

APPLIED AND HEALTH SCIENCES



# **Six Lessons to Healthier Eating in Middle Schools Students: Investigating a Change in Knowledge and Behavior**

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## Introduction

The definition of nutrition, according to Weaver-Hightower (2010), is the process of taking in food and using it for growth, metabolism, and repair. Nutritional stages are ingestion, digestion, absorption, transport, assimilation, and excretion. Freijer, et al. (2019) state that nutrition is about eating a healthy and balanced diet. Food and drink can provide the energy and nutrients people need to be healthy and active. Understanding nutritional terms enhances and encourages better food choices. Nutrition is significantly more complicated than simply food intake. Nutrition consists of a proper balance of carbohydrates, fats, proteins, vitamins, minerals, and water.

Teaching nutrition to children is important as it can help them make better decisions when eating. Proper nutritional choices can reduce the chances of diabetes, heart problems, obesity, cancer, strokes, and cardiovascular disease in adulthood (Dietary Guidelines, 2015). The knowledge of nutrition that children obtain early in life may help them make better decisions that can influence their adult years forming their choices early in their lives. Learning to like different foods and willingness to try different foods at a young age, as well as learning to eat fruits and vegetables instead of junk food, could reduce the risk for chronic disease. Better health for future generations can happen, and teaching children healthy nutritional habits at a young age can contribute to the change. Schools are in a unique position to provide students with knowledge and skills concerning healthy nutrition and disease prevention.

The 2015-2020 Dietary Guidelines for Americans recommends that people aged 2 years or older follow a healthy eating pattern that includes a variety of fruits and vegetables, whole grains, fat-free and low-fat dairy products, a variety of protein foods and some oils. The guidelines also recommend that people limit calories from solid fats and added sugars as well as reduce sodium intake (US HHS, 2015). Although these recommendations are in place, many children do not follow them (Bauer, Yang & Austin, 2004). Between 2001 and 2010, the consumption of sugary beverages accounted for 10% of total caloric intake (Mesirow & Welsh, 2015). Between 2003 and 2010 data showed that most youth do not meet the minimum fruit and vegetable intake recommendations (Drewnowski & Rehm, 2015). In addition, calories from added sugars and solid fats contributed to 40% of the caloric intake of children and half of these calories came from soda, fruit drinks, dairy desserts, desserts, pizza and whole milk (Reedy & Krebs-Smith, 2010).

Considering the benefits of teaching children about nutrition, it is concerning that nutrition isn't a required subject in all school systems. Even though it has been proven that there are benefits to teaching kids about nutrition, the educational system generally doesn't prioritize requiring courses on nutrition or providing funding for nutrition courses. Students attending traditional schools in the U.S. receive less than eight hours of nutrition education each school year (Results, 2014). In addition, the percentage of schools that required instruction on nutrition decreased from 84.6% to 74.1% between 2000 and 2014 (Results, 2014). The educational system tries to fit nutrition or other health-related curriculum into alternative classes such as physical education. However, that strategy takes time out of the schedule that allows for physical activity. Another option would be to teach nutrition during the same time allotted for breakfast that is provided by the school or incorporated into other appropriate subjects such as Science and Math (Murimi et al., 2018).

Much food served in schools does not have high nutritional value and may teach children that fast food is a good option. For example, pizza is one of the most prevalent foods being served in schools. About 26% of all U.S. school districts serve fast food pizza to students (Weaver-Hightower, 2011). Children are learning visually what should be on a plate and many schools do not provide fresh healthy foods. School-aged children are not usually allotted a great deal of time for meals. Most meals last between only 25 and 35 minutes with some of that time spent standing in line to receive food. As a result, many children are forced to eat quickly and do not focus on what they're eating. However, some attempts have been made to increase the variety and quality of food available to students. For example many school districts provide breakfast programs for students. Since implementing breakfast programs, Yao, Liu, & Zhou (2019) found that students who eat breakfast have better grades and focus more in school.

While many attempts have been made to increase the number of schools that teach nutrition, knowledge and programs may not be maintained or properly managed. Crawford (2011) found that children are eating at minimum sufficient or excessive food calories based on the recommended federal government dietary guidelines of America. Although children are getting enough caloric intake, it has been found that children from the age of 5 to 18 eat approximately 720-950 empty calories a day Crawford (2011). Federal government dietary guidelines are helpful but are not being taught or maintained in all school districts and research shows that most children do not eat the daily nutritional requirements to assure healthy growth (US HHS, 2015; Krebs-Smith, Guenther, & Subar, 2010; Reedy & Krebs-Smith, 2010). Huynh et al. (2015) conducted a study demonstrating that slowed growth doesn't have to be permanent, with kids as old as three and four years successfully catching up through nutritional intervention and dietary counseling.

In this study, six nutrition classes were taught at a local middle school in Pueblo, Colorado, to increase nutrition knowledge and influence nutritional behavior in middle school students.

## Hypothesis

The students at Roncelli STEM Academy will improve their nutrition knowledge and improve their nutrition behavior scores after being taught six nutrition lessons.

## Methods

The samples consisted of 51 students from Roncelli STEM that were enrolled in a physical education class. The experimental group of students (N=25) were taught six lessons that came from HealthSmart Digital, Nutrition and Physical Health Curriculum. Health Smart is a comprehensive health education program that is built on research and best practices to meet the characteristic of effective health education curricula from the Centers for Disease Control (CDC). It meets national standards and is based on the knowledge and skills expectation in the CDC Curriculum Analysis Tool (ETR.org, 2019). These six lessons included: what is nutrition, assisting my eating habits, reading food labels, healthy snacks, eating healthier, eating healthier at fast-food restaurants, and assisting physical activity. The lessons were delivered twice a week. The lessons followed the curriculum fully and maintained the integrity of the curriculum. The lessons were presented in a PowerPoint format. All the activity sheets from the curriculums were used with the students. A matched controlled group of 25 students who did not received the lessons was chosen from the same school. The experimental and control groups were chosen at random.

Both groups were given a nutrition knowledge pre-test, before any lessons were completed and post-test, after the lessons were completed. The students were also given a nutrition behavior pre-test and post-test at the same time as the knowledge test. The knowledge pre-test and post-test asked students to list the MyPlate U.S. Government recommendations for food groups and serving recommendations, to develop a healthy meal plan for Breakfast, Lunch and Dinner, as well as questions concerning the benefits of eating breakfast and three healthy snacks. The behavioral pre-test and post-test asked students to recall their nutritional behavior in the past month regarding how many times they had eaten fast food, how may unhealthy snacks they had eaten daily, how many sugary drinks they had consumed daily, how many servings of fruit and vegetables they had consumed daily, and how many times they had eaten while engaging in television or video games.

The first meeting day, the students took the pre-test for nutrition knowledge and behavior. The second meeting day, students were provided the first lesson, this continued until the sixth lesson was given. After the six lessons, on the last meeting day, the students were given the post-test for nutrition knowledge and behavior. When taking the pre-test and post-test, students were separated and provided no assistance beyond instruction for the assessment. The experimental and control groups took the pre-test and post-test in the same way in the same general time period.

After the lessons were completed, the students' data was put into Excel where paired samples t-tests were analyzed from their pre- and post-test results on both the behavior and nutrition assessments. The outcome of the t-test evaluation determined whether the lessons helped students improve their nutritional behavior and knowledge concerning nutrition. Finally, a one-way ANOVA test was performed to evaluate the differences in the control versus the experimental sample that received the lessons.

## Result

There was no significant difference from pre-test to post-test in the experimental ( $p=.14$ ) or control group ( $p=.47$ ) for nutritional behaviors as found through matched t-tests. When analyzing the knowledge score through a matched t-test, both the experimental group ( $p<.0001$ ) and the control group ( $.0189$ ) showed a significant increase in nutritional knowledge from the pre-test to the post-test. A one-way ANOVA test on nutrition knowledge pre-test to post-test in both the control and experimental groups revealed that the control group had a significantly higher knowledge score at the pre-test ( $.0465$ ) showing that the control group had more knowledge coming into the pre-test than those who received the lessons. A second one-way ANOVA revealed that there was no significant difference pre-test to post-test on the nutrition behavior in the control group when compared to the experimental group.

**Table 1.**

t-test outcomes for knowledge pre-test to post-test

	Pre - Knowledge Experimental Group	Post - Knowledge Experimental Group	Pre-Knowledge Control Group	Post-Knowledge Control Group
Mean	13.2	25.6	17.1	21.3
P value	<.0001		.0189	

**Table 2.**

t-test outcome for nutrition behavior pre-test to post-test

	Pre-Behavior Experimental Group	Post-Behavior Experimental Group	Pre-Behavior Control Group	Post-Behavior Control Group
Mean	83.8	67.13	94.3	93.6
P value	.1412		.4735	

**Table 3.**

One-way ANOVA Knowledge Difference Between Experimental to Control Groups

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	1890.449	3	630.1497	16.7047	1.23E-08	2.710647
Within Groups	3244.169	86	37.7229			
Total	5134.618	89				

**Table 4.**

One-way ANOVA Behavioral Difference Between Experimental to Control Groups

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	7780.153	3	2593.384	0.893221	0.448206	2.713227
Within Groups	243886.1	84	2903.406			
Total	251666.3	87				

### Discussion

When examining the children's behavior data, neither the students that received the lessons nor the control group had a significant change in their nutritional behavior. Although, when looking at the students' scores individually, it was found that many of the students in the experimental group individually increased their consumption of fruit and vegetables and decreased their intake of junk food. This may have been influenced by the lessons or by other factors.

The knowledge data revealed a significant increase in both the experimental and control groups. The difference for the students that were taught the six lessons of nutrition was greater than the control group. The one-way ANOVA for the knowledge score data showed that the control group had a higher knowledge score before the experiment when compared with the experimental group. The groups were randomly chosen and unfortunately the two groups were not matched for nutritional knowledge at pre-test, which may have affected the outcomes. Although the students that were in the control group had more knowledge than those that received the lessons, it is important to note that these two groups came from the same school. It is possible that some crossover of information occurred between those students that received lessons and some of those that did not receive lessons through friends or other discussions. To improve the study, it would be important to have a control group from a completely different school. Another limitation of the study was the small size of the groups. The limited number of subjects may have also skewed the data. One additional confounding factor was the short timing of the lessons and the possible influence of culture and/or nutritional habits of the student's family.

### Conclusion

The results can conclude that nutritional behavior did not significantly change after six nutrition lessons in a group of middle school students, although some individual students did show beneficial behavioral changes. The results also concluded that nutrition knowledge did significantly increase in the group after the six nutrition lessons. This study also demonstrated that teaching knowledge lessons alone will not necessarily translate into behavioral change.

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