague, and specific messages are needed. For variety of vegetables, a more specific message such as, eat two to three servings of dark green leafy, yellow/orange and cruciferous vegetables each day should be provided (47).

This intervention focused on increasing offerings of dark green leafy, yellow/orange, cruciferous vegetables and tomatoes in young children. Parents were given specific information on types of these vegetables and their role in chronic disease prevention. Results
from this study showed that parents in the experimental group increased offerings of these vegetables in their children’s diet thus indicating the benefits of specificity of message. If we are to continue to observe improvements (even minimal ones) in the consumption of these vegetables then we need to provide specific messages on these vegetables.

No statistical difference was observed in the levels of critical thinking. This intervention was of short duration (two 45-minute sessions). In previous studies, interventions that made a difference in levels of critical thinking were of much longer duration. For example, changes in the levels of thinking were observed after a 19-hour unit (over a 17-day period) designed to help students develop practical reasoning skills. Anderson (1982) mentioned that after 100 hours of a student learning to program a computer, only modest acquisition of the skill is achieved (48). If we are to take up the challenge of nurturing critical thinking skills in individuals we need to consider that it would take hours of practice in developing these skills, as well as patience and perseverance (48).

Limitations of the study include its small sample size that made it difficult to detect differences between treatment conditions. In addition, the study was of short duration. To develop thinking skills normally takes a longer time frame. Anderson (1982) mentioned that skill acquisition falls into two stages (48): The declarative stage when there is initial encoding of the skill and the learner generates the desired behavior to at least some crude approximation and the procedural stage where further learning or a fine tuning of the knowledge takes place so that it would be applied more appropriately. These stages take a considerable period of time. In this study of such short duration, individuals are generally at the declarative stage where they are just beginning to learn the tasks of critical thinking and problem solving. Therefore, it was difficult to detect changes in critical thinking. The method
used to assess critical thinking required parents to write their responses to problems in the scenario. This could have been challenging for someone with limited reading and writing skills. Martin (1998) mentioned that in implementing thinking skills, teachers need to realize that there is a link between reading skills and decision making skills (49). A more accurate assessment of parents’ skills could have been achieved by reading the scenarios, asking the questions, and taping/video taping the responses.

Nonetheless, this study served two purposes. One, to remind us that specific messages are needed if increases in dark green leafy vegetables, yellow/orange, and cruciferous vegetables are realized in the U.S. population. Two, that there is still a need to develop critical thinking methodology specific to nutrition. However, we need to remember that the development of critical thinking should be seen as a journey where individuals move along the continuum from irrational decision-making to rational, reasonable, reflective thinking and where the tools needed to solve ill-structured problems are acquired. This journey is more of a marathon requiring persistence than a short 100-meter sprint.

Future interventions should plan studies of longer duration. In addition, elements of the model need to be tested to determine the effect of each component in the development of critical thinking skills. There should also be a follow-up of parents to determine which aspects of the intervention they enjoyed.

REFERENCES


Figure 1. Critical Thinking Model.
### Table 1

*Demographic Information for Participants in Experimental and Control Groups*

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<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Mother</td>
<td>8</td>
<td>15</td>
<td>12</td>
<td>22</td>
<td>20</td>
<td>37</td>
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<tr>
<td>Other</td>
<td>16</td>
<td>30</td>
<td>16</td>
<td>30</td>
<td>32</td>
<td>59</td>
</tr>
<tr>
<td>Ages of children at meal</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>2 and under</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>8</td>
<td>2</td>
<td>4</td>
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<td>3 to 5 years</td>
<td>20</td>
<td>83</td>
<td>18</td>
<td>75</td>
<td>38</td>
<td>79</td>
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<tr>
<td>6 and over</td>
<td>4</td>
<td>17</td>
<td>4</td>
<td>17</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>Adults at meals</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>5</td>
<td>21</td>
<td>4</td>
<td>17</td>
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<td>17</td>
<td>71</td>
<td>19</td>
<td>79</td>
<td>36</td>
<td>75</td>
</tr>
<tr>
<td>3 to 4</td>
<td>2</td>
<td>8</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td>6</td>
</tr>
</tbody>
</table>

*Note.* Totals may not add up to 100%
Table 2.

**Effects of a Critical Thinking Intervention on Parents’ Knowledge, Attitudes, Critical Thinking Skills and Vegetable Offerings in 2- to 5-Year-Old Children**

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Standard Error</th>
<th>F</th>
<th>p-value</th>
<th>η²</th>
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<tr>
<td><strong>Knowledge score</strong></td>
<td></td>
<td></td>
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<tr>
<td>Exp.</td>
<td>25</td>
<td>3.73</td>
<td>0.26</td>
<td>4.04</td>
<td>*</td>
<td>.08</td>
</tr>
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<td>Control</td>
<td>24</td>
<td>2.99</td>
<td>0.26</td>
<td></td>
<td></td>
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<tr>
<td><strong>Attitude score</strong></td>
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<td></td>
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<td></td>
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<tr>
<td>Exp.</td>
<td>25</td>
<td>3.45</td>
<td>0.11</td>
<td>1.22</td>
<td>n.s.</td>
<td>.00</td>
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<tr>
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<td>3.31</td>
<td>0.11</td>
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<tr>
<td><strong>Level of critical thinking score</strong></td>
<td>22</td>
<td>5.19</td>
<td>0.52</td>
<td>.772</td>
<td>n.s.</td>
<td>.02</td>
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<tr>
<td>Exp.</td>
<td>25</td>
<td>4.56</td>
<td>0.48</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>24</td>
<td>4.08</td>
<td>0.48</td>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>Dark green leafy, yellow/orange, cruciferous vegetable, tomatoes offered within one week</strong></td>
<td>22</td>
<td>6.17</td>
<td>0.44</td>
<td>5.74</td>
<td>*</td>
<td>.12</td>
</tr>
<tr>
<td>Exp.</td>
<td>24</td>
<td>4.72</td>
<td>0.42</td>
<td></td>
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<tr>
<td>Control</td>
<td>24</td>
<td>4.72</td>
<td>0.42</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Other vegetable offered per week</strong></td>
<td>22</td>
<td>6.81</td>
<td>0.36</td>
<td>0.34</td>
<td>n.s.</td>
<td>.01</td>
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<tr>
<td>Exp.</td>
<td>24</td>
<td>6.51</td>
<td>0.35</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>24</td>
<td>6.51</td>
<td>0.35</td>
<td></td>
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</tbody>
</table>

*Note.* η² = Effect size; Exp. = Experimental group.

aANCOVA performed for dependent measure. bANOVA performed for dependent measure.

* p ≤ .05. n.s. p > .05
CHAPTER 4

THE USE OF VEGETABLE AND PHYSICAL ACTIVITY SCENARIOS TO IDENTIFY AND ASSESS THE LEVEL OF CRITICAL THINKING IN LOW-INCOME PARENTS OF DRAKE UNIVERSITY HEAD START IN POLK COUNTY, IOWA

A paper to be submitted to the Journal of Nutrition Education and Behavior

Ingrid K. Richards-Adams, Cheryl O. Hausafus, Suzanne Hendrich

ABSTRACT

Objective: To use the open-ended responses of two critical thinking scenarios to assess the critical thinking skills of Drake University Head Start parents, and determine if there are changes in their critical thinking skills after two 45-minute sessions using critical thinking methodology.

Design: A two-group, randomized, pretest, posttest design. Data were collected during a four month period (October 2005 to January 2006).

Setting/Participants: Parents (n = 77) of Drake University Head Start in Polk County, Iowa participated in the study. Twenty eight did not have complete data and were excluded from the quantitative analysis. All remaining respondents were retained for the qualitative analysis.

Intervention: This study is part of a larger study that evaluated the effectiveness of a critical thinking approach in increasing dark green leafy, yellow/orange, cruciferous vegetables, tomatoes, and physical activities in Head Start children. Parents in the intervention group were exposed to two 45-minute sessions on vegetables and physical activity occurring one session per week for two consecutive weeks. As part of the intervention parents solved problems collaboratively and reflected on their thought processes.
Main Outcome Measures: A researcher-developed questionnaire was used to measure knowledge, attitudes, and critical thinking related to vegetables and physical activity, vegetable offerings, and physical activity. Critical thinking was measured by two scenarios and open-ended questions.

Analysis: Both quantitative (Analysis of Covariance and chi-square) and qualitative (content analysis) measures were used to analyze data. A $p$-value less than or equal to .05 was used as the criterion for statistical significance.

Results: No differences were seen between the experimental and control groups in terms of their overall critical thinking score using quantitative measures. However, content analysis, the qualitative measure, revealed that parents in the experimental group showed some improvement in addressing the problem related to the vegetable scenario. They were more likely to extend their contextual framework to address other aspects of the problem, and were more likely to provide some answer to the most challenging questions.

Conclusions and Implications: Small improvements were observed in the critical thinking skills of parents after the brief critical thinking intervention. Interventions of longer duration may be necessary to realize greater improvement in critical thinking skills. The use of both quantitative and qualitative measures was helpful in assessing gains in critical thinking.

INTRODUCTION

Adults are daily confronted with nutrition choices—what foods should be purchased, prepared, and consumed? Many of these choices are complex and value laden (1, 2). The complexity of decision making increases for individuals experiencing financial constraints as they must factor limited resources into their decision making schema. Critical thinking provides important tools for reasoning, initiative taking, problem-solving, and making sound
decisions. Learning to think critically is therefore one of the most significant activities of adult life and adults by reason of their many experiences are predisposed to critical thought (3). However, predisposition does not guarantee sound decisions. Norris stated that critical thinking abilities are not well developed among young people or adults. Individuals must therefore be provided with opportunities to develop skills that would promote critical thinking (4). Research has shown that critical thinking is a skill that can be improved in everyone (5) and with instruction (6).

Nitzke et al. stated that there is a need to develop critical thinking methodology appropriate for nutrition (7). An important aspect in the development of such methodology is the assessment of critical thinking. Assessing any thinking process is not an easy task (8) and critical thinking is no different. Questions of how critical thinking should be defined? What skills and abilities should characterize the definition of critical thinking? And what instruments should be used to determine the attainment of critical thinking skills must all be examined and addressed?

Conceptualizing and defining critical thinking is an important first step in the assessment of critical thinking. Many authors argue for the use of context-specific critical thinking definitions mainly because critical thinking in itself is context-bound (9, 10), and the way critical thinking is defined within a specific context determines what will be measured through assessment. Thus prior to designing assessment tools, test makers must decide if critical thinking is a process or a product, a skill or disposition, a cognitive or behavioral skill, or an internal or external process (11).

Once a clear definition of critical thinking is conceptualized, the decision must be made as to the skills and abilities that would characterize critical thinking. Many
characterizations of critical thinking skills occur in the literature. However, the skills chosen to characterize critical thinking depend on the way critical thinking is defined. Dressel and Mayhew’s lists of critical thinking skills included defining a problem, selecting pertinent information for the solution of a problem, recognizing stated and unstated assumptions, formulating, selecting relevant and promising hypotheses, drawing valid conclusions, and judging the validity of inferences (12). Similar skills were suggested by Darkenwald and Merriam as an appropriate model for learning in adult education (13). They proposed including recognizing a problem, analyzing it, discussing it in terms of other people’s experiences and available information, using information to formulate solutions, and acting upon the solutions.

The decision of which instruments should be used to evaluate the attainment of critical thinking skills is challenging. Many individuals believe that many of the preexisting instruments used to evaluate critical thinking are not appropriate for every situation (8, 9, 10). Laster (1998) suggested that an effective approach would be to refine or develop instruments for assessing thinking (8). Kerka pointed out that scenario analysis is one of the new forms of evaluation assessing higher order thinking skills (14), and other authors (6, 15) agree. According to Stone, scenarios help students identify problems, determine potential causes of problems, and develop potential solutions to the problems (16). Halpern emphasized the importance of “simulated scenarios” that present situations similar to those encountered in the real-world as a good assessment of critical thinking (6). In the field of nutrition, Reicks, Bosch, Herman, and Krinke used critical analysis of scenarios as a method that supports the development of critical thinking skills (17).
The purpose of this research was to (a) identify the critical thinking skills in a group of low-income parents at Drake University Head Start in Polk County, Iowa, and (b) determine if there are changes in critical thinking after two 45-minute sessions that employed critical thinking methodology and adult learning techniques.

A context-specific definition was developed for the study. Critical thinking was defined as the process whereby individuals analyze and evaluate information and their behavior in order to make fully informed decisions while reflecting on their thought processes. Dressel and Mayhew lists of skills were chosen to characterize critical thinking. These skills are appropriate for adult learners in critical thinking situations involving problem solving (12, 13). Scenarios related to vegetables and physical activity were used to evaluate critical thinking skills of parents in the study.

Few studies have attempted to assess critical thinking specific to nutrition. An instrument has been developed to assess critical thinking constructs in nutrition audiovisual materials (7), and the effectiveness of a food safety teaching strategy to promote critical thinking has been undertaken (17). As far as we know, no studies have used a specific methodology to assess critical thinking. This study attempts to fill the gap in this area.

METHODS

Subjects

Parents of Drake University Head Start (DUHS) program within Polk County, Iowa were recruited for the study. DUHS serves 550 low-income families through 16 centers under six different program options. DUHS teachers and recruitment advocates assisted in recruiting parents. Flyers in English and Spanish were used to inform parents about the study and invite them to participate. A total of 46 parents participated in this aspect of the study.
**Study Design**

A two-group randomized design was used in the study. DUHS operates 16 centers under six program options. The six different program options were used to randomly assign centers to experimental or control groups. Parents in these centers volunteered for participate in the study. Parents in experimental and control groups completed a questionnaire at the beginning and end of the study. The Iowa State University and Drake University Institutional Review Boards: Human Subjects approved the study.

**Data Collection**

Data were collected using a questionnaire consisting of nine sections, a demographic section; three vegetable and three physical activity sections related to knowledge, attitude and critical thinking; a vegetable recall section; and a physical activity recall section. Results of data from the knowledge, attitude, and recall sections related to vegetables and physical activity are presented elsewhere.

**Instrument**

Two scenarios (one relating to vegetables and one to physical activity) and a scoring rubric were created to assess critical thinking skills in parents. The scenarios were ill-structured and could be characterized as having no one correct answer making them suitable for assessing critical thinking (8, 18). The five questions that followed each scenario were hierarchical in terms of the level of thinking required.

The vegetable scenario stated, “At the WIC clinic, Joan was told that she needed to offer her children more vegetables. Joan mentioned that she is afraid that she would not have enough money to do this.” Parents were asked to respond to the following questions: (1) What is Joan’s problem? (2) What other information you will need to know about Joan’s
situation if you are to help her? (3) What can Joan do to offer her children more vegetables? (4) What do you think is the best way to solve Joan’s problem? (5) Why do you think that solution is the best? The physical activity scenario stated, “Henry enjoys watching television and playing computer games. He spends at least 4 hours a day on these activities. His father tells him to turn off the television and be active. Henry complains that he does not want to be active.” (1) What are Henry’s problems? (2) What other information do you need to know about Henry’s situation if you are to help him? (3) Suggest some things that Henry’s dad can do to make Henry more active. (4) What do you think is the best solution to Henry’s problem? (5) Why do you think that solution is the best?

**Rubric**

A rubric consisting of five main parts (A to E), and three levels (I, II, III) was developed to measure the critical thinking skills of parents in the study. Each part of the rubric corresponded to one of the five questions that followed the vegetable or physical activity scenario. Part A, problem identification was related to question 1. Part B, selection of pertinent information to the problem was related to question 2. Part C, selection of promising hypothesis, was related to question 3. Part D, drawing of valid conclusion, was related to question 4 and Part E, judging the validity of inferences, was related to question 5. Obtaining a score at level I indicated that an individual has not engaged in critical thinking. A score at level II indicated that participants have engaged in some critical thinking and a score at level III indicated that a higher level of critical thinking was displayed in solving problems related to vegetable offering and physical activity. See Figure 1.
Validity

Four professors at Iowa State University read and examined the questionnaire and provided feedback in terms of format, structure of items, suitability and clarity. The instrument was also administered to four low-income individuals who provided feedback in terms of readability, clarity, and the time taken to complete the questionnaire. To evaluate content validity, an expert in evaluation and assessment examined the scenarios to determine whether the instrument provided a measure of critical thinking as it related to problem solving. Changes were made in response to feedback provided. The entire instrument was piloted with a group of parents from the Iowa State University Child Development Laboratory.

Reliability

To assess the reliability of critical thinking scores, a two-step process was used. First, two experts in research and evaluation at Iowa State University reviewed the categories of responses created by the researcher. They were provided with a chart containing a list of parents’ responses on the left and a list of categories generated by the researcher from these responses on the right. They were asked to read the list of parents’ responses and determine if the categories and the list of responses under each category generated by the researcher were reasonable. Second, to determine inter-rater reliability of individual parents’ scores, two individuals in Family and Consumer Sciences Education were given the responses of individual parents and the categories that were formed by the researcher. They were asked to place the responses of each individual under the most appropriate category. Their method of placement was compared with that of the researcher. A 96% agreement was obtained for vegetable and physical activity.
Measures

Both quantitative and qualitative methodologies were used in analyzing the data. This approach is supported in the literature (19, 20, 21). Quantitative measures included the total critical thinking score, the word count of responses, and a count of the number of times respondents did not provide a response to a question; content analysis was used as the qualitative measure.

Total Critical Thinking Score. One point was given for a correct response for each of the five questions that followed the vegetable and physical activity scenarios. A total score was obtained by summing the scores for the five questions.

Word Count Analysis. The entire phrase or sentence provided by parents in response to the questions that followed the scenarios was tallied to derive a word count. This method was undertaken to determine changes in the number of words parents used to describe the problem. The assumption was that as critical thinking skills and abilities increased parents would use more words to describe or provide solutions to the problem.

No Response. The number of parents who did not respond to a particular question was recorded and analyzed. This approach was conducted to determine if there were differences in the number of No Responses between the control and experimental groups following the intervention.

Content Analysis. Content analysis was used to analyze and quantify the open-ended responses provided by parents. Responses to each question were read several times in order to identify reoccurring phrases or words. Categories were identified from these words and phrases. The responses were re-read and categories were refined. Participants’ responses were then placed into the identified categories. Berg (1998) viewed the development of
inductive categories as allowing the researcher to link or ground categories to the data from which they derive (20).

**Data Analysis**

The quantitative data were analyzed using SPSS computer software (version 14.0, for windows) (22). Analysis of Covariance (ANCOVA) was conducted with the posttest critical thinking scores on word count and number of No Responses. A chi-square was conducted on the number of No Response for each question to determine if the observed number of No Responses for each question was due to chance. A $p$ value less than or equal to .05 was used as the level of significance. Content analysis was used to analyze the open-ended responses from the vegetable and physical activity scenarios.

**RESULTS**

**Word Count for Vegetable and Physical Activity**

Results of the analysis of covariance (ANCOVA) on word count for vegetable problem solving showed that parents in the experimental group used more words to solve problems related to the vegetable scenario at the end of the intervention, $F(1, 44) = 5.42, p \leq .05, \eta^2 = .11$. See Table 1 for means and standard deviations. The partial $\eta^2$ of .11 suggests a moderate effect size of instruction using the critical thinking method and the number of words that parents used to respond to problem situations regarding vegetable offerings in their children’s diet.

ANCOVA results on word count for physical activity problem solving showed no significant differences in mean posttest scores in the experimental and control group, $F(1, 45) = 2.50, p \geq .05, \eta^2 = .05$. See Table 1 for results of means and standard deviations.
**Count of Number of No Response**

The ANCOVA results showed no statistically significant difference in mean overall posttest scores between the control and the experimental group for No Response related to both vegetable and physical activity following the intervention. See Table 1 for results.

A 2 x 2 chi-square test was conducted for each of the five questions related to vegetable critical thinking to determine if there was a difference in the number of parents in the control and intervention groups who did not answer each of the five questions. Results indicated that for question 4, “What do you think is the best way to solve Joan’s problem?” the observed rate for individuals who did not respond to this question was significantly different between the experimental and control groups, $\chi^2(1, N = 71) = 7.431, p < .001$. A greater proportion of control parents chose not to respond to this item at posttest. A significant difference was also observed for question 5, “Why do you think that solution is the best?” $\chi^2 (1, N = 71) = 9.125, p < .001$, with a greater proportion of control parents not responding.

**Content Analysis of Vegetable Responses**

Comparison of parents’ responses (control $n = 30$, experimental $n = 26$) for question 1, “What is Joan’s problem?” revealed both the experimental and control groups identified finances as being the source of Joan’s problem (control $n = 20$, experimental $n = 13$). However, instead of relating Joan’s problem only to finances parents in the experimental group expanded their contextual framework as to the nature of the problem. Their responses included other factors such as money management and budgeting issues ($n = 6$), unaware as to the resources she could use ($n = 3$), and a lack of knowledge ($n = 3$). Parents in the control group mostly suggested lack of finances as the source of Joan’s problem ($n = 20$). A common
theme in the posttest responses in the experimental group was that vegetables are inexpensive. Participants stated, “She needs to look at prices more, vegetables are very inexpensive,” and “She doesn’t know that vegetables can be economical.” Parents in the experimental group were exposed to at least one session on critical thinking related to diet and physical activity. It seems that they were able to expand their knowledge as to the contextual factors that have an impact on such a problem.

Analysis of question 2, “What other information will you need to know about Joan’s situation if you are to help her?” showed similar responses between the control \((n = 29)\) and experimental groups \((n = 25)\). It was stated that information was needed on Joan’s finances \((\text{control } n = 11, \text{experimental } n = 8)\), Joan’s budget \((\text{control } n = 5, \text{experimental } n = 2)\), and whether there are organizations that help her \((\text{control } n = 5, \text{experimental } n = 4)\). The experimental group also suggested that they needed information on the vegetables Joan liked, purchased, or offered her children \((n = 5)\), and the number of children Joan had \((n = 3)\). The control group did not suggest responses in these categories. Their responses were limited to needing information on Joan’s financial situation, organizations she knows of that could help her, and her budget as listed above. The experimental group seemed to broaden their understanding of what information is needed if help is to be provided to Joan.

When question 3, “What can Joan do to offer her children more vegetables?” was analyzed, it was observed that a wide range of solutions were suggested by both the control \((n = 29)\) and experimental groups \((n = 26)\). Close to one quarter of the responses for the control group \((n = 7)\) mentioned that Joan should get assistance in the form of food stamps or from other government programs as a means of offering her children more vegetables. Four parents \((n = 4)\) in the experimental group suggested this approach. More parents in the
experimental than the control group suggested solutions that included offering vegetables in
creative ways in cooking and serving (control $n = 5$, experimental $n = 10$). Parents in the
experimental group ($n = 4$) also suggested making substitution (vegetables instead of snacks),
and purchasing vegetables in other forms ($n = 3$). These suggestions were not given by
parents in the control group. The control group ($n = 3$) suggested that Joan could make wise
consumer choices. This was not suggested by parents in the experimental group. The
experimental group suggested more creative approaches as a means of Joan offering her
children more vegetables.

Question 4 asked parents “What do you think is the best way to solve Joan’s
problem?” Responses were similar for both control ($n = 28$) and experimental groups ($n = 25$). Both groups thought that organizations offering help would be the best way to solve
Joan’s problem (control $n = 9$, experimental $n = 7$), budgeting or wise buying (control $n = 7$,
experimental $n = 5$), and education (control $n = 5$, experimental $n = 3$). As the questions
increased in complexity the responses of parents in the control and experimental groups
became more similar.

Question 5 asked, “Why was the solution suggested in question four the best?” Some
of the reasons were because it provides Joan’s need for food or vegetables (control $n = 5$,
experimental $n = 7$), and it will help with money problems (control $n = 5$, experimental $n = 3$). Individuals in the control group suggested that the solution was the best for health reasons
($n = 2$). This was not suggested by the experimental group. The experimental group
suggested that the solution was best because it allowed Joan to be a role model ($n = 2$) and
because it was sensible or logical ($n = 2$). These responses were not suggested by the control
group. Six parents in the control group did not answer this question. At the level of providing justification, the responses from both the experimental and control groups were quite similar.

**Content Analysis of Physical Activity Responses**

Comparison of the control \((n = 28)\) and experimental \((n = 24)\) groups’ responses for question 1, “What is Henry’s problem?” revealed a similarity of responses between the two groups. The two main categories of responses were too much TV or computer games (control group \(n = 13\), experimental group \(n = 10\)) and inactivity (control group \(n = 9\), experimental group \(n = 9\)). Parents in both groups also suggested that the problem is that Henry is lazy (control \(n = 4\), experimental \(n = 2\)). The responses were similar for control and experimental group. Parents in both groups identified Henry’s problem in terms of the information provided in the scenario.

Question 2 asked, “What other information do you need to know about Henry’s situation if you are to help him? Parents in both the control \((n = 26)\) and experimental groups \((n = 25)\) suggested most frequently that information concerning Henry’s or his family’s activities or interest was needed (control \(n = 11\), experimental \(n = 7\)). Parents in the experimental group also suggested that information on Henry’s daily schedule \((n = 5)\) and his diet and health \((n = 2)\) will provide information needed to help Henry. Two parents in the control group stated that they needed information on his health \((n = 2)\). Again, there was not much distinction between the groups in terms of information needed to solve Henry’s problem.

When parents in the control \((n = 27)\) and experimental groups \((n = 24)\) were asked to “suggest some things that Henry’s dad could do to make him more active,” a large number of parents suggested that his dad should do activities with him (control group \(n = 16\),
experimental group \( n = 14 \). Other main suggestions included: involve him in activities (control group \( n = 2 \), experimental group \( n = 5 \)) and take away or limit the television or computer game (control \( n = 5 \), experimental \( n = 4 \)). Parents in both groups mentioned the responsibility of Henry’s dad to do things with him, get Henry involved in activities, or set limits on the television and computer. Solutions from both groups of parents were related to increasing Henry’s activity and limiting access to the television and computer.

Analysis of question 4, “What do you think is the best solution to Henry’s problem?” for the control \( (n = 27) \) and experimental groups \( (n = 25) \) revealed three main categories of responses. These included, getting involved with him (control \( n = 7 \), experimental \( n = 13 \)), involve him in activity (control \( n = 5 \), experimental \( n = 4 \)), and limiting television and computer time (control \( n = 6 \), experimental \( n = 2 \)). More parents in the experimental group suggested being involved in activities with Henry, a relational aspect, as being the best solution to the problem.

Question 5 asked, “Why do you think that solution is the best?” Reasons suggested were similar for the control \( (n = 27) \) and experimental groups \( (n = 25) \). These reasons included, allows for interaction with his dad (control \( n = 7 \), experimental \( n = 6 \)), gets him active (control \( n = 5 \), experimental \( n = 2 \)), improves his health and well being (control \( n = 3 \), experimental \( n = 2 \)), provides a role model (control \( n = 2 \), experimental \( n = 2 \)). Less variability was observed between the control and experimental groups in terms of their responses to questions related to physical activity scenario.

**DISCUSSION**

Content analysis indicated that at lower levels of the critical thinking process, that is, problem identification, information needed to solve Joan’s problem, and suggestion of what
can be done to offer more vegetables, the experimental group displayed higher gains in mean posttest scores. As the question progressed to a higher level of thinking fewer differences were observed in responses from the control and experimental group.

A common theme in the posttest responses is that vegetables are inexpensive. Participants stated, “She needs to look at prices more, vegetables are very inexpensive,” and “She doesn’t know that vegetables can be economical.” The experimental group therefore offered a wider range of responses in identifying Joan’s problem than the control group. The identification of the problem was the most elementary stage in the problem solving scenario and the experimental group seemed to have expanded their cognitive structures as to factors that could contribute to Joan’s problem. At posttest it was mentioned that the problem could have been one of lack of education or knowledge. Individuals in the experimental group were exposed to one or two lessons on critical thinking relating to vegetables. There may have been a connection in terms of the education as a means of imparting information in these areas hence it was stated that one of Joan’s problems was lack of knowledge or education. The experimental group suggested more practical solutions in the area of offering more vegetables.

This intervention consisted of two 45-minute to 1-hour sessions on increasing vegetables and physical activities in young children using critical thinking skills and strategies specific to andragogy. The results indicated that low-income parents are capable of solving problems in the areas mentioned above.

The limitation here is that limited time was given to complete the questionnaire and some participants possessed a lower level of education and hence the writing of responses may have been a deterrent to problem solving. In addition, respondents supplied their
answers on the questionnaire where a one-inch blank was provided to write in their own words. This limited space could have reduced the amount of information given.

The intervention showed small changes in parents’ problem solving after a short time frame. However, with an intervention of longer duration greater changes in parents’ problem solving skills may be possible. There was no transfer of problem solving skills from vegetable to physical activity scenarios. Transfer of thinking skills requires the use of a variety of problem situations so that individuals could make cognitive connections across different contexts. Interventions must be planned specifically to achieve transfer, such interventions would require longer time commitment. The use of scenarios was useful in identifying small improvements in parents’ problem solving skills. Future interventions assessing critical thinking skills should utilize multiple measures to provide a more accurate assessment of thinking skills.

REFERENCES


### VEGETABLE QUESTIONS

<table>
<thead>
<tr>
<th>What is Joan’s problem?</th>
<th>LEVEL I</th>
<th>LEVEL II</th>
<th>LEVEL III</th>
<th>PHYSICAL ACTIVITY QUESTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unable to state the problem</td>
<td>__0 point</td>
<td>States one problem</td>
<td>States two or more problems</td>
<td>What are Henry’s problems?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>__1 point</td>
<td>__2-3 points</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>What other information you will need to know about Joan’s situation if you are to help her?</th>
<th>LEVEL I</th>
<th>LEVEL II</th>
<th>LEVEL III</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Unable to select pertinent information to the solution of the problem</td>
<td>__0 point</td>
<td>States one pertinent piece of information to the solution of the problem</td>
<td>States two or more pertinent pieces of information to the solution of the problem</td>
<td>What other information do you need to know about Henry’s situation if you are to help him?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>__1 point</td>
<td>__2-3 points</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>What can Joan do to offer her children more vegetables?</th>
<th>LEVEL I</th>
<th>LEVEL II</th>
<th>LEVEL III</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Unable to select relevant and promising hypotheses</td>
<td>__0 point</td>
<td>Selects one relevant and promising hypothesis</td>
<td>Selects two or more relevant and promising hypotheses</td>
<td>Suggest some things that Henry’s dad can do to make Henry more active.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>__1 point</td>
<td>__2-3 points</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>What do you think is the best way to solve Joan’s problem?</th>
<th>LEVEL I</th>
<th>LEVEL II</th>
<th>LEVEL III</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Unable to draw a valid conclusion</td>
<td>__0 point</td>
<td>Draws one valid conclusion</td>
<td>Selects two or more relevant and promising hypotheses</td>
<td>What do you think is the best solution to Henry’s problem?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>__1 point</td>
<td>__2-3 points</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Why do you think that solution is the best?</th>
<th>LEVEL I</th>
<th>LEVEL II</th>
<th>LEVEL III</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Unable to judge the validity of inference</td>
<td>__0 point</td>
<td>States one point to judge the validity of the inference</td>
<td>States two or more point to judge the validity of the inference</td>
<td>Why do you think that solution is the best?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>__1 point</td>
<td>__2-3 points</td>
<td></td>
</tr>
</tbody>
</table>

### TOTAL POINTS

<table>
<thead>
<tr>
<th></th>
<th>VEGETABLE QUESTIONS</th>
<th>PHYSICAL ACTIVITY QUESTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL POINTS</td>
<td>0</td>
<td>5</td>
</tr>
</tbody>
</table>

*Figure 1.* Rubric for grading the critical thinking scenarios.
Table 1

*Results of Word Count and No Responses for Vegetable and Physical Activity Scenarios*

<table>
<thead>
<tr>
<th>Descriptor</th>
<th>Control</th>
<th></th>
<th>Intervention</th>
<th></th>
<th>F</th>
<th>p value</th>
<th>$\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$N$</td>
<td>Mean</td>
<td>$SD$</td>
<td>$N$</td>
<td>Mean</td>
<td>$SD$</td>
<td></td>
</tr>
<tr>
<td>Word count for vegetable scenario</td>
<td>25</td>
<td>30</td>
<td>22</td>
<td>22</td>
<td>39</td>
<td>27</td>
<td>5.42</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Word count for physical activity</td>
<td>25</td>
<td>37</td>
<td>22</td>
<td>23</td>
<td>36</td>
<td>22</td>
<td>2.50</td>
</tr>
<tr>
<td>scenario</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No response for vegetable questions</td>
<td>43</td>
<td>1</td>
<td>1</td>
<td>28</td>
<td>1</td>
<td>1</td>
<td>1.21</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No response for physical activity questions</td>
<td>43</td>
<td>1</td>
<td>1</td>
<td>28</td>
<td>1</td>
<td>1</td>
<td>.02</td>
</tr>
</tbody>
</table>

* $p \leq .05$. n.s. = non significant.
Table 2.

*Categories of Response Based on Questions 1–5 of the Vegetable Critical Thinking*

<table>
<thead>
<tr>
<th>Vegetables Scenario and Questions</th>
<th>Categories of responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>At the WIC clinic, Joan was told that she needed to offer her children more vegetables. Joan mentioned that she is afraid that she would not have enough money to do this.</td>
<td><strong>Control</strong></td>
</tr>
<tr>
<td>1. What is Joan’s problem</td>
<td>$N = 30^a$</td>
</tr>
<tr>
<td>• Finances = 20$^b$</td>
<td>• Finances = 13 $^b$</td>
</tr>
<tr>
<td>• No response = 2</td>
<td>• Money management/budget = 6</td>
</tr>
<tr>
<td>2. What other information you will need to know about Jane’s situation if you are to help her?</td>
<td>$N = 29$</td>
</tr>
<tr>
<td>• Financial situation = 11</td>
<td>• Financial situation = 8</td>
</tr>
<tr>
<td>• Resources = 5</td>
<td>• Vegetables or foods liked, purchased, or provided = 5</td>
</tr>
<tr>
<td>• Budget = 5</td>
<td>• Resources she knows (WIC, Food Stamps) = 3</td>
</tr>
<tr>
<td>• No response = 4</td>
<td></td>
</tr>
<tr>
<td>3. What can Jane do to offer her children more vegetables?</td>
<td>$N = 29$</td>
</tr>
<tr>
<td>• Help/resources = 7</td>
<td>• Offer in creative ways = 10</td>
</tr>
<tr>
<td>• Offer in creative ways = 5</td>
<td>• Make substitution (vegetable for fruit juice, veggies instead of snack) = 4</td>
</tr>
<tr>
<td>• Offer more = 3</td>
<td>• Use resources = 4</td>
</tr>
<tr>
<td>• Wise consumerism = 3</td>
<td>• Purchase vegetables in different forms = 3</td>
</tr>
<tr>
<td>• No response = 3</td>
<td></td>
</tr>
<tr>
<td>4. What do you think is the best way to solve Jane’s problem?</td>
<td>$N = 28$</td>
</tr>
<tr>
<td>• Resources = 9</td>
<td>• Resources = 7</td>
</tr>
<tr>
<td>• Budget = 7</td>
<td>• Budget or wise buying = 5</td>
</tr>
<tr>
<td>• Education = 5</td>
<td>• Education = 3</td>
</tr>
<tr>
<td>• No response = 5</td>
<td>• Garden; Offer in creative ways; Role model; Job = 2</td>
</tr>
<tr>
<td>5. Why do you think that solution is best?</td>
<td>$N = 28$</td>
</tr>
<tr>
<td>• No response = 6</td>
<td>• situation/provides needs = 7</td>
</tr>
<tr>
<td>• Provide food or vegetables = 5</td>
<td>• Helps with money = 3</td>
</tr>
<tr>
<td>• Helps money situation = 5</td>
<td>• Provides example = 2</td>
</tr>
<tr>
<td>• Health reasons = 2</td>
<td>• Sensible/logical = 2</td>
</tr>
</tbody>
</table>

$^a$ = number of respondents  
$^b$ = category and number of individuals within the category
Table 3.

*Categories of Response Based on Questions 1-5 of the Physical Activity Critical Thinking*

<table>
<thead>
<tr>
<th>Physical activity scenario and questions</th>
<th>Categories of responses</th>
<th>Control</th>
<th>Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Henry enjoys watching television and playing computer games. He spends at least 4 hours a day on these activities. His father tells him to turn off the television and be active. Henry complains that he does not want to be active.</td>
<td>1. What are Henry’s problems?</td>
<td>( N = 28 )</td>
<td>( N = 24 )</td>
</tr>
<tr>
<td></td>
<td>• Too much TV/video = 10</td>
<td>• Too much TV/computer games = 10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• In activity = 8</td>
<td>• Not active = 9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Lazy = 4</td>
<td>• Lazy = 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• No response = 1</td>
<td>• Dad is not involved with him = 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• No response = 1</td>
<td>• No response = 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. What other information do you need to know about Henry’s situation if you are to help him?</td>
<td>( N = 26 )</td>
<td>( N = 25 )</td>
</tr>
<tr>
<td></td>
<td>• His or family’s activities or interest = 9</td>
<td>• His family’s activities or interest = 7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Does he have friends = 3</td>
<td>• Daily schedule = 5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Physical limitation/disabilities = 2</td>
<td>• No response = 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• No response = 1</td>
<td>• Diet/health = 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Suggest some things that Henry’s dad can do to make Henry more active.</td>
<td>( N = 27 )</td>
<td>( N = 24 )</td>
</tr>
<tr>
<td></td>
<td>• Do activities with him = 14</td>
<td>• Do activities together with him = 14</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Limit or take away TV = 4</td>
<td>• Involve him in activities = 5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Involve him in activities = 2</td>
<td>• Take away/limit the TV = 4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Buy equipment for sports = 2</td>
<td>• Talk to him = 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. What do you think is the best solution to Henry’s problem?</td>
<td>( N = 25 )</td>
<td>( N = 27 )</td>
</tr>
<tr>
<td></td>
<td>• Get involved with him = 13</td>
<td>• Limit TV/computer = 6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Get him active = 4</td>
<td>• Get involve with him = 6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Limit TV = 2</td>
<td>• Involve him in activity = 4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• No response = 3</td>
<td>• No response = 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Involves activities with dad and others = 6</td>
<td>• Allows for interaction with parents = 6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Helps dim to be active = 5</td>
<td>• Motivates him = 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Good for him, needs it, feels better = 3</td>
<td>• Improves health = 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• No response = 3</td>
<td>• Provides a role model = 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Lead by example = 2</td>
<td>• Gets him active = 2</td>
<td></td>
</tr>
</tbody>
</table>
CHAPTER 5
WHAT DO THE GROCERY REGISTER RECEIPTS OF
LOW-INCOME INDIVIDUALS TELL ABOUT THEIR PURCHASES
OF DARK GREEN LEAFY, DARK YELLOW OR ORANGE,
AND CRUCIFEROUS VEGETABLES AND TOMATOES?

A paper to be submitted to the *Journal of Family and Consumer Sciences*

Ingrid K. Richards-Adams, Cheryl O. Hausafus, Suzanne Hendrich

ABSTRACT

Parents of Drake University Head Start, in Polk County, Iowa collected grocery register receipts (GRR) for two weeks before and after an intervention to determine the effectiveness of a critical thinking approach in increasing offerings of dark green leafy, yellow/orange, cruciferous vegetables, tomatoes and physical activity in Head Start children. From the GRR it was possible to identify purchases of dark green leafy, yellow/orange, cruciferous vegetables, and tomatoes, and other information such as the grocery stores where food was purchased, the average number of trips to the store, and forms of payment used for grocery purchases. Due to the small number of participants collecting GRR at pre and posttest it was difficult to use the grocery receipt to supplement information obtained on vegetable offering recall from the larger study. However, the GRR provided an easy, cost-effective approach to identifying vegetable purchases and to determine individuals at risk for intakes of dark green leafy, yellow/orange, cruciferous vegetables, tomatoes and tomato products.

INTRODUCTION

The grocery register receipt (GRR) is an often overlooked tool in dietary assessment. More prestige is often afforded to the 24-hour food recall, the food diary, food frequency, and diet history. Although these methods are considered the hallmark of most nutrition
studies, they possess inherent limitations. The 24-hour recall is helpful in identifying individual food consumption but overlooks intake of episodically consumed foods (Subar et al., 2006). The food intake record or food diary is less likely to rely on memory but suffers from low response rates (Lancaster et al., 2000). The dietary methods listed above share similar problems of reliance on self-reported dietary intake, being time consuming, requiring a high level of personal involvement, and being expensive, especially if more than one assessment is required (Van Horn, 2006).

Grocery register receipts provide an easy, low-cost, time efficient approach for identifying food purchases. Individuals need only remember to save the grocery receipts so the burden to record or remember items consumed (and their quantities) over a period of time is relatively low. This method is less intrusive than the food frequency or diet history as there is no need to record (or tell someone) the foods eaten, as a result the keeping of GRR is generally well adhered. Rankin et al. (1998) developed a system for collecting and analyzing supermarket receipts data in order to track food purchases made by families. Their data analysis revealed the average percentage of energy purchased as fat was 38.4%, total fiber was 6.61/1000 kcal., and the number of servings of fruits and vegetables was 1.44/1000 kcal. From their analysis they were able to identify families at highest risk for poor nutritional quality of purchases.

Information collected from GRR could provide indication of the food shopping habits and nutrient intake of individuals (Hersey et al., 2001). Dinkins (1997) mentioned that food shopping decisions influence the economic well-being as well as the health status of families. Dark green leafy, yellow/orange vegetables and tomatoes have been shown to protect against diseases such as strokes (Gillman et al., 1995; Ness & Powles, 1997) cardiovascular disease
(Hung et al., 2004; Liu, Lee, Ajani, Cole, & Buring, 2001; Ness & Powles, 1997) and certain types of cancers (Malin et al., 2003). Research studies show protection for additional chronic diseases such as cataracts, diverticulosis, chronic obstructive pulmonary disease, and hypertension (Steinmetz & Potter, 1996; Van Duyn & Pivonka, 2000). However, dark green leafy vegetables, yellow/orange, and cruciferous vegetables tend to be lacking in the diets of low-income individuals and these individuals experience higher incidences of chronic diseases (Dinkins, 1997; Treiman et al., 1996).

This study used GRR to (1) identify purchases of dark green leafy, yellow/orange, cruciferous vegetables and tomatoes in a low-income population, (2) identify the other information that could be obtained from the GRR, and (3) determine how the GRR could supplement information obtained from the vegetable offering recall used as part of the larger study.

Others have used grocery receipts as a means to reduce risk factors for chronic diseases (Gerace, 1986) and to analyze household food acquisition patterns prompted by children (DeWalt et al., 1990). However, no studies have used GRR to identify purchases of dark green leafy, yellow/orange, cruciferous vegetables, and tomatoes (the vegetables that have been associated with a reduction in risk for chronic diseases) in a low-income population. This study adds to this body of literature.

**Study Design**

This study was part of a larger study evaluating the effectiveness of a critical thinking approach in increasing offerings of dark green leafy, yellow/orange, cruciferous vegetables, tomatoes, and physical activity in a low-income population. Parents of Drake University Head Start (DUHS) in Polk County, Iowa, were recruited for the study by DUHS teachers
and recruitment advocates. A two group randomized pretest-posttest design was used in the study. Parents in the experimental group completed a questionnaire at pretest and posttest, collected two weeks of grocery receipts at the beginning and end of the study, and were exposed to two 45-minute sessions on vegetables and physical activities occurring one session per week for two consecutive weeks. Parents in the control group completed similar information as the experimental group but they were not exposed to the intervention. Some individuals who provided GRR were not involved in other aspects of the study.

Parents were not asked to record foods eaten away from home, food produced at home (garden), gifts of food, or foods purchased at stores where an itemized receipt was not provided (DeWalt et al., 1990). The collection period was structured so that the 2-week period would fall at the beginning or in the middle of the month. Many low-income individuals have more food in the home at the beginning of the month when they receive assistance such as food stamps. The Iowa State University and Drake University Institutional Review Boards: Human Subjects approved the study.

Data Coding

Grocery receipts were coded for name of store where purchases were made, date of purchase, vegetable items purchased, quantity of vegetables purchased, and forms of payment used. Other food items on the GRR, such as meat, dairy, fruits and grains were not included in the analysis. Grocery receipts that contained no food purchases or those that were outside of the collection period were not entered into the analysis. A number of participants shopped at ethnic stores where food items on the GRR were listed in Spanish. A translator identified all purchases on these receipts and they were coded and/or omitted based on the criteria listed above.
Vegetable Classification

Vegetables were classified into five main groups: (1) Dark green leafy vegetables (leaf lettuce, spinach, all types of greens), (2) yellow/orange (squash, pumpkin, carrots, sweet potato/yams), (3) cruciferous vegetables (broccoli, cauliflower, cabbage, radish, Brussels sprout), (4) tomatoes and tomato products (tomato, tomato paste, tomato sauce, tomato soup), and (5) other vegetables (corn, green beans, potatoes, celery, cucumber).

Handling Discrepancies

It was difficult to determine the composition of salad items listed on the GRR. For example, bagged salads were listed as crispy salad, salad mix, garden salad, garden supreme, Caesar salad, and spring salad. To settle this discrepancy, the name of these items, cost, brand, and name of store were identified and label inspections were made at the particular supermarket to identify the product. The rule of thumb used to determine whether salad items were classified as a green leafy vegetable was, if the main (first) ingredient stated on the food label was iceberg lettuce it was counted as “other vegetable.” If the main ingredient was any type of leaf lettuce, it was designated a green leafy vegetable.

RESULTS

In the experimental group, 18 individuals provided GRR at pretest and 9 at posttest. Seven individuals provided both pretest and posttest grocery receipts. In the control group, 24 individuals provided GRR at pretest, 18 provided GRR at posttest and 4 individuals provided both pretest and posttest receipts. Seven individuals in the intervention group and four individuals in the control group provided GRR both at pre and posttest.

Table 1 provides information on the type of vegetables purchased by individuals in the study. ANCOVA results showed no statistically significant difference between the
experimental and control groups on the following posttest dependent measures: number of
dark green leafy, yellow/orange, cruciferous vegetables, and tomatoes purchased; cost of
dark green leafy, yellow/orange, cruciferous vegetables, and tomatoes; number of other
vegetables purchased; cost of other vegetables purchased; and cost of total bill.

Other information obtained from the GRR included the grocery store where food
purchases were made, the average number of trips to the store, and forms of payment used
for grocery purchases. A range of grocery stores (Dahls, Fareway, Walmart, Hy-Vee, Aldi,
Bienvendios, Target, and Other Stores (Sam’s Club, Drug Town, and Dollar General) were
used to make food purchases. Walmart and Hy-Vee were the stores most frequently used.
Target and Other Stores were used less frequently to shop for food items. An average of five
trips were made to the store within each 2-week period was 5. See Table 2 for results. The
forms of payment used included Cash, WIC checks, Food stamps, and Other forms of
payment (mainly credit). Cash and Food stamps were the most frequently used forms of
payment. Cash was used as a form of payment an average of 5 times, and Food stamps an
average of 3 times within each two week period. Standard deviation = 4.26 and 4.12
respectively). See Table 3 for results.

One of the goals of this study was to use the GRR to supplement information
obtained from the larger study on vegetable offering recall. It was difficult to determine
changes in behavior from pretest to posttest using the GRR because complete pre and posttest
information was available for only seven individuals in the experimental and four individuals
in the control group.
DISCUSSION

This study showed that it is possible to identify vegetable purchases from the GRR. Information was obtained on purchases of dark green leafy, yellow/orange, cruciferous vegetables, and tomatoes; other vegetables; total vegetables; and the number of times no vegetable was purchased. This information is important in that it provides an easy means to screen individuals who may be at risk for poor consumption of dark green leafy, yellow/orange, cruciferous vegetables, and tomatoes, the vegetables that have been shown to be protective against certain chronic diseases.

Other useful information was obtained from the GRR. Information on the types of stores where participants most frequently shopped was provided. Information on type of store can provide some indication of the availability of vegetables and the price patrons may have to pay for vegetables. Some of the stores where vegetables were purchased could be considered large chain food stores (Walmart, Hy-Vee and Fareway) while others, such as the ethnic food store, could be considered as neighborhood stores. From this information inferences could be made as to the availability of dark green leafy, yellow/orange, cruciferous vegetables and tomatoes. Rose and Richards (2004) examined the relationship between various measures of food store access and household fruit and vegetable use among participants in the Food Stamp program. They found environmental factors such as easy access to supermarket shopping, distance from home to food store, ownership of car, and travel time to store to be related to dietary choice and stated the importance of including such factors in interventions to effect dietary improvements. The environment where a food store is located is responsible for price disparities (Kaufman, MacDonald, Lutz & Smallwood, 1997). Kaufman and colleagues (1997) found that supermarkets located in urban and rural

areas (areas where there are high concentrations of low-income households) charge more for foods, compared with those in suburban neighborhoods. Although some grocery purchases were made at smaller chain stores, it seemed that most of the groceries purchased by this group of individuals were obtained from larger chain food stores. The assumption could be made that generally, vegetables were adequately available to this group of individuals.

One of the objectives of the study was to use the information obtained from the GRR to validate information provided by participants in the vegetable offering recall (used as of the larger study). A major problem with dietary assessment methods such as the 24-hour food recall and the food frequency is the reliance on self-reported dietary intake. The GRR provided information on the number of dark green leafy, yellow/orange, cruciferous vegetables, and tomatoes purchased by participants from pre to posttest. However this information was obtained from a small number of individuals, seven individuals in the experimental and four individuals in the control group. Additional studies with a larger sample size will be needed to provide information on the usefulness of this approach.

**CONCLUSIONS**

The use of GRR provided an easy and effective means to identify purchases of dark green leafy, yellow/orange vegetables, cruciferous vegetables, and tomatoes and other vegetables in this low-income group. Other useful information such as the type of store and quantity of items purchased could also be identified. The use of GRR holds promise as a means to validate self-reported dietary information. Additionally, this method of assessment could be used by family and consumer sciences teachers as a teaching tool to help students identify their purchases of dark green leafy, yellow vegetables, cruciferous vegetables, tomatoes and other vegetables. Intakes of these vegetables are low in most segments of the
population. When purchases of these vegetables are identified, the GRR could be used to
teach students how to substitute purchases of dark green leafy, yellow vegetables, cruciferous
vegetables, and tomatoes for other vegetables and non-nutritious food items.

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pay more for food? Item selection and price differences affect low-income household


Table 1.

*Types of Vegetables Purchased by Individuals in Experimental and Control Groups using Grocery Register Receipts*

<table>
<thead>
<tr>
<th>Type of vegetable</th>
<th>Pretest Experimental group (n = 18)</th>
<th>Pretest Control group (n = 24)</th>
<th>Posttest Experimental group (n = 9)</th>
<th>Posttest Control group (n = 18)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Dark green leafy</td>
<td>7</td>
<td>4 %</td>
<td>16</td>
<td>7 %</td>
</tr>
<tr>
<td>Yellow/orange</td>
<td>10</td>
<td>5 %</td>
<td>15</td>
<td>7 %</td>
</tr>
<tr>
<td>Cruciferous</td>
<td>10</td>
<td>5 %</td>
<td>24</td>
<td>10 %</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>29</td>
<td>15 %</td>
<td>23</td>
<td>10 %</td>
</tr>
<tr>
<td>Other</td>
<td>74</td>
<td>39 %</td>
<td>77</td>
<td>34 %</td>
</tr>
<tr>
<td>None</td>
<td>61</td>
<td>32 %</td>
<td>74</td>
<td>32 %</td>
</tr>
<tr>
<td>Total</td>
<td>191</td>
<td>100%</td>
<td>229</td>
<td>100%</td>
</tr>
</tbody>
</table>

*Note. n = number of different vegetables purchased during a 2-week period at pretest and posttest.*
Table 2

Total Trips to Food Stores made by Head Start Parents in the Experimental (n = 27) and Control Groups (n = 42) using Grocery Register Receipts

<table>
<thead>
<tr>
<th>Name of store</th>
<th>Number of trips to store at pretest</th>
<th>Number of trips to store at posttest</th>
<th>Total trips to store at pre- and posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Dahl</td>
<td>28</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Fareway</td>
<td>23</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Walmart</td>
<td>63</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Hy-Vee</td>
<td>73</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Aldi</td>
<td>16</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Bienvenidos</td>
<td>7</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Target</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>9</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 3

Payment Methods used by Head Start Parents in Experimental and Control Groups to Purchase Groceries

<table>
<thead>
<tr>
<th>Payment</th>
<th>Types of payment at pretest (n = 42)</th>
<th>Types of payment at posttest (n = 27)</th>
<th>Total payment at pre- and posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Cash</td>
<td>153</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>WIC</td>
<td>6</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Food stamps</td>
<td>66</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Note. n = number of times a type of payment was used over a two-week period.
CHAPTER 6
SUMMARY AND GENERAL CONCLUSIONS

This chapter provides reasons for the study, summarizes the objectives, methodology employed to evaluate the hypothesis, and findings and discussion of the study. General conclusions for future research in the area of critical thinking in nutrition settings are also provided.

Reasons for the Study

In the midst of great affluence America is in a national nutrition crisis. Chronic diseases such as cancer, heart disease, and diabetes are leading causes of death and disabilities in 90 million Americans. Adopting healthy diets and engaging in appropriate regular physical activity can serve to curb the devastating effects of chronic diseases.

At the onset of the study, data from the Behavioral Risk Factor Surveillance System, a telephone survey conducted annually in Iowa, showed Iowa as having the second lowest vegetable intake in the nation (Iowa Department of Public Health Bureau of Health Statistics, 2000). This led to the focus on vegetables. A review of the literature revealed five facts that further defined the study: (1) A strong link has been shown between specific vegetables, namely, dark green leafy, yellow/orange, cruciferous vegetables, and tomatoes and the reduction of risks for coronary heart disease, cancer, and stroke. Recent research also suggests protection against cataract formation, chronic obstructive disease, diverticulosis, and hypertension. (2) Consumption of vegetables, for most individuals in America, falls below recommended levels, especially intakes of dark green leafy, yellow/orange, and cruciferous vegetables. Low-income individuals consume vegetables at much lower levels than individuals in the general population. (3) Physical inactivity leads to overweight, obesity, and
other chronic diseases. (4) There is a need for change in the delivery of nutrition education. Traditional methods such as lectures and one-on-one sessions do not allow individuals to analyze, synthesize, and assess information. Critical thinking provides the tools necessary for reasoning and making sound decisions. (5) The food habits of children are formed at an early age by repeated exposures to food. Several studies suggest that food preferences formed early in life may influence adult food selection. Although chronic diseases and inactivity exist in high numbers in the adult population, the goal was to direct intervention efforts (through parent education) toward children in an effort to establish healthy eating habits early in life. The focus of the study was on the use of critical thinking methodology; dark green leafy, yellow/orange, cruciferous vegetables, and tomatoes; physical activity and young children.

**General and Specific Objectives**

The general objective of the study was to evaluate the effectiveness of a critical thinking approach used to educate low-income parents on the importance of increasing offerings of dark green leafy, yellow/orange, cruciferous vegetables, and tomatoes and for increasing physical activity to their 2- to 5-year-old children.

The specific objectives were to increase (1) knowledge, (2) attitudes,(3) critical thinking skills of Drake University Head Start parents related to vegetables and physical activities in their 2- to 5-year-old children, (4) to increase the number of vegetables (dark green leafy, yellow/orange, cruciferous vegetables and tomatoes) Drake University Head Start parents offer their 2- to 5-year-old children, and (5) to increase physical activity in children of Drake University Head Start.
Study Information

A two-group randomized pretest, posttest design was used in the study. The experimental group was exposed to two 45-minute sessions related to vegetables and physical activity occurring one session per week for two consecutive weeks. The control group did not experience the intervention. The researcher created a nine-section questionnaire that was used to collect demographic information, six measures of the dependent variables (knowledge, attitudes, critical thinking, related to vegetables and physical activity), a vegetable recall, and a physical activity recall. A critical thinking definition and six-part model of critical thinking were developed for the study. Critical thinking was viewed as the process whereby individuals analyze and evaluate information and their behavior in order to make fully informed decisions while reflecting on their thought processes. The critical thinking model’s components were stimulus, empowerment, critical response, outcome, action, and reflection. Reflection was an integral part of the model and occurred after each model component.

Data Collection

Data were collected during a four month period (October 2005 to January 2006). There was a four to six week period at the end of the intervention and before collection of posttest data. A total of 77 parents participated in the study. Completed pretest and posttest information was obtained for 49 parents.

Resulting Research

Three research papers resulted from the study: (1) A critical thinking approach increases offerings of dark green leafy, dark yellow orange, cruciferous vegetables and tomatoes in a low-income (Drake University Head Start) population.
(2) The use of vegetable and physical activity scenarios to identify and assess the level of critical thinking in low-income parents of Drake University Head Start in Polk County, Iowa and (3) What do the grocery register receipts of low-income individuals tell about their purchases of dark green leafy, yellow/orange, cruciferous vegetables and tomatoes?

Summary of Findings and Discussion

Knowledge

Positive results were observed with this approach. Parents in the experimental group increased their knowledge of (a) the role of dark green leafy, yellow/orange, cruciferous vegetables, and tomatoes in the prevention of chronic diseases (b) vegetable serving sizes for two to three year olds, and (c) the approximate number of times it takes before new foods (in this case vegetables) are accepted. Acquiring this knowledge base is important in attempting to increase vegetable intake. Some reports showed that consumption of dark green leafy, yellow/orange, cruciferous vegetables and tomatoes was low because individuals are unaware of the importance of eating these vegetables and their role in chronic disease prevention. Others showed that the knowledge similar to that gained by parents in the experimental group was a predictive factor in vegetable consumption.

A statistically significant difference was not observed between the intervention and control groups in knowledge of the importance of physical activity. A short time, perhaps insufficient, was allotted for the physical activity aspect of the intervention and may have been responsible for parents’ lack of the knowledge base needed to bring about change.

Attitudes

Parents’ attitudes toward vegetables and physical activity remained unchanged at the end of the intervention. However, parents’ attitudes related to vegetables from pre to post
intervention ranged from 2.99 to 3.59, and related to physical activity was from 3.08 to 3.47 on a 4-point scale, showing that parents of Drake University Head Start possessed positive attitudes towards vegetables and physical activity.

**Critical Thinking**

There were no statistically significant differences between the experimental and control group on a total critical thinking score related to vegetables and physical activity using a quantitative measure of analysis such as the Analysis of Covariance (ANCOVA). This was not surprising as previous studies where change was realized involved longer term educational interventions. Additionally, the sample size was small making it difficult to detect changes in this area. However, content analysis (the qualitative measure used in the study) showed that parents in the experimental group made some improvement in addressing the problem related to the vegetable scenario. They were more likely to extend their contextual framework to address other aspects of the problem, and were more likely to provide some answer to the most challenging questions. These changes were observed for the vegetable but not the physical activity aspects of problem solving. This could be because the vegetable component of the intervention received more time and focus than the physical activity components.

**Vegetable Offerings**

Parents in the experimental group reported offering significantly more dark green leafy, yellow/orange, cruciferous vegetables, and tomatoes to their children during the week of data collection. This is important because this improvement in offerings of dark green leafy, yellow/orange, cruciferous vegetables, and tomatoes may be a step towards health improvement for these families. The study, based on the premise that repeated offerings of
foods to children leads to their acceptance of it, did not measure vegetable intake but offerings of vegetables.

**Physical Activity**

Parents were asked the number of times in a week their child participated in physical activity, the length of time the activity lasted, and the number of hours of television their child watched on an average school day. The ANCOVA results showed no statistically significant difference between the experimental and control groups in light and heavy physical activity in which they engaged their children and the number of hours allowed for television on an average school day. A significant difference was observed between the experimental and control groups in total physical activity, that is, the number of days the child was physically active for at least 60 minutes per day. It could be that it was more difficult for the parents to distinguish between light and heavy physical activities in their children. Additionally, it may not be very easy to determine what constitutes heavy physical activity for 2- to 5-year-old children. However, parents in the experimental group engaged their 2- to 5-year-old children in significantly more days of physical activity for at least 60 minutes per day than parents in the control group.

**Limitations**

This study is not without limitations. It was difficult to get parents to attend sessions of the intervention. Many parents mentioned conflicts with work and the need to care for other children. Future efforts should work on providing child care for parents to facilitate educational activities. The short time frame and small sample size were definite limitations and future efforts should seek improvements in these areas.
Future Research

The pursuit of educational strategies to foster critical thinking raises many unanswered questions. Future research should continue to develop critical thinking methodology specific to nutrition.

A model consisting of stimulus, empowerment, critical response, action, and reflection was developed for the study. Each of these elements of the model should be tested to determine its effects on critical thinking. Interventions should be planned for longer periods of time so that skills in critical thinking could be established. There is a need to add qualitative components to all intervention efforts. This can be accomplished by using focus groups with parents to determine aspects of the intervention that were effective and to provide further insights into the findings of the study and avenues for future research.

The qualitative measure used to assess critical thinking provided a measure that was sensitive enough to pick up small changes in critical thinking. Future work assessing critical thinking should use multiple measures so that subtle changes in critical thinking could be detected. There is also a need to refine instruments used to identify level of critical thinking skills present in individuals.

Certain dispositions are associated with critical thinking. These dispositions include inquisitiveness with regard to a wide range of issues; concern to become and remain generally well-informed; alertness to opportunities to use critical thinking; trust in the processes of reasoned inquiry; self-confidence in one’s own ability to reason; open-mindedness regarding divergent world views; flexibility in considering alternatives and opinions; understanding of the opinions of other people; fair-mindedness in appraising reasoning; honesty in facing one’s own biases, prejudices, stereotypes, egocentric, or
sociocentric tendencies; prudence in suspending, making, or altering judgments; and willingness to reconsider and revise views where honest reflection suggests that change is warranted (Facione, 1995). Future work should identify critical thinking disposition in individuals and determine how this disposition affects their ability to think critically.

One of the main issues in developing critical thinking in individuals is whether skills acquired in one context are transferable to novel contexts. Much work needs to be done in this area not only to determine the extent to which transfer of critical thinking is possible, but also to plan interventions that attempt to facilitate transfer of critical thinking skills. This can be accomplished by providing a wide range of problems for individuals to solve.

This study showed that it is possible to see improvements in the offerings of dark green leafy, yellow/orange, cruciferous vegetables, and tomatoes in a low-income population. The use of specific messages regarding these vegetables and a methodology that provided the tools needed for reasoning, problem solving, and making sound decisions contributed to the success of the intervention. There are still unanswered questions regarding the effectiveness of critical thinking methodology compared to other instructional approaches, how long the positive effects of critical thinking last, ways to refine instruments used to assess critical thinking and ways to stage individuals as to novice and expert critical thinkers, nevertheless, these questions provide fertile ground for future research.
APPENDIX A

VEGETABLE CURRICULUM: THE POWERHOUSE VEGETABLES

PHYSICAL ACTIVITY CURRICULUM

Developer: Ingrid K. Richards-Adams

PROBLEM

This mini curriculum addresses low physical activity in Head Start children, and the prescriptive approach whereby nutrition education is often dispensed to clients.

Low physical activity

- Physical activity and poor eating habits contribute to 400,000 preventable deaths
- More than 40% of deaths in the U.S. are caused by behavior patterns that could be modified
- A sedentary lifestyle is a major factor that lowers the quality of life and kills Americans

Prescriptive nutrition education

Strategies for nutrition education, largely, have embraced traditional educational approaches such as lecture or one-on-one sessions that tend to be based on didactic authoritarian teaching (Abusabha, 1990). These approaches do not allow the individual to gather, analyze, synthesize, and assess information (Beck, Bennett, McLeod, & Molyneaux, 1992). This curriculum uses adult education principles and critical thinking strategies to encourage parents to critically examine their actions and make fully informed decisions regarding vegetable offerings in their child’s diet.

Audience:

Parents of Drake University Head Start.
Rationale for emphasizing specific vegetables

- Vegetables, specifically dark green leafy, dark yellow and orange, cruciferous and tomatoes have been shown to protect against chronic diseases such as heart disease and different types of cancers. Results from large longitudinal and cohort studies (Women’s Health Study, Health Professionals Follow-Up study, Physician’s Health Study, and National Health and Nutrition Examination Survey (NHANES) indicated that constituents in these vegetables are more directly linked to reduced risk for selected chronic diseases (Nanney et al., 2004).

- “The health-related effects of vegetables and fruits may be different. Some evidence suggests that vegetables and not fruits are important for cancer prevention, particularly for cancers of the digestive tract, lungs and colon” (Trudeau, Kristal, Li, & Patterson, 1998). It is therefore important to promote the benefits of vegetables.

- It may be more challenging to increase vegetable intake compared to fruits. Fruits have a sweet taste and are generally preferred. They are also easier to purchase and require little preparation before cooking (Satia, Kristal, Patterson, Neuhouser, & Trudeau, 2002). Trudeau, Kristal, Li, and Patterson (1998) also suggested that it is important to study determinants of fruit intake separately from vegetable intake.

Rationale for offering 2 powerhouse and 3 other vegetables at early ages

- Children are predisposed for chronic diseases at an earlier age. One study conducted in six public schools in New York City estimated that by age 12, over 50% of children had modifiable risks for coronary heart disease (Harris et al., 1997).

- Several studies suggest that food preferences formed early in life may influence adult food selection (Birch, 1998; Hall & Holmberg, 1974). It is also easier to establish
healthful habits during childhood than to attempt to change eating habits later in life (Johnson, Guthrie, Smiciklas-Wright, & Wang, 1994).

- Research shows that children normally respond negatively and are fearful, or express dislike for foods to which they are not accustom. However, repeatedly offering the food generally leads to acceptance. Acceptance of new foods or foods disliked is not an immediate response. It may take as many as eight to ten offerings of the food. Offering means that the child actually tastes the food. Research studies also show that a child’s food preferences are learned at an early age by experiences with different foods (Birch, 1999).

**Rationale for emphasizing physical activity**

- Poor diet and inactivity can lead to overweight and obesity
- Persons who are overweight or obese are at increased risk for high blood pressure, diabetes (Type II), heart disease and some types of cancers
- One in three U.S. children born in 2000 will contract Type II diabetes unless their lifestyles emphasize eating less and exercising more. The odds are one in two for African American and Hispanic children
- Children born today are expected to have a shorter life expectancy than their parents due to inactivity and diet.

**Rationale for the use of critical thinking**

Critical thinking has been defined differently based on the context and discipline in which it occurs. McPeck (1981) sheds light on this somewhat darkened path of definitions. He stated that critical thinking involves more than the correct assessment of statement or the use of logic. When an individual engages in critical thinking he or she is thinking about something
specifically an “X” a problem, an activity, or a subject area and it is therefore logically connected to that “X.” He further stated that only such things as problems, activities, or subject areas can be thought about critically. Just as there are innumerable activities and types of activities that can be thought about critically, there are also innumerable ways in which critical thinking can be manifested. This line of reasoning is important to acknowledge because repeatedly in the literature, the view is espoused that critical thinking is and only is related to logic (correct assessment of statements and the detection of fallacies). Although critical thinking includes these activities, the definition entails a lot more, and many more activities (including an act requiring physical strength and dexterity, problem solving, chess playing, soccer, cooking, and so on) could be included in the definition of critical thinking. This perspective provides a broader scope for viewing the concept of critical thinking as a subject area (McPeck, 1981).

The term critical thinking has an identifiable meaning. However, the criteria for its correct application vary from field to field (McPeck, 1981). Brookfield (1987) mentioned that manifestations of critical thinking vary according to the context in which critical thinking occurs. Nutrition as a discipline examines the relationship of food to the well-being of the human body. Nutrition education is concerned with providing adequate knowledge and skills necessary for critical thinking regarding diet and health so that individuals can make appropriate food choices from an increasing array of contextual factors (Devine, 1980). Who then decides what constitutes legitimate and worthwhile problems in the area of nutrition? More so, who decides what should count as critical thinking or what should be prerequisite
skills? Professionals in a field are most suited to make these decisions based on the data available.

THE CRITICAL THINKING MODEL COMPONENTS

Stimulus - Given at the start of the intervention

Empowerment - Preparation of individual to deal with problem

Critical Response - A series of questions that related to problem solving

Outcome - Options that will be identified to use in solving the particular problem

Act - Mini goals that will be implemented to solve the problem

Reflection – process of thinking about actions

**Curriculum goal:** To use critical thinking strategies to increase the amount of physical activity Head Start parents engage their 2- to 5-year-old children in.
INDIVIDUAL

Examine and explore internally an issue of concern...which may lead to change of conceptual perspective.

Stimulus
Present issues, statements and problems

Empowerment
Emphasize an individual’s strengths and competencies to solve problems.

Reflection

Critical Response
- Define problem
- Select pertinent information
- Select relevant and promising hypothesis
- Draw valid conclusions
- Judge validity of inferences

Outcome

Action
Decide to take steps to solve a problem

Figure 1. CRITICAL THINKING MODEL
LESSON ONE

Objectives

Parents will be able to:

1. Explain the importance of first offering two powerhouse vegetables then one to two other vegetables to their children daily
2. Distinguish powerhouse vegetables from those that are of a lesser nutritional value
3. State the recommendation for daily intake of vegetables
4. Demonstrate the appropriate serving sizes of vegetables for children 2–5 years old
5. Use critical thinking strategies to overcome the barriers/problems they face in offering three powerhouse vegetables to their children
6. Prepare dishes using powerhouse vegetables
7. Understand the importance of engaging their children in physical activity
8. Understand the problems related to physical inactivity
9. State the recommendations for physical activity for children and adults
10. Use critical thinking strategies to overcome the barriers/problems they face in engaging their children in physical activity
11. Engage in physical activities
LESSON TWO

Objectives

Parents will be able to:

1. Explain the importance of first offering two powerhouse vegetables then one-to-two other vegetables to their children daily
2. Identify factors related to a favorable environment in which to offer their child vegetables
3. Identify creative ways in which to offer vegetables to children
4. Use critical thinking strategies to overcome barriers or problems they face in offering two powerhouse vegetables and two others to their children
5. Prepare dishes using powerhouse vegetables
6. Understand the importance of engaging their children in physical activity
7. State the benefits of physical activity
8. Suggest ways in which they can engage their child in physical activity
9. Use critical thinking strategies to overcome the barriers/problems they face in engaging their children in physical activity
10. Engage in a physical activity exercise
INTRODUCTION

The term vegetable is broadly defined as plants or parts of plants that are used for food. These include: leaves, stems, roots, flowers, and seeds. With such a broad definition for vegetables, foods like rice and corn that would normally qualify as cereals, and potatoes that are mainly starch, are classified as vegetables.

Different parts of the plant perform different functions. The part of the plant and the function it plays largely determine its composition and nutritive value. The leaves of plants normally perform a metabolizing function and are not stores for nutrients. Leaves are generally low in energy but high in many vitamins that function in the metabolic processes. Roots and seeds are storage parts of plants and are therefore high in starch and protein (Largen, & Bence, 2000).

Ongoing research has shown a strong link between specific vegetables (dark green leafy, dark yellow orange, tomatoes and cruciferous vegetables) and the reduction of chronic diseases. Research studies also show that these vegetables are beneficial in diseases such as cataract, chronic obstructive pulmonary disease, diverticulosis and hypertension (Nanney, Haire-Joshu, Hessler & Brownson, 2004).

BENEFITS OF VEGETABLES

Inclusion of vegetables in the diet is important as they provide a broad variety of essential and non-essential nutrients. Vegetables are good sources of vitamin A, beta-carotene, vitamin C, potassium, folic acid, and dietary factors such as fiber, flavonoids and complex carbohydrates. Vegetables are a rich source of many vitamins, minerals and fiber. Some examples of vegetables and the nutrients they provide follow:
Vitamin A: The green leafy (leaf lettuce, greens, bok choi) and deep yellow vegetables (squash, pumpkin, carrots) are a good source of carotene that is changed to vitamin A in the body. (Many leafy green vegetables are excellent sources of vitamins A and C and contribute calcium, iron, fiber and other nutrients. http://www.leafy-greens.org/yourgreens_grade.html).

Vitamin C: Brussels sprout; green peppers, kale, cabbage, broccoli, tomatoes, and cauliflower.

Calcium: Broccoli, kale and turnip greens.

All vegetables provide a good source of fiber.

Vegetables are low in calories, fats and sodium providing we do not add sugar, salt and fat to them. Vegetables do not contain cholesterol (which is found in animal products). In addition, vegetables add color, texture, and flavor to our meals. Meals would be dull without the use of vegetables.

**THE POWERHOUSE VEGETABLES**

I. Cruciferous Vegetables: Cruciferous is a Latin word for a family of plants that includes broccoli, cauliflower, cabbage (red and Chinese), Brussels sprout, rutabaga, turnips and kohlrabi. The word cruciferous is used because the blossoms of these plants resemble a cross or crucifix. These vegetables are rich in vitamin C, fiber and water. However, it is the presence of certain phytochemicals namely **glucosinolates** and **indoles** that make these veggies unique in their cancer fighting abilities (particularly stomach and colon cancer). These phytochemicals increase the activity of enzymes that destroy toxic molecules and damage cell membranes and other components of the cell e.g., DNA. Damage to cell
components and cell membrane can lead to the development of cancer.
Phytochemicals therefore interfere with cancer cells’ ability to grow.

II. DARK GREEN LEAFY VEGETABLES: There are many types of dark green leafy vegetables available to consumers: Spinach, romaine lettuce, leaf lettuce, mustard greens, collard greens, chicory, Swiss chard, turnip greens, and watercress to name a few. Dark green leafy vegetables are good sources of folate; a wide range of carotenoids (lutein, zeaxanthin, along with saponins and flavonoids); vitamin A and C, riboflavin, iron, calcium, magnesium, and potassium. Darker leaves tend to have more of these important nutrients.

Researchers have found that carotenoids in dark green leafy vegetables can inhibit the growth of certain types of breast cancer cells, skin cancer cells, lung cancer and stomach cancer.

III. DARK YELLOW VEGETABLES: Dark yellow vegetables like carrots, winter squash, sweet potatoes, yams and pumpkin are an important source of carotenoids (beta-carotene) in the diet. These carotenoids are changed to vitamin A in the body. Beta-carotene is the carotenoid that is most easily changed to vitamin A in the body. Dark yellow vegetables help in the prevention of cancer of the lungs, mouth, throat and cervix.

IV. TOMATOES: Tomatoes contain an antioxidant, lycopene, shown to reduce the incidence of certain types of cancers, particularly, prostate, lung, and stomach. There is more lycopene in processed tomatoes than in raw tomatoes. In raw tomatoes, lycopene is normally bound to the cell structure. As the tomato is
processed, lycopene is released from the cell structure and is more easily absorbed by the body. Lycopene is higher in processed forms such as pastes, cooked tomatoes, soups, ketchup and juices.

*Main Vegetable Groupings*

<table>
<thead>
<tr>
<th>Dark green vegetables</th>
<th>Starchy vegetables</th>
</tr>
</thead>
<tbody>
<tr>
<td>bok choy</td>
<td>corn</td>
</tr>
<tr>
<td>broccoli</td>
<td>green peas</td>
</tr>
<tr>
<td>collard greens</td>
<td>lima beans (green)</td>
</tr>
<tr>
<td>dark green leafy lettuce</td>
<td>potatoes</td>
</tr>
<tr>
<td>kale</td>
<td></td>
</tr>
<tr>
<td>mesclun</td>
<td></td>
</tr>
<tr>
<td>mustard greens</td>
<td></td>
</tr>
<tr>
<td>romaine lettuce</td>
<td></td>
</tr>
<tr>
<td>spinach</td>
<td></td>
</tr>
<tr>
<td>turnip greens</td>
<td></td>
</tr>
<tr>
<td>watercress</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Orange vegetables</th>
<th>Other vegetables</th>
</tr>
</thead>
<tbody>
<tr>
<td>acorn squash</td>
<td>artichokes</td>
</tr>
<tr>
<td>butternut squash</td>
<td>asparagus</td>
</tr>
<tr>
<td>carrots</td>
<td>bean sprouts</td>
</tr>
<tr>
<td>Hubbard squash</td>
<td>beets</td>
</tr>
<tr>
<td>pumpkin</td>
<td>Brussels sprouts</td>
</tr>
<tr>
<td>sweet potatoes</td>
<td>cabbage</td>
</tr>
<tr>
<td></td>
<td>cauliflower</td>
</tr>
<tr>
<td></td>
<td>celery</td>
</tr>
<tr>
<td></td>
<td>cucumbers</td>
</tr>
<tr>
<td></td>
<td>eggplant</td>
</tr>
<tr>
<td></td>
<td>green beans</td>
</tr>
<tr>
<td></td>
<td>green or red peppers</td>
</tr>
<tr>
<td></td>
<td>iceberg (head) lettuce</td>
</tr>
<tr>
<td></td>
<td>mushrooms</td>
</tr>
<tr>
<td></td>
<td>okra</td>
</tr>
<tr>
<td></td>
<td>onions</td>
</tr>
<tr>
<td></td>
<td>parsnips</td>
</tr>
<tr>
<td></td>
<td>tomatoes</td>
</tr>
<tr>
<td></td>
<td>tomato juice</td>
</tr>
<tr>
<td></td>
<td>vegetable juice</td>
</tr>
<tr>
<td></td>
<td>turnips</td>
</tr>
<tr>
<td></td>
<td>wax beans</td>
</tr>
<tr>
<td></td>
<td>zucchini</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dry beans and peas</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>black beans</td>
<td></td>
</tr>
<tr>
<td>black-eyed peas</td>
<td></td>
</tr>
<tr>
<td>garbanzo beans (chickpeas)</td>
<td></td>
</tr>
<tr>
<td>kidney beans</td>
<td></td>
</tr>
<tr>
<td>lentils</td>
<td></td>
</tr>
<tr>
<td>lima beans (mature)</td>
<td></td>
</tr>
<tr>
<td>navy beans</td>
<td></td>
</tr>
<tr>
<td>pinto beans</td>
<td></td>
</tr>
<tr>
<td>soy beans</td>
<td></td>
</tr>
<tr>
<td>split peas</td>
<td></td>
</tr>
<tr>
<td>tofu (bean curd made from soybeans)</td>
<td></td>
</tr>
<tr>
<td>white beans</td>
<td></td>
</tr>
</tbody>
</table>

Adapted from U.S. Department of Agriculture (2005), *MyPyramid.*
RECOMMENDATIONS

The amount of vegetables you need depends on your age, sex, and level of physical activity.

Foods in the vegetable group include:

- 100 % vegetable juice
- Vegetables cooked or raw
- Fresh, frozen or canned vegetables
- Tomatoes and tomato products

RECOMMENDED DAILY VEGETABLE SERVING SIZES

<table>
<thead>
<tr>
<th>Group</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children</td>
<td></td>
</tr>
<tr>
<td>2-3 years old</td>
<td>1 cup</td>
</tr>
<tr>
<td>4-8 years old</td>
<td>1 ½ cups</td>
</tr>
<tr>
<td>Girls</td>
<td></td>
</tr>
<tr>
<td>9-13 years old</td>
<td>2 cups</td>
</tr>
<tr>
<td>14-18 years old</td>
<td>2 ½ cups</td>
</tr>
<tr>
<td>Boys</td>
<td></td>
</tr>
<tr>
<td>9-13 years old</td>
<td>2 ½ cups</td>
</tr>
<tr>
<td>14-18 years old</td>
<td>3 cups</td>
</tr>
<tr>
<td>Adults</td>
<td></td>
</tr>
<tr>
<td>Women 19-50 years old</td>
<td>2 ½ cups</td>
</tr>
<tr>
<td>Men 19-50 years old</td>
<td>3 cups</td>
</tr>
</tbody>
</table>

These vegetable serving sizes are appropriate for individuals who get less than 30 minutes a day of moderate physical activity. Those who are more physically active may be able to consume more vegetables while staying within caloric needs.
WHAT COUNTS AS 1 CUP OF VEGETABLES

In general, 1 cup of raw or cooked vegetables or vegetable juice, or 2 cups of raw leafy greens can be considered as 1 cup from the vegetable group.

(U.S. Department of Agriculture, 2005).

VICTORIOUS VEGETABLES LESSON PLAN

Motto: You can do it! Yes, you can!

Main Idea: Some vegetables are more powerful in the fight against chronic diseases. It is important to offer these vegetables daily to your child.

Objectives

Parents will be able to:

1. Explain the importance of offering three powerhouse vegetables to their children daily
2. Distinguish powerhouse vegetables from those that are of a lesser nutritional value
3. State the recommendation for daily intake of vegetables
4. Demonstrate the appropriate serving sizes of vegetables for children 2–5 years old
5. Use critical thinking strategies to overcome the barriers/problems they face in offering three powerhouse vegetables to their children
6. Prepare dishes using powerhouse vegetables
7. Understand the importance of engaging their children in physical activity
8. Understand the problems related to physical inactivity
9. State the recommendations for physical activity for children and adults
10. Use critical thinking strategies to overcome the barriers/problems they face in engaging their children in physical activity

11. Engage in a physical activity exercise

**Material Needed:** Pictures of powerhouse vegetables; samples of powerhouse vegetables, baseball, Styrofoam cups, and ice cream scoop to show vegetable portion sizes, chart with comparison of nutritional value of vegetables, chart of the critical thinking process, recipe cards, ingredients and equipment for preparation of recipes.

**Preparation Needed:**
- Set up room with vegetable posters or pictures, slogans, critical thinking process, recipes and vegetable tablecloth or mats.
- Take out chart with name of cruciferous vegetables

**Introduction:**
As participants arrive and settle in, explain briefly that this is an opportunity for parents to make a difference in the lives of their children. Share that they will be informed of the latest in the areas of health and physical activity for their children. Let participants know that these are fun filled sessions where they are going to take an active part in their learning. At this time, begin an icebreaker exercise so that individuals become acquainted with each other. Set the ground rules for discussion.

**Question 1:** Pass out six (6) gift boxes to parents. Place one of these words in each of the six boxes: Money, fancy car, home by golf course, college education, health, and big screen TV. Pass out the gifts to any six parents who would receive them. Ask parents to open them. Allow time for the opening of gifts. Ask parents, which of these gifts would you most like to give to your child? Give time for discussion. Conclude: Although these gifts are all
wonderful to give your child, the gift of good health may be most important. You can have all the money in the world but if you do not have good health it is not worth much.

OR

Ask parents, what is the best gift they think they can give their children? Allow parents time to answer. Mention that there are no wrong answers and emphasize that the questions ask for their opinion therefore all answers are acceptable. As participants answer, acknowledge their answers and provide some feedback (good job, I can see what you mean, I am sure that many would agree with you and so on).

Establish that as parents we want to give good gifts to our children. Use some of the answers that some of the participants suggested (money, college education, etc.). However, one of the best gifts that you can give your child is that of good health. It seems that a child could have all the gifts you mentioned but without good health, other gifts become less important. Are you giving your child the gift of health? If not, how can you give your child this gift? (Wait for responses and respond where necessary). Mention that these sessions are meant to enable parents to give the gift of health to their children. You will learn about vegetables and their health benefits and ways you can successfully introduce them to your children. You will also learn about the benefits of physical activities in your children’s lives. There are other ways to ensure your child’s health but this class pays particular attention to vegetables and physical activity.

Statistics

1. Iowa ranks as one of the states with the lowest vegetable use in the nation (Behavioral Risk Factor Surveillance System, 2000).
2. Vegetable use is lower among low-income individuals than in the general population

3. Low-income individuals experience higher incidences of cancer and other chronic diseases

4. Children are at risk from lifestyles that can lead to chronic disease, such as coronary disease, cancer and diabetes

Research

1. Research conducted in six public schools in New York City estimated that by age 12, over 50% of children had modifiable risks for Coronary Heart Disease.

STIMULUS

Main concept # 1: Not all vegetables are created equal

Ask participants to name three of their favorite vegetables. Let parents know that they have done a great job of naming vegetables. Mention that the vegetables that they have named as their favorite vary in the amount of nutrients and health protecting benefits they provide.

Explain the concept of powerhouse vegetables and why these vegetables are important. For example, the substances found in these vegetables reduce the risk for certain diseases such as cancer, diabetes, hypertension, strokes, eye disease, and heart disease. These diseases are called chronic diseases.

Antioxidants: Explain the role of antioxidants.

Let us look at these vegetables (Show picture or chart of powerhouse vegetables). When pictures are shown, make distinction.
(a) Dark green leafy. For example, for the dark green leafy vegetables show pictures of spinach, leaf lettuce, kale and other greens and mention to participants that the leaves are dark green all over. Compare this with the leaves of iceberg lettuce

(b) Dark yellow or orange: Winter squash, sweet potatoes and yams, pumpkins, carrots

(c) Cruciferous vegetables. This group includes broccoli, Brussels sprouts, cabbage, cauliflower. Researchers reported that men who eat at least 1.5 cups of cruciferous vegetables a week can reduce their prostate cancer risk by more than 40%. It is suggested that phytochemicals in these vegetables called isothiocyanates help the body produce enzymes that destroy cancer-causing compounds.

(d) Tomatoes are rich in a compound called lycopene. Processed tomato products have higher concentrations of lycopene. Examples of tomato products include: sauces, pastes, ketchup, soups, cooked tomatoes, and juice.

**Make the Point:** All vegetables provide some nutrients and some protection BUT powerhouse vegetables give the most protection against chronic diseases.

**Reflection:**

- *How are you doing? Have you been giving the best gift to your child?*
- *What are some things that you need to do in order to move in this direction?*

Have individuals talk about what surprised them most about the information that they have just heard. Have them discuss why they were surprised and how they can best remember this information

We learned about powerhouse vegetables and how you need to choose 2 powerhouse vegetables and 3 others. Now let us look at recommendations and serving sizes.
Main concept # 2: Recommendation and serving size

Take out chart with recommendation and the serving size for vegetables. Mention that the recommendation for vegetables is 3-5 servings per day. Let participants know that this may sound like a lot but share briefly that this will be distributed throughout the day. Ask for participants input on way they can get 3-5 vegetables in the child diet daily. At this point, stress that this program teaches parents to first serve two powerhouse vegetables daily and then add one to three others. Mention that you would work with the powerhouse vegetables first because of the benefits of these in protecting from all those diseases. REMEMBER 2 POWERHOUSE AND 1 TO 3 OTHERS VEGETABLES. Let participants know that in the next session a lot more time will be spent in helping them find creative ways to get in these vegetable servings.

Go through the information on serving size with participants. Mention that we need to be familiar with serving size because many times we think a serving is much more than it really is. Have parents practice with each of the vegetable servings (raw, chopped cooked or raw vegetables, vegetable juice). Work first with the size of a baseball for salad greens, a small Styrofoam cup for vegetable juice, and an ice cream scoop for cooked vegetables, and about seven or eight baby carrots for different servings of vegetables.

Game: The EB (Eye Ball) Game

Have different servings of vegetables in different forms. Use varying amounts of vegetable juice in glasses. Have some chopped and raw vegetables on disposable plates. (Different materials could be used to substitute for vegetables). Have participants decide which one comes closest to a serving of vegetables.
Reflection:

- Do you feel that you can better work with the number of serving sizes?
- What are your thoughts and feelings about serving sizes?
- Is this something that seems manageable to you?

EMPOWERMENT

Share information on adult critical thinking.

Reflection:

- Are you doing what is BEST for your child?
- What is the greatest barrier you feel you must overcome in terms of increasing the number of vegetables you offer your child?
- What has worked for you in the past in terms of serving vegetables to your children?

CRITICAL RESPONSE

Main Concept # 3: Use critical thinking strategies to overcome the barriers/problems they face in offering three powerhouse vegetables to their children

QUESTION: How can I make this work for my child?

Read the brief scenario. Tell participants that you will present a short outline of a process that can be used to solve problems when they occur. This process is called the critical thinking process. Mention that critical thinking helps individuals look at problems and choose the solution that would work best for them while reflecting on their actions. The THINK method will be used:

T: Tackle the real problem

H: How can the problem be solved (think of all possible ways?)
I: Identify solution that is in your child’s best interest

N: Now set a goal

K: Keep checking progress and reflecting at each step

**Model the process above.**

Talk to yourself. Mention that you have been trying to get your children to eat vegetables because you recently found out more about their benefits. Mention that you

**Group problem solving**

Have parents work in groups to solve the problem. Tell them to use the THINK process. Ask group to reflect on why this would work for them.

Scenario:

Marsha is now learning about powerhouse vegetables and their role in preventing heart disease and some types of cancers. She is very concerned that she has not been giving her children the vegetables that are most beneficial to them. She wants your advice on the best way to approach the situation facing her.

**Reflection:**

- *What are two things you can do at this point that you think will work for your child?*

- *In terms of offering powerhouse vegetables to your child, what areas do you need help to make your plan work?*

**ACTION:** Parents will write two action steps that they will take this week to increase vegetables in their children’s diet.

Have participants decide on two ways in which they could offer two powerhouse vegetables and three others to their child. Have parents write these ways down or tell it to someone who
can write it down for them. Stress the importance of taking these action steps. Nothing will happen until we take action.

**Reflection:**

- *Why are do you think your plan will work?*

**Wait!**

**STIMULUS**

Up until this point, we have only talked about diet. However, studies are showing that both physical activity and diet go hand in hand. They are needed together.

- Lack of physical activity and poor eating habits contribute to 400,000 preventable deaths.
- More than 40% of deaths in the U.S. are caused by behavior patterns that could be modified.
- A sedentary lifestyle is a major factor that lowers the quality of life and kills Americans.
- One in three U.S. children born in 2000 will contract Type II diabetes unless their lifestyles emphasize eating less and exercising more. The odds are one in two for African American and Hispanic children.
- Children born today are expected to have a shorter life expectancy than their parents due to inactivity and diet.

**Benefit of regular physical activity**

- Look and feel better daily
- Can lower blood pressure and cholesterol levels
- Can reduce the risk of Type II diabetes or heart disease
• Reduce anxiety and depression

EMPOWERMENT

• Requirements
  • Adults 18 and older—30 minutes of physical activity on five or more days a week
  • Children—60 minutes of activity a day

CRITICAL RESPONSE

Tips and ideas to get active: Adults

• Go for walks
• Take elevator instead of stairs
• Clean out the garage or the attic
• Sign up for a group exercise class
• Park at the farthest end of the parking lot when shopping

Tips and ideas to get active: Children

• Take your dog out for a walk (if you have one) or ask an adult to take a walk with you
• Start up a playground kickball game
• Join a sport team
• Help parents with yard work or household cleaning
• Play tag with other children in your neighborhood

ACTION: Parents will write two action steps that they will take this week to increase physical activity in their children.

• Activity: Dancing to “Electric Slide”
• Handout: Active living for families handout Nibbles for Health 36
• Book: Oliver’s Vegetables. Vivian French. Age: Preschool to 8 years
Main concept #5: Prepare dishes using powerhouse vegetables

Mention to participants that each week time will be taken to prepare dishes that should give them ideas on how to use powerhouse vegetables.

LESSON 2: VICTORIOUS VEGETABLES

Motto: Once is not enough! Consistently offer two powerhouse and three other vegetables to children.

Main Idea: The environment in which vegetables are offered is important in getting the child to accept them.

Objectives:

Parents will be able to:

Identify factors related to a favorable environment in which to offer their child vegetables

1. Identify creative ways to offer two powerhouse and three other vegetables to children throughout the day

2. Use critical thinking strategies to overcome barriers or problems they face in offering two powerhouse vegetables and two others to their children

3. Prepare dishes using powerhouse vegetables

4. Understand the importance of engaging their children in physical activity

5. State the benefits of physical activity

6. Suggest ways in which they can engage their child in physical activity

7. Use critical thinking strategies to overcome the barriers/problems they face in engaging their children in physical activity
8. Engage in a physical activity exercise

Material needed: Pictures of powerhouse vegetables, chart of the critical thinking process, recipe cards, ingredients and equipment for preparation of recipes

Preparation needed:

- Set up room with vegetable posters or pictures, slogans, critical thinking process, recipes and vegetable tablecloth or mats.
- Take out chart with name of cruciferous vegetables

Introduction: As Participants arrive and settle, thank them for coming and for making their children’s well being an important aspect of their lives. Ask parents what went well for them over the last week in their attempts to offer two powerhouse and three other vegetables to their children. Provide parents with opportunities to verbalize and discuss their experiences.

STIMULUS

Main concept 1

Identify factors related to a favorable environment in which to offer their child vegetables

Role play: Divide the group into half. Have one half of the group play the role of children not wanting to try vegetables and the other half of the group role play parents who are trying to get their children to eat their vegetables.

The goal of this role playing exercise is to have parents explore and enact a problem situation related to serving vegetables to their children and then explore feelings, attitudes, values, and problem-solving strategies in a group setting.
Joyce and Weil (1996) suggest nine phases or stages for role playing exercises. These stages will be adapted mainly because of time constraint. Four of the stages from Joyce and Weil (1996) are used. Suggested time for this role playing exercise is 10-15 minutes.

Phase One—Warm up the group: Introduce problem and make problem explicit. Explain role playing. Select role players. Allow groups to get inside problem situation.

*Explain to the group that is playing the role of children who are unwilling to try vegetables that they have to think up as many reasons why they do not want to try vegetables. Let them know that they must play the roles of children 2–5 years old. Let the other group know that as parent they need to try all they know to get the child to try vegetables. Let this group know that they are playing a role so they may use things that they have heard others use.*

Phase two—Enact: Begin role play

*Allow each group to situate themselves and begin their roles*

Phase three—Discuss and Evaluate: Review action of role play. Discuss major focus

*Discuss things that came up in the role play. Ask parents specifically what they think would work.*

Phase four—Share experiences and generalize: Relate problem situation to real experience and current problems. Explore general principles of behavior

**RULES FOR OFFERING VEGETABLES**

1. Know your responsibility as a parent: Parent responsibility is to provide two powerhouse vegetables and three others daily. NOTE: Parents are responsible for providing what the child is offered. The reason why children do not like vegetables is that many times they are not offered. Therefore, parents need to offer.
2. Children will generally accept vegetables in an environment where parents set appropriate limits.

3. Do not force the children to eat or overfeed them vegetables

4. Do not use negative strategies such as punishment or threats

5. Small children have a fear of new foods. It takes several (8-10) exposures of the new food for the child to get ready to taste it and a lot of tasting before a child gets to the point where he or she likes the vegetable.

6. Offer children vegetables in different forms (cooked, raw, and mixed with other foods) before you decide they do not like them.

7. Children vary in how much they eat and what they like. Be flexible. Each child is an individual. Do not have predetermined ways in which your child should eat or accept vegetables

8. Keep in mind that vegetable servings for children are smaller than vegetable serving sizes for adults.

   Note: General guideline: 1 Tablespoon of vegetable for each year of life.

9. Offer a variety of vegetables at a particular meal. This allows children to be able to choose a vegetable they like

10. Present vegetables to children eating them yourself. Let children approach them on their own.

**Main Concept 2: Identify creative ways to offer two powerhouse and three other vegetables to children throughout the day**

**Breakfast**
• Have some vegetable juice
• Add vegetables to omelets and/or top omelets with vegetables
• Serve omelets with salsa
• Add vegetables to muffins or bread

**Lunch**
• Have some vegetables with your sandwich (leaf lettuce, tomato slices, fresh spinach leaves, cucumber slices, grated raw carrots or squash)
• Have a ½ cup of vegetable cooked or raw as a salad
• Drink vegetable juice
• Have a bowl of vegetable soup

**Dinner**
• Add vegetables to meats and stews
• Include vegetables in casseroles. For example, vegetable lasagna
• Stir fry vegetables and serve with rice and pasta
• Make a vegetable pizza or try vegetables wrapped in tortilla
• Have a vegetable salad either as a side dish or main dish
• Have some vegetable soup
• Have a vegetable entrée (Mixed Vegetable au gratin, vegetable casserole or sautéed vegetables)

**Dessert**
• Have some dessert made with vegetables. For example, pumpkin pies, cookies with vegetable
Drinks

- Carrot and pumpkin milk drink

Main concept 4

Identify Barriers to children eating vegetables and how to overcome them

Availability

- Make vegetables easy for children to get to and eat. Always have vegetables available in the home. These could be fresh, frozen, or canned

Accessibility

- Make ready-to-eat vegetables an obvious choice for grab-and-go snacks. Have a vegetable box with vegetables cut or sliced in small plastic bags available in the refrigerator.

Preference

- Getting Children to eat vegetables is a matter of taste and experience. Let children decide which vegetables they will eat at each meal or snack period. Play vegetable BINGO. Have vegetable chart on the refrigerator and allow child to fill in vegetables until they have BINGO.

NOTE: The key to overcoming barriers to healthy eating is to keep nutritious choices like vegetables so visible, so easy and appealing that children hardly notice they are eating healthier.

EMPOWERMENT

Have parents share how they have been successful in over the last week in offering two powerhouse and two other vegetables to their children.
CRITICAL RESPONSE

Main concept 3: Use critical thinking strategies to overcome the barriers/problems they face in offering two powerhouse vegetables and two other vegetables to their children

T: Tackle the real problem

H: How can the problem be solved (think of all possible ways?)

I: Identify what would work best for you

N: Now set a goal

K: Keep checking progress and reflecting at each step

Group problem solving

John is a single parent with three boys, a seven year old, a five year old and a 2 year old. He mentioned that a friend told him of the importance of offering two powerhouse vegetables and three other vegetables to his children. He tells you that he is not too sure what the powerhouse vegetables are and why it is important to serve them to his children. His biggest problem though is how to give his children three to five vegetables daily. Have parents work in groups using the THINK model for problem solving to suggest solutions to John’s problems.

ACTION

Have parents talk about their experience of offering powerhouse vegetables to children. Talk about areas where they think that help is needed.

Have parents identify two ways in which they can provide a suitable environment to serve vegetables to their child.

Recipes (See Appendix D).
Lesson 2: physical activity

STIMULUS

• Statistics
  • Heart disease and strokes is the number one killer of men and women in the United States
  • Physically inactive people are twice as likely to develop heart disease as regularly active people
  • Poor diet and inactivity can lead to overweight and obesity.
  • Persons who are overweight or obese are at increased risk for high blood pressure, diabetes (Type II), heart disease and some types of cancers
• Benefit of regular physical activity
  • Increase energy levels
  • Improve self-esteem
  • Tone muscles
  • Helps maintain a healthy weight

Requirements

• Try to fit in at least 30 minutes of moderate physical activity on most days
• A moderate activity is equal to walking 2 miles in 30 minutes
• Three 10 minutes chunks of active time are okay
• If you have been out of action for a while, start slowly
EMPOWERMENT

Tips and ideas to get active: Adults

- Use a push mower to mow the lawn
- Volunteer to become a coach or a referee
- Use an aerobic tape for exercising at home
- Bike to work, to run errands, or visit friends

CRITICAL RESPONSE

Tips and ideas to get active: Children

- Use a push mower to mow the lawn
- Volunteer to become a coach or a referee
- Use an aerobic tape for exercising at home
- Bike to work, to run errands, or visit friends

Activity: Parent and kid vegetable game (Similar to Potato Race but parents and children try to put vegetables in a basket for vegetable soup)

- Handout: Child Play. Nibbles for Health 37
- Books: Bread and Jam for Frances. Russell Hoban.

ACTION: Parents will write two action steps that they will take this week to increase vegetables in their children’s diet.
APPENDIX B
LESSON PLAN FOR VEGETABLES

What should I do regarding increasing vegetable offerings in my children?

<table>
<thead>
<tr>
<th>Component of Critical Thinking Model</th>
<th>Lesson Content</th>
<th>Activity</th>
<th>Reflection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction: Giving the best gift to your child.</td>
<td>Gift giving: Parents receive gift boxes with slips of paper stating, a new house, a big screen TV, a college education, a new car etc.). <strong>Discussion:</strong> “what is the best gift you can give your child?”</td>
<td>• What is the best gift you can give your child?</td>
<td></td>
</tr>
</tbody>
</table>
| STIMULUS | a. Statistics on vegetables use  
b. Recommendation and serving sizes of vegetables  
c. Benefits of vegetables in the diet  
d. Not all vegetables are created equal | **Eye Ball Game:** Parents guess vegetable serving sizes closest to 1 cup  
**Power shopping for vegetables:** Which vegetables are best buys in terms of nutrient density? Comparison of iceberg lettuce and leaf lettuce in terms of nutrient content. | • What surprised you most about the information that you just heard about vegetables?  
• Why are you surprised?  
• How can you best remember this information? |
<table>
<thead>
<tr>
<th>Component of Critical Thinking Model</th>
<th>Lesson Content</th>
<th>Activity</th>
<th>Reflection</th>
</tr>
</thead>
</table>
| EMPOWERMENT                        | a. Ways of including vegetables in the diet  
b. Overcoming barriers to vegetable use | **Discussion:**  
Why adults are predisposed to critical thought? | • What is the greatest barrier you feel you must overcome in terms of increasing the number of vegetables you offer your child?  
• What has worked for you in the past in terms of serving vegetables to your children? |
| CRITICAL RESPONSE                   | a. Modeling of the critical thinking process  
b. Use of critical thinking questions to take participants through the process | **Collaborative problem solving:**  
Parents solve problems in groups | • What is one thing that you can do at this point that you think will work for your child? |
| OUTCOME                             | a. Identify a plan to deal with the problem  
b. Identify areas where help is needed | **Parents decide a course of action to take** | • In what areas do you feel you need help to make your plan work? |
| ACTION                              | a. Identify personal steps that will be taken  | **Parents identify one or two steps they can take to increase vegetables and physical activity in their children**  
**Parents prepare vegetable recipes** | • Why are you confident that your plan will work? |

**Other questions for reflection**

a. Is increasing vegetable offerings in your child’s diet a concern for you?
b. Why is it important to include vegetables in your children’s diet?
c. What are some reasons why you have not served vegetables to your children?
d. What are the consequences of these actions on you and your child?
e. What factors affect your ability to serve more vegetables to your children?
f. What information is needed to help you decide what to do?
g. What steps can you take to increase the number of vegetables you offer your children?
h. What are some alternative courses of actions you can take?
APPENDIX C
HANDOUT FOR VEGETABLE CURRICULUM
PICTURES OF POWERHOUSE VEGETABLES
VEGETABLE SERVING SIZES

Children 2-3 years need: 1 cup vegetable daily

1 cup of vegetable =
- ¼ cup grated carrots
- ¼ or 1 broccoli floret
- ¼ cup peas or green beans

1 cup vegetable =
- Snack: 2 pieces of broccoli or cauliflower
- Lunch: Sandwich with 1 lettuce leaf, tomato slice
- ½ cup lettuce leaves
- Dinner: ¼ cup sweet potato or ¼ cup tossed salad, ¼ cup spaghetti sauce or ¼ cup cole slaw

1 cup raw leafy vegetables = softball
1/2 cup of other vegetables, cooked, chopped raw = light bulb
CRITICAL THINKING PROCESS

T: Tackle the real problem

H: How can the problem be solved (think of all possible ways?)

I: Identify solution that is in your child’s best interest

N: Now set a goal

K: Keep checking progress and reflecting at each step
WEEKLY VEGETABLE GOALS

You should include three to five servings of vegetables daily. First, include one or two servings from dark green leafy or orange/yellow/red vegetable sources.

My weekly vegetable goal is:

1. ___________________________________________________

2. ___________________________________________________

<table>
<thead>
<tr>
<th></th>
<th>Breakfast</th>
<th>Lunch</th>
<th>Dinner</th>
<th>Snack</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td></td>
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<tr>
<td>Tuesday</td>
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<td>Wednesday</td>
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<tr>
<td>Sunday</td>
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<td></td>
</tr>
</tbody>
</table>
## Sugenercias para servirles legumbres a sus niños por todo el día

### Proporcione el mejor medio ambiente
- Permita que los niños le vean comer legumbres
- Sea flexible
- No le constriña a su niño a comer legumbres
- No use castigos o amenazas

### Involucre a sus niños
- Convirta la comida en diversión. Permita que los niños creen caritas divertidas o animales con legumbres cortadas.
- Permita que los jovencitos le ayuden a seleccionar legumbres para las comidas y meriendas.
- Permita que los jovencitos preparen las legumbres. A los jovencitos les encanta comer lo que hagan.
- Deje que los jovencitos estén al tanto de la cantidad de legumbres comidas cada día.

### Sea persistente con su plan de ataque
- Ofrezca legumbres todos los días.
- Ofrezca legumbres en formas distintas (cocinadas, crudas, y mezcladas con otros comestibles).
- Ofrezca una variedad de legumbres en una comida particular y permita que el niñito seleccione la legumbre que le gusta.
- Ofrezca legumbres muchas veces antes de decidir que a su niñito no le gusta la legumbre.
- Recuerden que el servicio de legumbres para los niñitos es más pequeño.

### Legumbres deben de ser obtenibles
- Pongan las legumbres al alcance fácil de los niñitos para que las coman. Guarde en la nevera algunos sacos plásticos con ensaladas de legumbres listas para comer.

## Sugenercias para servirles legumbres a sus niños por todo el día

### Desayuno
- Tome jugo de legumbre
- Añada legumbres a las tortillas y/o ponga las legumbres por encima de ellas
- Sirva las tortillas con salsa.
- Añada las legumbres a bollos o al pan.

### Almuerzo
- Tome unas legumbres con su bocadillo (hojas de lechuga, pedazos de tomate, hojas frescas de espinaca, pepino tajado, zanahorias crudas y ralladas o calabacín).
- Tome media taza de legumbres cocidas o crudas de ensalada.
- Beba jugo de legumbres.
- Tome un tazón de sopa de legumbres.

### Cena
- Agregue legumbres a la carne y al guisado.
- Incluya legumbres en cacerolas.
- Revuelva frite legumbres y sirva con arroz y pastas alimenticias.
- Haga un pizza de legumbres o prueba las legumbres envueltas en tortilla.
- Tome una ensalada vegetal como un plato lateral o como un plato principal.
- Tome alguna sopa vegetal.
- Tome una entrada vegetal (legumbres mezcladas y gratinadas, cazuela vegetal o legumbres salteadas).

### Meriendas/Postres
- Sirva legumbres con meriendas por todo el día. Prepare el postre con legumbres. Por ejemplo, tartas de calabaza, o pastel de zanahoria.
<table>
<thead>
<tr>
<th>TIPS FOR OFFERING YOUR CHILDREN VEGETABLES</th>
<th>TIPS FOR SERVING VEGETABLES THROUGHOUT THE DAY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Provide the best environment</strong></td>
<td><strong>Breakfast</strong></td>
</tr>
<tr>
<td>• Let children see you eating vegetables</td>
<td>• Have some vegetable juice</td>
</tr>
<tr>
<td>• Be flexible</td>
<td>• Add vegetables to omelets and/or top</td>
</tr>
<tr>
<td>• Do not force your child to eat</td>
<td>omelets with vegetables</td>
</tr>
<tr>
<td>vegetables</td>
<td>• Serve omelets with salsa</td>
</tr>
<tr>
<td>• Do not use punishment or threats</td>
<td>• Add vegetables to muffins or bread</td>
</tr>
<tr>
<td><strong>Get children involved</strong></td>
<td><strong>Lunch</strong></td>
</tr>
<tr>
<td>• Make food fun. Let children create</td>
<td>• Have some vegetables with your</td>
</tr>
<tr>
<td>funny faces or animals with cut up</td>
<td>sandwich (leaf lettuce, tomato slices,</td>
</tr>
<tr>
<td>vegetables</td>
<td>fresh spinach leaves, cucumber slices,</td>
</tr>
<tr>
<td>• Let children help you choose</td>
<td>grated raw carrots or squash)</td>
</tr>
<tr>
<td>vegetables for meals and snacks</td>
<td>• Have a ½ cup of vegetable cooked or</td>
</tr>
<tr>
<td>• Let children prepare vegetables</td>
<td>raw as a salad</td>
</tr>
<tr>
<td>Children enjoy eating what they make</td>
<td>• Drink vegetable juice</td>
</tr>
<tr>
<td>• Let children keep tract of the amount</td>
<td>• Have a bowl of vegetable soup</td>
</tr>
<tr>
<td>of vegetables eaten for the day</td>
<td></td>
</tr>
<tr>
<td><strong>Be persistent in your approach</strong></td>
<td><strong>Dinner</strong></td>
</tr>
<tr>
<td>• Offer vegetables daily</td>
<td>• Add vegetables to meats and stews</td>
</tr>
<tr>
<td>• Offer vegetables in different forms</td>
<td>• Include vegetables in casseroles.</td>
</tr>
<tr>
<td>(cooked, raw, and mixed with other</td>
<td>• Stir fry vegetables and serve with rice</td>
</tr>
<tr>
<td>foods)</td>
<td>and pasta</td>
</tr>
<tr>
<td>• Offer a variety of vegetables at a</td>
<td>• Make a vegetable pizza or try</td>
</tr>
<tr>
<td>particular meal and allow child to</td>
<td>vegetables wrapped in tortilla</td>
</tr>
<tr>
<td>choose a vegetable he or she likes</td>
<td>• Have a vegetable salad either as a side</td>
</tr>
<tr>
<td>• Offer vegetables many times before</td>
<td>dish or main dish</td>
</tr>
<tr>
<td>you decide your child does not like</td>
<td>• Have some vegetable soup</td>
</tr>
<tr>
<td>the vegetable</td>
<td>• Have a vegetable entrée (Mixed Vegetable</td>
</tr>
<tr>
<td>• Remember vegetable servings are</td>
<td>au gratin, vegetable casserole or</td>
</tr>
<tr>
<td>smaller for children</td>
<td>sautéed vegetables).</td>
</tr>
<tr>
<td><strong>Vegetables should be accessible</strong></td>
<td><strong>Snacks/Dessert</strong></td>
</tr>
<tr>
<td>• Make vegetables easy for children to</td>
<td>• Serve vegetable with dip as snacks</td>
</tr>
<tr>
<td>get to and eat. Have vegetable snack</td>
<td>throughout the day. Prepare dessert</td>
</tr>
<tr>
<td>ready-to-eat in small plastic bags in</td>
<td>with vegetables. For example, pumpkin</td>
</tr>
<tr>
<td>the refrigerator</td>
<td>pies, carrot cake</td>
</tr>
</tbody>
</table>
APPENDIX D
VEGETABLE RECIPES

Abbreviations used in recipes:

tsp = teaspoon

Tbsp = tablespoon

---

Early Morning Cheese Scramble

<table>
<thead>
<tr>
<th>Ingredients</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 eggs</td>
</tr>
<tr>
<td>4 Tbsp milk</td>
</tr>
<tr>
<td>¼ cup low fat cheese</td>
</tr>
<tr>
<td>1 Tbsp margarine</td>
</tr>
<tr>
<td>Pinch of salt</td>
</tr>
<tr>
<td>¼ tsp white pepper</td>
</tr>
<tr>
<td>Pieces of broccoli or cauliflower, mixed vegetables</td>
</tr>
<tr>
<td>¼ cup salsa</td>
</tr>
</tbody>
</table>


---

Carrot Muffin

<table>
<thead>
<tr>
<th>Ingredients</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ½ cup carrots, grated</td>
</tr>
<tr>
<td>1 tsp cinnamon</td>
</tr>
<tr>
<td>1/8 tsp cloves</td>
</tr>
<tr>
<td>1 Tbsp orange peel (optional)</td>
</tr>
<tr>
<td>2 eggs</td>
</tr>
<tr>
<td>4 Tbsp raisin</td>
</tr>
<tr>
<td>1 tsp vanilla</td>
</tr>
<tr>
<td>6 Tbsp flour</td>
</tr>
<tr>
<td>1 tsp vanilla</td>
</tr>
<tr>
<td>1 tsp baking powder</td>
</tr>
<tr>
<td>2/3 cup powdered skimmed milk</td>
</tr>
<tr>
<td>6 Tbsp sugar</td>
</tr>
</tbody>
</table>


Recipe URL: http://www.cdkitchen.com/recipes/recs/504/Carrot_Muffins1570.shtml
Vegetable Salad

Lettuce leaves or spinach leaves
Tomatoes cut into cubes or cucumber cut into cubes or celery cut into cubes
Cabbage sliced thinly or carrots grated
Broccoli florets or cauliflower pieces
Fruit: mandarin orange segments (drained), or strawberry or blueberries or pineapple
Grated cheddar cheese or grated mozzarella

Salad dressing of your choice

Add one ingredient from 1-6 above. Add salad dressing.
Note: Chicken or other meat could be added to this salad to make a complete meal.

Sunshine Salad

2 cups shredded carrots  ½ cup drained mandarin orange sections
2 cups shredded red cabbage (1 small head)  1/8 tsp salt
1 6-ounce container low-fat orange or lemon yogurt  1 orange, unpeeled

Place shredded carrots and cabbage in medium bowl. Mix. Rinse orange. Use grater against smallest holes to form very fine pieces of orange peel. Measure ¼ teaspoon grated rind into small bowl. Add yogurt and salt to orange rind. Stir well with wooden spoon. Add yogurt mixture to carrot-cabbage mixture. Stir until well combined. Stir until all ingredients are completely mixed. Drain mandarin sections in strainer. Measure ½ cup and add to bowl. Gently mix in orange sections with rubber spatula. Serve immediately. Or cover with plastic wrap and refrigerate until serving.
American Heart Association Kid’s Cookbook
### Vegetable and Fruit Salad

1 cup broccoli florets  
1 cup cauliflower florets  
1 cup grapes (red)  
1/4 cup low-fat mayonnaise  
1 Tbsp sugar  
Optional ingredients (2 Tbsp, coarsely chopped red onion)

Mix all ingredients together. Cover and let it sit in the refrigerator for 15-30 minutes before serving.

### Vegetable Soup

1-cup broccoli florets, fresh or frozen  
1-cup cauliflower florets, fresh or frozen  
1 stalk celery  
1 can tomato juice  
1 low-sodium stock cube  
1 cup low-fat grated cheese

Steam vegetables in ½ cup water for 5 minutes. Add tomato juice and stock cube. Cook for 3 minutes longer. Serve with grated cheese.

### Spinach Rice

1 cup frozen spinach (squeezed and drained) or 3 cups fresh spinach  
2 cloves garlic grated  
1 cup rice  
2 cups low-sodium chicken or beef stock  
1 Tbsp oil

Heat pan on stove until medium hot. Add oil and grated garlic, stir. Add spinach, cook for 2 minutes. Add rice and stock, stir. Allow to boil. Turn heat down to low. Cook for 30 minutes or until rice is tender. Stir with a fork.
Oriental Stir-Fry

1½ cups frozen broccoli 1½ cups frozen baby carrots
2 Tbsp honey 1 Tbsp fresh lemon juice
1½-tsp ground allspice ¼ tsp ground ginger
2 tsp margarine 1 tsp sesame oil
1 green scallion

Place frozen broccoli and carrots in strainer. Run hot water over vegetables until they are thoroughly defrosted, about 1 minute. Drain well in strainer, then place on paper towels to drain thoroughly. Pat dry with paper towels if necessary.

Place carrots on cutting board. With small, sharp knife, cut carrots into thin diagonal slices. Rinse and slice green portions of onion. Throw away white part. Measure ½ to 1 teaspoon into a small bowl.

Place honey, lemon juice, allspice, ginger, and pepper in another small bowl. Set aside.

Place margarine in wok. Place wok on burner. Turn heat into medium-high. Heat margarine until melted.

Carefully add broccoli, carrots, and green onion to wok. Hold handle of wok with potholder in one hand. Place a wooden spoon in your other hand. Cook vegetables 2 minutes, stirring constantly.

Add honey and lemon juice mixture. Cook 2 to 3 minutes longer, stirring constantly. Vegetables should be cooked through but still slightly crisp when done.

Serve immediately.

American Heart Association Kid’s Cookbook

Individual Pizza

1 tube enriched biscuits
4 ounce jar pizza sauce
6 ounces low-fat mozzarella cheese
Vegetables: sweet pepper strips, diced tomatoes, shredded carrots etc.

Preheat oven to 350 degrees. Press out 1 biscuit at a time to make individual pizza crusts. Spoon the pizza sauce on the flattened biscuit and sprinkle with cheese and vegetables of your choice.

Hint: You can substitute English Muffins for the biscuits. Broil until golden brown.

We Made it Together: Drake University Head Start Cookbook
Carrot and Beet Smoothie
1 cups grated, raw carrots
1 cup grated, raw beets
2 2/3 cups low-fat evaporated milk
3 cups ice
3 Tbsp honey
3/4 cup low fat sweetened condensed milk

Blend all ingredients thoroughly. Serve immediately

Pumpkin Smoothie
1 cup pumpkin (from can) or
1 cup of fresh, cut-up pumpkin, steamed
2 2/3 cups low-fat evaporated milk
3 cups ice
3 Tbsp honey
3/4 cup low-fat sweetened condensed milk

Blend all ingredients thoroughly. Serve immediately
APPENDIX E
CRITICAL THINKING RUBRIC
<table>
<thead>
<tr>
<th>VEGETABLE QUESTIONS</th>
<th>LEVEL I</th>
<th>LEVEL II</th>
<th>LEVEL III</th>
<th>PHYSICAL ACTIVITY QUESTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is Joan’s problem?</td>
<td>Unable to state the problem ___0 point</td>
<td>States one problem ___1 point</td>
<td>States two or more problems ___2-3 points</td>
<td>What are Henry’s problems?</td>
</tr>
<tr>
<td></td>
<td>What other information you will need to know about Joan’s situation if you are to help her?</td>
<td>Unable to select pertinent information to the solution of the problem ___0 point</td>
<td>States one pertinent piece of information to the solution of the problem ___1 point</td>
<td>States two or more pertinent pieces of information to the solution of the problem ___2-3 points</td>
</tr>
<tr>
<td></td>
<td>What can Joan do to offer her children more vegetables?</td>
<td>Unable to select relevant and promising hypotheses ___0 points</td>
<td>Selects one relevant and promising hypothesis ___1 point</td>
<td>Selects two or more relevant and promising hypotheses ___2-3 points</td>
</tr>
<tr>
<td></td>
<td>What do you think is the best way to solve Joan’s problem?</td>
<td>Unable to draw a valid conclusion ___0 point</td>
<td>Draws one valid conclusion ___1 point</td>
<td>Selects two or more relevant and promising hypotheses ___2-3 points</td>
</tr>
<tr>
<td></td>
<td>Why do you think that solution is the best?</td>
<td>Unable to judge the validity of inference ___0 point</td>
<td>States one point to judge the validity of the inference ___1 point</td>
<td>States two or more point to judge the validity of the inference ___2-3 points</td>
</tr>
<tr>
<td>TOTAL POINTS</td>
<td>0</td>
<td>5</td>
<td>10-15</td>
<td>TOTAL POINTS</td>
</tr>
</tbody>
</table>
APPENDIX F
KAC QUESTIONNAIRE USED IN STUDY

Name ______________________________________________________

Head Start Program __________________________________________

For each question, please check (√ ) one choice.

1. ___Male       ___Female

2. ___Married    ___Single    ___Divorced    ___Other

3. ___Caucasian  ___Hispanic   ___African American   ___Asian
    ___Middle Eastern    ___________________ Other (Please describe.)

4. To which age group do you belong? ____18-29 ____30-39   ___40 and over

5. Highest level of education? ____1-6 grade    ____ 7-8 grade   ___Some high school
    ____ High school diploma    ____ Some college    ____College degree

6. Who normally shops for food in your home? ___Mother       ___Father
    ___Other    Please describe the person you checked as “other.”
    __________________

7. Who normally cooks food in your home? ___Mother       ___Father
    ___Other

    Please describe the person you checked as “other.”
    __________________
8. Who normally eats with your Head Start child? ___Mother  ___Father  ___Other.  Please describe the person you checked as “other.”  

____________________________

9. Within the last month, did you receive information on nutrition or physical activity? ___Yes ___No  If yes, where did this information come from?

____________________________

B. Please fill in the correct information.

10. How many people regularly eat at your home? ____

11. How many of these people are adults (over 18 years)? ____

12. How many children are in each of the following age groups?
   ____0-2 years  ____3-5 years  ____6-12 years  ____13-17

Part A

Circle the answer that you think is correct

1. Which of the following vegetables would best help your child to stay healthy (and avoid diseases such as heart disease and cancer)? Circle as many as you wish.
   Peas  Ice berg lettuce  Broccoli  Corn
   Potatoes  Squash  Tomatoes  Greens

2. If your child were 2-4 years old, in total, how many cups of vegetables would you give him or her each day?
   a. ½ cup
   b. 1 cup
   c. 1 ½ cup
   d. 2 cups
3. How many times does it take on average for a child to accept a new vegetable?
   a. 1-2 times
   b. 3-4 times
   c. 5-6 times
   d. 7-8 times
   e. 9-10 times or more

4. If you want your child to eat more vegetables, what would be good to do?
   a. Force the child to eat the vegetable provided
   b. Give your child a treat such as dessert to get him or her to eat the vegetable
   c. Offer the child the vegetable while you are eating it
   d. Let the child remain at the table until she or he has eaten the vegetable

**Part B**

Circle the response that tells how you feel about the following statements.

5. How important is it for you to offer your child vegetables every day?
   1. Not at all important
   2. Somewhat important
   3. Very important
   4. Extremely Important

6. If your child refuses to try vegetables, how important is it for you to find new ways to give your child vegetables?
   1. Not at all important
   2. Somewhat important
   3. Very important
   4. Extremely Important

7. How important is it for you to purchase vegetables for your child instead of candies and snacks?
   1. Not at all important
   2. Somewhat important
   3. Very important
   4. Extremely Important

8. How important is it for you to purchase vegetables for your child if you only have a small amount of money?
   1. Not at all important
   2. Somewhat important
   3. Very important
   4. Extremely Important
Part C

At the WIC clinic, Joan was told that she needed to offer her children more vegetables. Joan mentioned that she is afraid that she would not have enough money to do this.

9. What is Joan’s problem

10. What other information you will need to know about Jane’s situation if you are to help her?

11. What can Jane do to offer her children more vegetables?

12. What do you think is the best way to solve Jane’s problem?

13. Why do you think that solution is best?
Part D  Vegetable recall

Please circle each of the vegetables you offered your child last week.

Artichokes  Asparagus  Bean sprouts
Beets  Bok Choy  Broccoli
Brussels sprouts  Cabbage  Carrots
Cauliflower  Celery  Corn
Cucumber  Eggplant  Green beans
Lettuce (leaf)  Lettuce (iceberg)  Mixed vegetable
Mushroom  Okra  Onion
Peas  Green or red peppers  Parsnips
Potatoes  Pumpkin  Swiss chard, kale, spinach
Summer squash (thin skin)  Tomatoes  Tomato sauce
Winter squash (hard skin)  V8 Juice  Turnip, other than greens
Sweet potatoes or yams  Watercress  Zucchini

Part E  Physical activity knowledge

Circle the answer that you think is correct.

14. Which of the following is NOT a benefit of regular physical activity for your child?
   a. Builds healthy bones
   b. Lowers energy level
   c. Lowers blood pressure and cholesterol
   d. Improves self-esteem

15. What is the total amount of time a child should spend in physical activity a day?
   a. 90 minutes (one-and-a-half hours)
   b. 60 minutes (one hour)
   c. 30 minutes (half hour)
   d. 10 minutes
Part F  Physical activity attitudes

Circle the response that tells how you feel about the following statements.

16. How important is it for you to encourage your child to be involved in physical activity every day?
   1. Not at all important
   2. Somewhat important
   3. Very important
   4. Extremely Important

17. How important is it for you to look for new way of helping your child be physically active?
   1. Not at all important
   2. Somewhat important
   3. Very important
   4. Extremely Important

18. How important is it for you to encourage your child to take a walk, help with housework, or ride a bike, rather than watching television or playing a video game?
   1. Not at all important
   2. Somewhat important
   3. Very important
   4. Extremely Important

19. How important is it for you to keep involving your child in physical activity even if he or she said they do not want to be active?
   1. Not at all important
   2. Somewhat important
   3. Very important
   4. Extremely Important

Part G  
Read the short story and answer the following questions:

Henry enjoys watching television and playing computer games. He spends at least 4 hours a day on these activities. His father tells him to turn off the television and be active. Henry complains that he does not want to be active.

20. What are Henry’s problems?
21. What other information will you need to know about Henry’s situation if you are to help him?

22. Suggest some things that Henry’s dad can do to make Henry more active.

23. What do you think is the best solution to Henry’s problem?

24. Why do you think that solution is the best?

Part H  Physical activity recall
25. During the past week, on how many days did your child take part in running, fast bicycling, or similar activities for at least 20 minutes?
   a. 0 days
   b. 1 day
   c. 2 days
   d. 3 days
   e. 4 days
   f. 5 days
   g. 6 days
   h. 7 days
26. On how many of the past 7 days did your child participate in physical activity for at least 30 minutes that did not make him or her breathe hard, such as fast walking, raking leaves, and helping with housework?
   a. 0 days
   b. 1 day
   c. 2 days
   d. 3 days
   e. 4 days
   f. 5 days
   g. 6 days
   h. 7 days

27. During the past 7 days, on how many days was your child physically active for a total of at least 60 minutes per day? (Add up all the time your child spends in any kind of physical activity).
   a. 0 days
   b. 1 day
   c. 2 days
   d. 3 days
   e. 4 days
   f. 5 days
   g. 6 days
   h. 7 days

28. On an average school day, how many hours of TV does your child watch?
   a. My child does not watch TV on an average school day
   b. Less than 1 hour per day
   c. 1 hour per day
   d. 2 hours per day
   e. 3 hours per day
   f. 4 hours per day
   g. 5 or more hours per day

29. During the past 7 days, did a family member join your child in physical activity?
   a. Yes. Which member (dad, mom, sister, brother, other)?
       ____________________________________________
   b. No_____

Thank you for participating!
APPENDIX G
INVITATIONAL FLYERS FOR STUDY

Parents: It’s finally here!

- INFORMATION ON RAISING HEALTHY CHILDREN
- RECIPE PREPARATION
- SOLVING FOOD RELATED PROBLEMS
- YOU GET TOYS AND FOODS TO TAKE HOME
- LOTS OF FUN AND ACTIVITIES!
- CERTIFICATE GIVEN FOR PARTICIPATION

You need to attend both classes in a session.

Classes will be held at the following times and places.

Choose the session that is best for you!

Ankeny Head Start (406 SW School Street, Ankeny)
- Thursday November 3 and Thursday November 10 at 6:30 p.m.
- Tuesday November 8 and Tuesday November 15 at 6:30 p.m.

Toddler/EHS program (321 Euclid, Des Moines)
- Monday October 31 and Monday, November 7 at 9:00 a.m.
  OR
- Tuesday November 1 and Tuesday November 15 at 11:30 a.m.

Mitchellville Community Center (114 Center Ave S, Mitchellville)
- Monday, October 31 and Monday November 7 at 1 p.m.

Ashworth Head Start (1025 28th Street, West Des Moines)
- Wednesday, November 2 and Wednesday, November 9 at 8:15 a.m.
  OR
- Wednesday, November 2 and Wednesday, November 9 at 12:00 noon

Norwoodville Community Center (By the Saydel Head Start- 3077 NE 46th Avenue)
- Thursday, November 3 and Thursday, November 10 at 8:15 a.m.
  OR
- Thursday, November 3 and Thursday, November 10 at 12:00 noon

For more information, ask your family advocate or phone (515) 271-1854
REFERENCES


Research findings and recommendations prepared for the committee on pre-college philosophy. (ERIC Document Reproduction Service No. ED 315-423)


from focus groups using reciprocal determinism. *Journal of Nutrition Education, 5*, 14-20.


