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Nutrition Education Intervention in a Low-Income Middle School
Increases Students' Smart Beverage Choices

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Departmental Honors Thesis
The University of Tennessee at Chattanooga
Dietetics

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Abstract

Historically, the intake of fruits and vegetables by children is low, and children in low-income environments are even less likely to consume the recommended fruits and vegetables each day. Fruit and vegetable consumption is linked to obesity which leads to other detrimental diseases such as cardiovascular disease and type II diabetes mellitus. The purpose of this intervention was to evaluate the effects of an afterschool nutrition education in a low-income middle school setting. A pre-survey and post-survey were implemented to evaluate how the intervention impacted the participants' general nutrition knowledge, open-mindedness to taste unfamiliar fruits and vegetables (FVs), and intake of FVs and common beverages. Paired-sample t-tests were used to assess differences between the pre-survey and post-survey data. All analyses were performed using SPSS version 22.0.00, and the priori significance level was set to $\alpha < 0.05$. The results indicated a significant increase in the quality of smart beverage choices from baseline (12.40+3.50 score) to the end of the 16-week intervention (13.73+2.28 score), ($t=2.256(14)$, $p=0.041$). There was a significant decrease in nutrition knowledge from baseline (7.40+1.40 score) to the end of the 16-week intervention (6.47+ 2.17 score), ($t=-2.226(14)$, $p=0.043$). No other significant differences were observed.

Keywords: Nutrition education, middle school, low-income, fruits and vegetables

Introduction

I have worked for a nonprofit agency for the past three years that provides free, healthy meals to children in low-income areas of Chattanooga, Tennessee. During the summer, we visit the neighborhood playgrounds and recreation centers of over two-thousand children, ready to provide a safe play environment, friendship, and to be a healthy role model. One day while working, I snacked on a fresh peach from home, and a middle school boy asked me if I was eating an apple. Although his question was simple, I slowly began to realize the complexity of his curiosity.

First, the boy was unable to recognize the vast differences in sensory characteristics between a peach and an apple-- the varying colors, textures and consistencies. A bite into a furry peach releases a burst of juices whereas an apple creates a subtle crunch. Furthermore, he was unfamiliar with the common fruit despite his proximity to Georgia, the official peach state. I explained the difference between the two fruits and enthusiastically offered to bring the boy a taste of a peach the next day. Unsurprisingly, the boy loved the novel fruit and continuously asked for more throughout the summer.

This minor interaction left a small impact on the boy and a tremendous impact on me. I considered how this boy was willing to eat fruit, although many children in our nation do not consume the recommended fruits and vegetables (FVs) per day (CDC, 2014). Unfortunately, he did not have access to nutritious food or proper knowledge to choose it.

Background

Historically the consumption of FVs have been low in children but improvements have been made (CDC, 2014). According to the CDC, between 2003 and 2010, the amount of vegetables consumed by children aged 2-18 years old was unaltered while whole fruit

consumption increased by 67 percent. Despite the increased consumption of fruit, the individual daily recommendation for fruit, based on age, gender and level of physical activity, was not met by sixty-percent of children between 2007 and 2010. Fortunately, national efforts such as Let's Move! are devoted to increasing FV intake among children. Public officials realize that 60 million US children spend a large percentage of their time during the day at school and in daycare, so these institutions should be at the center of efforts to increase FV consumption and to improve health behaviors.

Regrettably, low-income children, like my friend from work, are even less likely to consume adequate fruits and vegetables. Income has repeatedly been shown to be positively correlated with intake, suggesting that low-income youth are at a disadvantage because they have a lack of access, monetary support, and nutrition knowledge to purchase and consume fruits and vegetables (Di Noia, 2014). The consumption of FVs is significant because numerous studies have found it as one of the many predictors of obesity. For example, McCrory et al. suggests obesity is related to the consumption of foods high in energy density (Produce for Better Health Foundation, 2016). The consumption of FVs, foods that are low in energy density, is negatively correlated with body mass index (BMI). This observation is logical because FVs provide ample fiber and nutrients which increase feelings of fullness and decrease overall consumption. One study even found that consuming meals with added vegetables decreases energy consumption by 30 percent.

The lack of consumption of FVs among low-income children leaves them at risk for developing childhood obesity which can lead to high blood pressure, high cholesterol, sleep apnea, asthma, joint problems, and increased risk of developing cardiovascular disease (CVD) and type 2 diabetes mellitus (Bariatric and Metabolic Institute; CDC, 2012). According to the

CDC, a study of obese children demonstrated that 70 percent had one CVD risk factor and 39 percent had at least two risk factors (2012). Research shows that obese children and teens are likely to become obese adults because lifestyle behavior habits are formed during childhood (Freedman, 2005). Since FV intake is one aspect that leads to a decreased risk of obesity, we must investigate how a child's food preferences are formed. Unfortunately, the literature is unclear regarding which factors influence the food preferences of children. The development of food preferences is a very complex issue, and there are many variables that must be considered such as the availability of food, frequency of exposure of the food to the child, and the influence of the parents.

Factors that Influence the Development of a Child's Food Preferences

Accessibility.

First, a child's environment determines the availability of food (Blanchette & Brug, 2005). Improving a child's accessibility to FVs, as well as addressing his or her taste preferences, is the most successful way to increase consumption of FVs in children 6-12 years of age.

Another study of rural, low-income families found that availability of FVs at home is the most significant factor influencing produce consumption (Amuta, Jacobs, Idoko, Barry, & McKyer, 2015). Unfortunately, many children in low-income areas do not have access to FVs or other nutritious foods. According to the United States Department of Agriculture (USDA), a low-access community has at least 500 people and/or 33 percent of the population that is located more than one mile from a grocery store that provides fresh, healthy, and affordable food (American Nutrition Association). The range is extended to 10 miles in rural areas. Low-access communities often occur in rural, minority and impoverished neighborhoods. Consequently,

residents are forced to purchase food from convenience stores and fast food restaurants that offer limited nutritious options. Low-quality diets in these areas contribute to the prevalence of obesity and other-diet related diseases. Without access to nutritious, affordable foods, children may not develop taste preferences for healthy foods, inhibiting the likelihood that they will choose to consume foods that are low in energy-density.

Exposure.

A multitude of other studies have concluded that frequent exposure is required to alter preferences of healthy foods in children, although the number of exposures required vary between specific children, children of different ages, and the type of food (Birch, 1987-9; Duncan et al., 2015; Gibbs et al., 2013; Lakkakula, 2010; Slusser, 2007). One intervention program offered children in low-income schools a taste of bell peppers, carrots, tomatoes, and peas once a week for ten weeks (Lakkakula, 2010). The children's preference for the vegetables were recorded using a Likert-scale. Trends of the study revealed that most students who originally did not like a vegetable, liked it by the eighth or ninth week of taste testing. These findings are modest because much of the literature claims that 10-15 (and sometimes even 20) taste exposures are required to influence the taste preference of a child (Birch, 1987-9; Lakkakula, 2010; Slusser, 2007). It is impractical for impoverished families to introduce healthy foods to their children repeatedly just to be rejected ten or twenty times. This process requires extended time, money and resources.

Parental Modeling.

Many studies have determined parental modeling as another major factor that influences a child's dietary intake (Chen, 2014; Cho Hyunyi & Nadow, 2004; Sharma et al., August 2015; Sylvestre, O'Loughlin, Gray-Donald, Hanley, & Paradis, 2007). For instance, Sylvestre, et al.

demonstrated that an increase in one unit of FVs by parents correlated with a 10-20% increase in FV consumption in their children (Sylvestre et al., 2007). However, it is not always easy to involve parents in a nutrition education intervention. For example, the Gimme 5 (Georgia) study did not have successful results when involving parental participation because the design of the intervention was not well implemented by teachers and many home activities never made it to the parents (Davis, 2000). Especially in low-income areas, parents are very busy working, have limited transportation, and do not have money to buy expensive produce.

In summary, there are many factors that influence the food preferences of children. It is difficult to design an intervention for low-income children targeted at improving their preferences for FVs because these children have limited access to these nutritious foods which restricts their exposure to this them, and parental participation is difficult to acquire. Thus, afterschool nutrition education intervention is a feasible solution for this population because it does not increase the demand on over-worked teachers or parents. It also provides students with the tools to make healthy choices when given the opportunity. Kevin Concannon, the USDA Under Secretary for Food, Nutrition and Consumer Services, declares, “Schools are essential to early exposure to good nutrition and provide a blueprint for healthy eating that can last a lifetime” (CDC, 2014). Public officials are beginning to recognize the power that schools have on the obesity epidemic in America. Schools and childcare institutions must capitalize on the opportunity to influence lifelong health habits.

Nutrition Education Intervention

Former First Lady Michelle Obama is on the forefront of combatting the obesity epidemic. While in office, she launched the national Let’s Move! campaign in 2010 in order to raise a healthier generation of children ("Let's Move!," 2016). The campaign focuses on the role

that each member of society can play as we combat the obesity epidemic, calling upon the support of parents, schools, community leaders, elected officials, chefs, kids and healthcare providers. Schools are specifically encouraged to improve the nutritional quality of school meals and to incorporate nutrition education and physical activity into the curriculum. The Let's Move! campaign provides beneficial national guidelines. However, more in-depth school nutrition education interventions will further bolster the principles set forth by this initiative.

Governmental forces are beginning to act to prevent childhood obesity, but effective school nutrition education strategies are not well understood.

In 1995, Contento et al. conducted the first systematic review of the effectiveness of nutrition education in over a decade (Contento et al., 1995). Forty-three studies included in the review focus on school-aged children. The literature review established a list of the most important factors to consider when designing a nutrition education intervention among school-age children. Interventions should dedicate substantial time and intensity to nutrition education, involve self-evaluation tools, intervene in the school food environment and involve the larger community. This landmark study provides valuable insight on the characteristics of an effective nutrition education intervention, and recent studies support the findings of Contento et al.

Fahlman, et al. conducted a pilot study that measured the impact of nutrition intervention on middle school students' nutrition knowledge, self-efficacy and eating behaviors through a pre and post-test (Fahlman, Dake, McCaughtry, & Martin, 2008). Researchers trained the teachers who then implemented the 8-lesson curriculum. The design of this study was risky because the available literature identifies teacher implementation of nutrition education as unsuccessful (Contento et al., 1995). For example, in the Contento et al. literature review, the median time teachers spent on nutrition education was 3 hours of a potential 39 hours and they completed an

average of 6 of 17 sessions due. Despite challenging methodology, Fahlman et al. displayed promising results (Fahlman et al., 2008). Intervention students increased their nutrition knowledge, and they were more likely to incorporate FVs into their diet and eliminate non-nutritious foods when compared to the control group. The study suggests that a well-implemented school based nutrition program can produce positive changes in dietary behavior.

On the other hand, low-income schools in South Africa did not have positive results when nutrition education was implemented by teachers during the school day (Steyn et al., 2015). The aim of the three-year HealthKick intervention was to promote healthy eating habits. The faculty were provided with a tool kit to help implement change, and results were measured through 24 hour recalls. Overall, the intervention did not improve the diet of the intervention group significantly. Researchers report that the implementation of action plans was not well undertaken by the schools. For example, of 57 nutrition or physical activity events planned, only 27 were completed. Teachers explained poor implementation was due to lack of time, diminished resources, poor facilities, low parental involvement and unhealthy foods sold at school. Many issues existed alongside the poverty in the intervention schools such as gang involvement, malnutrition and disease. The findings suggest that nutrition intervention becomes more complex when implemented in a low-income environment. Intervention must be creatively developed to limit the burden placed on teachers.

Ellsworth et al. conducted a novel nutrition intervention in 6 low-income middle schools (Ellsworth, Ernst, & Snelling, 2015). Programming was centered around a mobile farmer's market functioning in an old school bus. The three educational objectives were to introduce fresh produce to students, nutrition education based on USDA MyPlate, and sustainable farming education. The pre- and post-tests revealed that students' general nutrition knowledge increased

but sustainable farming concepts were not well understood by the middle school students. The study affirms that nutrition education can be successfully implemented in the middle school setting, which is promising because prior research proposes that increased nutrition knowledge may increase FV consumption (Blanchette & Brug, 2005). Therefore, well-implemented and age-appropriate nutrition intervention may increase FV consumption at the middle school level. Ellsworth et al. presented a unique model that does not rely on teacher implementation and extended resources or money which is appropriate for the low-income setting (2015).

Hypotheses

To further investigate the association between nutrition education and the consumption of FVs in a low-income middle school setting, a weekly afterschool nutrition program was implemented into East Lake Academy of Fine Arts in Chattanooga, Tennessee. The current study investigated the following hypotheses:

- Students who participate consistently in the nutrition afterschool program will demonstrate increased general nutrition knowledge between the pre- and post-test.
- Students who regularly attend the afterschool program will demonstrate increased open-mindedness to sample FVs between the pre and post test.
- Students who regularly attend the afterschool program will indicate on the 24-hour food recall questions that they made smarter beverage choices and consumed more FVs on the post-test compared to the pre-test.

The present study is important because the pre- and post-test measures open-mindedness to taste FVs through unique methods. Likewise, the intervention was implemented by volunteer university students which is uncommon, and there is limited literature available regarding the effectiveness of nutrition education on middle school students in a low-income setting.

Methods

Setting and Population

The intervention took place at East Lake Academy of Fine Arts (ELA), a middle school located in a low-income area of Chattanooga, Tennessee. All students were invited and given equal opportunity to participate in the nutrition afterschool program. They were not obligated to participate in any activity that made them feel uncomfortable. ELA is considered a Title-1 middle school, indicating that the school receives extra financial assistance from the government to ensure that at-risk and low-income students have a fair opportunity to receive a high-quality education (Hamilton County Department of Education, 2016; National Association for the Education of Young Children). The students at ELA are about 60% African American, 32% Hispanic, and 8% Caucasian (National Center for Education Statistics, 2015; Start Class). The demographic of ELA does not reflect the demographic in Tennessee which is about 23% African American, 9% Hispanic, and 65% Caucasian. ELA's academic performance based on state testing is ranked in the lowest 20% in Tennessee (Start Class). Ninety-nine percent of students at ELA are eligible for free or reduced lunch (Hamilton County School District).

Participants

Fifteen participants, 12 girls and 3 boys, met the requirements of signed parental consent and completion of the pre- and post-tests. Their ages at the start of the intervention ranged from 11 to 15 years of age. The mean age was 12 years and 3 months old. Attendance of participants included in the sample ranged from 1 to 16 sessions. The average attendance was 5.25 sessions. Low attendance was often the result of conflicts in schedules such as sports teams and student council.

Intervention Description

The afterschool program, entitled Kids Interacting with Nutrition and Growth at School (KINGS) club began September 15, 2015 and finished April 12, 2016. It was part of a larger grant entitled Combatting Obesity's Multiple chronic conditions through Preparation Activities Shared among Students (COMPASS). COMPASS is a HRSA grant with the School of Nursing and Department of Health and Human Performance at the University of Tennessee at Chattanooga. The present project received institutional review board (IRB) approval through an addendum to the COMPASS's IRB. There were 16 total sessions throughout the school year. KINGS Club met on Tuesdays from 4 to 5:30 p.m.

The intervention followed a nonrandomized, pre- and post- comparison study design, and there were no control groups in the sample. It was implemented by the principal researcher and volunteers from the University of Tennessee at Chattanooga (UTC). All participants were given the same educational experience based on the days they attended KINGS Club. Participants completed a pre-test and baseline height/weight measurements on their first day, but not necessarily the first day of the club. Post-tests and final height/weight measurements were completed during the last two weeks of the intervention. All measurements and pre- and post-tests were implemented by volunteers.

There were 6 general nutrition education lessons that were implemented during the intervention: (1) The health benefits of consuming whole, unprocessed foods; (2) How to choose nutritious snacks; (3) The benefits of consuming FVs that are a variety of colors; (4) The sugar content of common beverages; (5) How to choose nutritious fast food options; and (6) The proper portion sizes for the 5 food groups. A description of the 16 sessions is provided in Appendix 1. Typically, when a new lesson was taught, it was followed by physical activity

games during the remaining time. The next week was devoted to reviewing previous concepts and more physical activity games. All concepts were reviewed periodically throughout the intervention.

Data Collection

Nutritional intake and nutrition knowledge data was assessed by a written survey. Attitudes data were collected using a 4-point Likert-type scale. Open-mindedness to taste unfamiliar FVs was obtained using a ratio (# of FVs the students indicated that they would like to try/ # of FVs the student indicated that he or she had never tasted). All questions related to smart beverage choices, FV intake, nutrition knowledge, or open-mindedness to taste novel FVs were grouped together into separate categories. Smart beverages are defined as increased consumption of water and milk and decreased consumption of soda, 100% fruit juice, Kool-aid, sports drinks, and other fruit flavored drinks. On the survey, the participants indicated how many servings of these drinks that they had in the past 24 hours. Likewise, they indicated how many servings of FVs they had in the past 24 hours. Serving sizes were determined based on visual food models. The survey questions included fresh, frozen, canned, or dried fruits and vegetables. The answer choices for questions about beverages and FVs were 0-1 servings, 2-3 servings, 4-5 servings, and more than 5 servings. The participants' knowledge about nutrition was the final construct assessed. Five factual questions about nutrition were included in the survey. The information used to formulate the questions was based on the lessons taught throughout the year. The ordinal or nominal values in each category were summed creating a scale, thereby treating the combination of nutritional intake or nutrition knowledge variables as a continuous variable.

Statistical Analysis

Paired-sample t-tests were used to assess differences between the pre-survey and post-survey data. All analyses were performed using SPSS version 22.0.00, and the priori significance level was set to $\alpha < 0.05$.

Results

Descriptive characteristics are displayed in Table 1. A paired sample t-test indicated a significant increase in the quality of smart beverage choices from baseline (12.40+3.50 score) to the end of the 16-week intervention (13.73+2.28 score), ($t=2.256(14)$, $p=0.041$). There was a significant decrease in nutrition knowledge from baseline (7.40+1.40 score) to the end of the 16-week intervention (6.47+ 2.17 score), ($t=-2.226 (14)$, $p=0.043$). No other significant differences were observed. Results of the paired sample t-test for all constructs are displayed in Table 2.

Table 1

Descriptive Characteristics of Participants

Variable	Minimum	Maximum	Mean	Standard Deviation	Frequency	Percentage
Height (cm)	147.32	182.88	163.37	10.88		
Weight (kg)	44	107	70.89	19.41		
BMI	17.90	39.73	26.54	7.29		
Accessibility ^a						
0-1					1	6.67%
1-0					1	6.67%
1-1					13	86.67%
Gender						
Male					3	20%
Female					12	80%

^aAccessibility: Values as reported at baseline follow-up; 0 does not have access to FV; 1 has access.

Table 2

Nutrition Measures at Baseline and Immediately Following the 16-Week Intervention

Variable	Baseline Mean	Follow-Up Mean	T-statistic	p-value
Total smart beverages consumed on 24-hour recall (range 0-20) ^a	12.40	13.73	2.26	0.04*
Total FV consumed on 24-hour recall (range 0-8)	4.00	4.50	1.242	0.24
Total measure of nutrition knowledge (range 0-10)	7.40	6.47	-2.23	0.04*
Open-mindedness to sample unfamiliar FVs ^b (range 0-1)	0.21	0.27	0.36	0.73
Number of FVs participant had never tasted (range 0-32)	5.00	2.43	1.89	0.08

^aSmart beverages are defined as increased consumption of water and milk and decreased consumption of soda, 100% fruit juice, Kool-aid, sports drinks, and other fruit flavored drinks.

^bRatio of circled amount/foods never tasted;

*Indicates significance, a priori significance level was set to alpha <0.05.

Discussion

The weekly afterschool nutrition intervention implemented by volunteer university students was a unique way to investigate how nutrition intervention can influence a middle school students' nutrition knowledge, open-mindedness to taste novel foods, and intake of smart beverages and FVs. It did not create a burden on parents or teachers, making it ideal for the Title-I school setting. The survey results of the current study indicated that this type of intervention

may be an effective method to positively influence the beverage choices of middle school students, although changes in FV intake were insignificant. The students had access to nutritious beverages and FVs because 99% of ELA students are eligible for free or reduced lunch (Hamilton County School District). In addition, about 87% of participants indicated on the survey that they had access to FVs at the beginning and end of the 16-week intervention. The USDA's National School Lunch and School Breakfast Programs standards require that cafeterias serve a minimum of 1 cup of milk and 1.25 cups of FVs per day (USDA). Although the students had access to both nutritious beverages and FVs at school and home, the study results indicated that the students were more willing to eliminate sugary beverages and to increase water and milk consumption than to increase their FV intake.

Furthermore, the survey results demonstrated nutrition education may not be an effective method to increase open-mindedness to taste unfamiliar FVs. A more effective approach might have been to introduce unfamiliar FVs to the participants repeatedly to allow them to develop a preference for the food. Lakkakula, et al. observed that eight or nine exposures to four vegetables increased the students' preference for the food (2010). Unfortunately, the present intervention did not have the financial support or permission through the IRB to provide samples of foods to the participants. Finally, the significant decrease in nutrition knowledge may be characteristic of the small sample size of 15 participants and the low-level of attendance. Increased advertisement prior to the intervention may have increased the sample size and improved the attendance. Absences from session(s) hindered the participants' exposure to all nutrition topics that were tested. Also, a curriculum that focuses on one or two specific nutrition topics instead of many general nutrition topics may have allowed the students to better retain the information provided. Lastly, the construct of the survey may not have accurately depicted the students' nutrition

knowledge due to the small sample of questions. Including more questions testing the participants' nutrition knowledge would have reduced the impact one student's answer had on the overall statistical results. Amidst disappointing outcomes, observations from the intervention suggest that students were engaged and excited to learn about nutrition and physical activity while attending the sessions.

Conclusion

In summary, the results of this research reveal that nutrition education intervention in a low-income middle school can influence the beverage choices of the students positively. Reducing the intake of sugary beverages and increasing the intake of low-fat milk is part of the Let's Move initiative and other school nutrition trends across America ("Let's Move!," 2016). Further research of the best practices to implement this type of nutrition education intervention will help support these healthy trends in schools. Limitations of the study include: (1) the self-report methods of beverage and FV intake, (2) the relatively short length of the intervention, (3) the restricted ability to introduce taste tests, (3) the limited access to teaching resources, (4) the small sample size, (5) the lack of nutrition education reinforcement from teachers and parents, and (6) the lack of a control group. Future studies should refine the curriculum to emphasize more specific nutrition topics, so the information can be reinforced more frequently which will support the retention of knowledge. They should also consider including samples of nutritious foods with the purpose of progressing the participants' confidence of trying novel foods. To enhance attendance and boost the sample size, future researchers should consider offering incentives. For instance, participants who attend could receive a bag of groceries to take home. Finally, educating the parents on how they can positively impact their child's nutritional status

and providing the parents with resources such as cooking materials, nutrition activity ideas, and access to nutritious foods may make the intervention more effective.

Appendix 1: Description of 16-Week Intervention

Session #	Lesson Title	Objective	Activity Description
1	Introduction	<ul style="list-style-type: none"> - Introduce participants to college volunteers - Explain purpose of KINGS Club - Implement baseline measurements 	<ul style="list-style-type: none"> - Pre-test - Icebreakers
2	Whole vs Processed Foods	<ul style="list-style-type: none"> - Explain the difference between whole and processed foods - Introduce the concept of moderation 	<p>Nutrition Red Light, Green Light Game:</p> <ul style="list-style-type: none"> - All students stand on the start line - One student stands 100 yards away and calls out the name of foods. - Whole foods that should be eaten frequently represent a green light, indicating that the students run - Processed foods that are low in sugar, salt, and fat represent a yellow light, indicating that the students walk - Processed foods that are high in sugar, salt, and fat represent a red light, indicating that the students do not move. - If the student chooses the wrong motion, they must go back to the start line
3	Review	<ul style="list-style-type: none"> - Review concepts from previous lessons - Promote physical activity 	<ul style="list-style-type: none"> - Review nutrition concepts - Physical activity games
4	Healthy Snack Ideas	<ul style="list-style-type: none"> - Discuss snack ideas and healthy substitutions 	<ul style="list-style-type: none"> - Divide students into small groups - Discuss favorite snacks and identify if the snacks would be considered a red, yellow, or green light (referencing session #2) - Discuss if snacks could be changed to improve their nutritional value - Present snack ideas to other groups
5	Guest Speaker from Crabtree Farms and	<ul style="list-style-type: none"> - Teach the process of farming and the benefits of sustainable farming and buying locally 	<ul style="list-style-type: none"> - Hands-on activities presented by Crabtree Farm speaker
6	Eating a “Rainbow” of Fruits and Vegetables	<ul style="list-style-type: none"> - Demonstrate the benefits of eating FVs that are a variety of colors 	<ul style="list-style-type: none"> - Hand out an index card with the picture of a fruit or vegetable and its description - Instruct students to find another person whose fruit or vegetable card has similar health benefits - Observe that FVs of the same color provide similar nutrients - Discuss the importance of eating FVs of many colors
7	Review	<ul style="list-style-type: none"> - Review concepts from previous lessons - Promote physical activity 	<ul style="list-style-type: none"> - Review nutrition concepts - Physical activity games
8	End of the semester physical activity	<ul style="list-style-type: none"> - Celebrate the end of the semester 	<ul style="list-style-type: none"> - Split participants into 2 teams - Race through obstacle course

	obstacle course and “drunk goggles”	<ul style="list-style-type: none"> - Illustrate the dangers of drunk driving 	<ul style="list-style-type: none"> - Race through obstacle course again while wearing “drunk goggles” that simulate one’s vision while intoxicated - Discuss experience of wearing “drunk goggles” and the dangers of driving under the influence
9	Sugar Content of Beverages	<ul style="list-style-type: none"> - Teach how to read a food label - Introduce sugar content of beverages 	<ul style="list-style-type: none"> - Review food label on common beverages - Discuss sugar content and serving sizes - Measure out the sugar content of each drink - Discuss health benefits of water
10	Review	<ul style="list-style-type: none"> - Review concepts from previous lessons - Promote physical activity 	<ul style="list-style-type: none"> - Review nutrition concepts - Physical activity games
11	Fast Food Choices	<ul style="list-style-type: none"> - Discuss healthy options at fast food restaurants 	<ul style="list-style-type: none"> - Split participants into small groups - Provide each group with a different fast food menu and its nutritional information - Discuss the nutritional value of the menu items that students normally purchase - Identify healthy options and substitutions - Present healthy fast food ideas
12	Review	<ul style="list-style-type: none"> - Review concepts from previous lessons - Promote physical activity 	<ul style="list-style-type: none"> - Review nutrition concepts - Physical activity games
13	Food Groups and Portion Sizes	<ul style="list-style-type: none"> - Teach 5 food groups and portion sizes - Provide helpful tips to remember portion sizes 	<ul style="list-style-type: none"> - Draw dinner from last night on a paper plate - Teach about the MyPlate logo - Compare last night’s dinner to the MyPlate logo - Provide portion size handout that relates household objects to food portions
14	Food Group BINGO	<ul style="list-style-type: none"> - Reinforce the concept of food groups 	<ul style="list-style-type: none"> - Use BINGO boards with foods groups in the rows - Proctor calls out the name of foods - Students place a marker on the food’s correct food group
15	Review	<ul style="list-style-type: none"> - Review concepts from previous lessons - Promote physical activity 	<ul style="list-style-type: none"> - Review nutrition concepts - Physical activity games
16	Conclusion	<ul style="list-style-type: none"> - Implement post-test - Promote physical activity 	<ul style="list-style-type: none"> - Post-test - Physical activity games

Appendix 2: Pre-Post Test

Pre-Post Test




































Name: _____ Date: _____

Date of Birth: _____

1. Please put an X across the smiley face to show whether or not you like the food listed.

Mark your answer. Example:

APPLES					?
--------	---	---	--	---	---

		I LOVE THIS FOOD 	THIS FOOD IS OKAY 	I DO NOT LIKE THIS FOOD 	NEVER TRIED THIS FOOD ?
APPLES					?
ASPARAGUS					?
AVOCADO					?
BANANA					?
BELL PEPPERS					?
BLUEBERRIES					?
BROCCOLI					?
CANTALOPUE					?

CARROTS

?

CAULIFLOWER

?

CELERY

?

COLLARD GREENS

?

CORN

?

CUCUMBER

?

EGGPLANT

?

GRAPES

?

KALE

?

KIWI

?

LETTUCE









?

MANGO

?

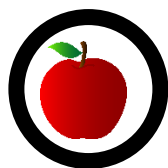
MUSHROOMS

?

ONIONS		😊	😐	☹️	?
PEACHES		😊	😐	☹️	?
PINEAPPLE		😊	😐	☹️	?
POTATO		😊	😐	☹️	?
SPINACH		😊	😐	☹️	?
YELLOW SQUASH		😊	😐	☹️	?
STRAWBERRY		😊	😐	☹️	?
SWEET POTATOES		😊	😐	☹️	?
TOMATOES		😊	😐	☹️	?
WATERMELON		😊	😐	☹️	?
ZUCCHINI		😊	😐	☹️	?

2. Look at all of the pictures in the chart above and circle the picture(s) of food(s) that you have never tasted before but would like to try. **Mark your answer. Example:**

APPLES



Please answer the following questions to the best of your knowledge:

1. In the past 24 hours, how many servings did you drink of...
 - a. Water? 0-1 2-3 4-5 more than 5
 - b. Soda? 0-1 2-3 4-5 more than 5
 - c. 100% Fruit Juice? 0-1 2-3 4-5 more than 5
 - d. Kool-Aid, Sports Drinks, or other fruit flavored drinks?
0-1 2-3 4-5 more than 5
 - e. Milk? 0-1 2-3 4-5 more than 5

2. In the past 24 hours, how many servings did you eat of...
 - a. Fruits (fresh, frozen, canned, or dried)? 0-1 2-3 4-5 more than 5
 - b. Vegetables (fresh, frozen, canned, or dried)? 0-1 2-3 4-5 more than 5

3. In the last month, how often were fruits and vegetables available in your home?
 - a. Never b. Sometimes c. Often d. Always

4. Match the following foods with their food group:

___ Beans	a. Grain
___ Rice	b. Protein
___ Pasta	c. Fruit
___ Broccoli	d. Vegetable
___ Chicken	
___ Apple	

5. How much of your plate should be fruits and vegetables?
 - a. None of my plate
 - b. One quarter of my plate
 - c. Half of my plate
 - d. All of my plate

6. What is a “processed” food?
 - a. A food that is eaten in its natural state (the way it was grown in nature).
 - b. A food that has been altered from its natural state.

For the following questions, please circle the best response.

7. Please circle the statement below that is the most correct:
 - a. I should only eat fruits and vegetables.
 - b. It is important that I eat a variety of types and colors of fruits and vegetables.
 - c. Fruit juice has the same nutritional benefit as fresh fruit.

8. Please circle the statement below that is the most correct:
 - a. If my parents are overweight, I will be overweight.
 - b. Exercise is not important if I eat enough fruits and vegetables.
 - c. What I eat affects my appearance and how well my body functions.

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