

# Nutrition Education Provided by a Dietetic Intern Improves the Nutrition Knowledge and Behaviors of Mississippi High School Culinary Students

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## RESEARCH

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## ABSTRACT

Obesity rates in the United States have been on the rise and the state of Mississippi (MS) has the highest rate of obesity in to the nation. Mississippi also has the highest rate of hypertension and cardiovascular disease compared to the rest of the states. Desoto County is located in the northwest part of MS, and has a high rate of obesity among high school students at 18.9%. The factors that contribute to the high rate of obesity include food insecurity, lack of nutrition education and lack of culinary education. Food insecurity involves food deserts where there is not access to fresh

fruits, vegetables, farmers' markets and grocery stores. Most of Desoto County is saturated with fast food restaurants, which then increases health risks. Nutrition education is paramount to improving health outcomes and should include the individuals involved in food preparation. The Desoto County Technology Center High School Culinary Arts program is designed to train future culinary experts. The purpose of designing a nutrition education program is to help the students understand the relationship between foods to create healthier cuisines at their future place of employment, along with an improvement their nutrition behaviors. The goal of the research was to develop a curriculum and outcomes. Evaluation measures which included pre-test and post-test evaluations of general nutrition knowledge and behaviors of culinary students to determine if the education improved nutrition knowledge. The program curriculum was designed by a Dietetic Intern, Abigail Mills, from the University of Memphis Clinical Nutrition Masters/Dietetic Internship Program and was implemented into the DeSoto County Technology Center High School Culinary Arts. A total of 48 students in Culinary I and Culinary II classes were asked to participate in the study. The Dietetic Intern created lessons and activities that were taught throughout the year based on the Mississippi Board of Education competencies. Nutrition knowledge and behaviors of the students were measured by pre-test survey given at the beginning of the year and post-test at the



completion of the culinary course. The survey consisted of nutrition background knowledge and nutrition behavior. Once the course concluded, the results were analyzed to determine if there was an overall enhancement of nutrition knowledge and behaviors for these culinary students. The post-test scores were significantly greater than the pre-test scores in each section for both culinary I ( $p=0.003$ ) and culinary II ( $p=0.003$ ).

**Key Words:** Education; Nutrition; Culinary arts.

## Introduction

Obesity rates in the United States have been on the rise and the state of Mississippi (MS) has the highest rate of obesity in the nation (1). Mississippi also has the highest rate of hypertension and cardiovascular disease deaths compared to the rest of the states (1). Many residents of MS report that they do not consume many fruits or vegetables during the day (2). DeSoto County is located in the northwest part in the state of MS and has the highest rate of obesity in the state; with adults at 35.2% and high school students at 18.9% (2). Factors that contribute to the high rate of obesity include food insecurity, lack of nutrition knowledge and lack of culinary education on how to prepare a healthy home cooked meal (2). Food insecurity involves food deserts where there is not access to fresh fruits, vegetables, farmers' markets and grocery stores. Most of DeSoto County is saturated with fast food restaurants, which then increases health risks of diabetes, hypertension, and obesity. DeSoto County schools teach nutrition education up until the 9th grade with the time spent on educating about nutrition is 4-5 hours per school year. Once the student reaches the high school level, the students have the option to take nutrition as an elective course. Nutrition instructors expressed that current resources are out of date and students respond with no interest in learning the curriculum. The culinary class instructor at DeSoto County Technology Center-West expressed that she would like to have someone with a nutrition background come into the program and implement nutrition education.

The aim of the study was to make an impact on adolescents who are living in the largest county by population in the state of Mississippi to demonstrate why nutrition is important in order to decrease the high rate of diabetes and hypertension. After completion of the program, the culinary students would know how to prepare healthy meals, learn basic nutrition knowledge and purchase healthy foods on a budget.

## Materials and Methods

The research project was conducted at the DeSoto County Technology Center–West in Horn Lake, Mississippi. The project received Institutional Review Board (IRB) approval and all students and parents signed a consent and assent at the start of the study. The principal investigator and the co-investigators completed human subjects training before the study began. The Dietetic Intern was hired from the University of Memphis and worked 40 hours a month with the culinary instructor and students. The Dietetic Intern used an already developed pre-test and post-test that contained nutrition education and nutrition behavior questions (multiple choice and true or false) (3). The survey had a grading tool to interpret the responses. At the beginning of the school year, the Dietetic Intern gave the pre-test to all the students.

The Culinary Arts Program at DeSoto County Center-West schools covered the following units:

### Culinary Curriculum Year I Includes (Culinary I):

1. Unit 1: Orientation
2. Unit 2: Food Safety and Sanitation
3. Unit 3: Safety in the Workplace
4. Unit 4: Professionalism and Utilizing Standard Recipes
5. Unit 5: Equipment and Techniques
6. Unit 6: Stocks, Sauces, and Soups\*\*
7. Unit 7: Fruits and Vegetables\*
8. Unit 8: Potatoes and Grains\*\*
9. Unit 9: Serving Your Guests
10. Unit 10: Communication
11. Unit 11: Building a Successful Career in the Industry



12. Unit 12: Overview of the Food Service and Hospitality Industry

13. Unit 13: Management Essentials

### **Culinary Curriculum Year II includes (Culinary II):**

14. Unit 14: Introduction

15. Unit 15: Dairy Products, Breakfast Food, and Sandwiches\*\*

16. Unit 16: Nutrition\*

17. Unit 17: Salads and Garnishing\*\*

18. Unit 18: Meat, Poultry, and Seafood\*\*

19. Unit 19: Desserts and Baked Goods\*\*

20. Unit 20: Marketing

21. Unit 21: Sustainability in the Food Service

### **Industry**

22. Unit 22: Purchasing, Inventory and Cost

### **Control**

23. Unit 23: Global Cuisine

24. Unit 24: Other Food Service Certifications

## **The following objectives guided the education provided by the Dietetic Intern**

### **Culinary I**

#### **Unit 7: Nutrition Objectives\* include:**

1. The role of fruits and vegetables in a healthy diet.
2. Vitamins and minerals obtained by eating fruits and vegetables.

### **Culinary II**

#### **Unit 16: Nutrition Objectives\* include:**

1. The role of fiber and phytochemicals in bodily functions.
2. Identify and discuss the role of carbohydrates, lipids, proteins, vitamins, minerals, and water.
3. Define cholesterol and list food sources.
4. Define protein and list food sources.
5. Identify three major vegetarian diets.
6. List the fat- and water-soluble vitamins and discuss the functions of water and minerals in the body.

7. Define food additives and the roles they play in food.

8. Identify ways to modify a recipe to make it healthy and nutritious (ex. reducing fat, salt, or refined sugar).

9. Define the criteria for food to be labelled organic.

*An asterisk (\*) indicates current nutrition education units. A double asterisk (\*\*) indicates units where the intern will add nutrition education.*

The Dietetic Intern developed nutrition components for units 6, 7, 8, 15, 16, 17, 18 and 19. The components included lectures and labs in the kitchen provided by DeSoto County Technology Center–West.

Culinary I students discussed Unit 7 covering fruits and vegetables. Even though the textbook did not cover the importance in detail, the Dietetic Intern added more information about how fruits and vegetables play a vital role to overall health. This led to discussion about how fruits and vegetables can be implemented in menus and recipes, such as how to prepare them in a nutritious way.

Culinary II students had a unit designated only to nutrition, unit 16. The Dietetic Intern covered requirements by the Mississippi State Board of Education, along with adding more information and education to increase the students' knowledge of nutrition. The lessons specifically covered the importance of calories, fat, and sodium content of recipes.

Once the culinary students had completed the course, they were given the post-test in the month of April and the answers were graded and compared for analysis.

The time frame of the research project was 12 months.

### **Participants**

All Culinary I and II level students were eligible to participate in the research study and all agreed to participate and consent from parents and assent from the students was obtained. Culinary I students consisted of one sophomore and the remainder juniors. Culinary II students consisted of all seniors. Culinary II students had previously completed taking the Culinary I course. All the students agreed to participate. The research project was part of an addition to the regular procedures for the course; therefore,



this was a convenience sample. A pre-test was administered at the beginning of the school year and a post-test was administered at the end of the school year. The pre-test and post-test survey included two sections: nutrition knowledge and nutritional behavior questions. Once the students returned the assent and content, they were assigned a number 1-45. Although 46 students agreed to participate only 45 students were available to take the pre-test.

The Dietetic Intern and Culinary Instructor kept a list of the students' names and numbers in order to keep them matched and if a student happened to forget their number during the school year. The co-investigators were not been provided a list of student names.

## Survey

Two surveys were given to the students; the General Nutrition Knowledge Questionnaire (GNKQ) (3) and the Adolescents' Food Habits Checklist (AFHC) (4), at the same time.

The GNKQ was created and validated for the United Kingdom's population for all ages by registered dietitians and physicians. It contains a series of questions with four sections: general nutrition knowledge, knowledge of specific food groups, choosing foods, and health related diseases. One section, titled "diet and disease" was removed because the topic was not to be covered in the units of the culinary classes. The Dietetic Intern renumbered the sections to flow in order based on removal of one section. The validated information on the questionnaire found that nutrition knowledge has highly correlated with the characteristics involving demographics, gender, age, education, and socio-economic status (4). Section one of the survey included questions regarding basic nutrition knowledge. Section Two included questions about food groups and nutrients. Section Three included choosing foods and comparing nutritional value. Section Four included questions about disease states and choosing appropriate food items. Section Five provided demographic information of each student.

The questionnaire provided a scoring rubric to interpret the results of the participants' responses. Based on the background research of the development of this questionnaire, the statistician for this research project was able to report results and compare them to what has been concluded in past studies (3).

The AFHC checklist is a one page survey of true or false questions regarding adolescent's behavior towards nutrition; with a note of consumption of high levels of fat and low levels fruits and vegetables (4). The results of the students' behavior showed specific motivations of promoting good health. The AFHC tested food choice situations, because at the adolescent age, there is more personal freedom to make individual decisions (4). The checklist was provided with a scoring rubric for the statistician for this research project to report results and compare the responses.

Each student had an assigned number 1-45 that only the Dietetic Intern and statistician knew. The pre-tests and post-tests are kept in a folder kept in Dr. William-Hooker's office, room 161 A1, in a locked file cabinet located in the Roane Fieldhouse at the University of Memphis.

During the first week of the school year, the pre-test was administered. At the end of the course in April, the Dietetic Intern administered the questions in a post-test to determine if nutrition knowledge and nutrition behavior were improved after receiving nutrition education from the Dietetic Intern.

## Results

Forty-six students agreed to participate in the study, however, when pre and post tests were given, some students were absent, therefore results are reported on the 42 students that took both tests. As Table 1 and Table 2 show, there were students from a number of ethnic groups and females outnumbered the males.

**Table 1: Ethnicities of Students in the Culinary Program (n=46).**

Group	Black	White	Mixed	Hispanic	Other
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Culinary I - Pre	13	7	1	3	1
Culinary II - Pre	2	10	4	1	0
Culinary I – Post	15	6	0	3	1
Culinary II – Post	4	10	1	3	0

**Table 2. Gender of Students in the Culinary Program (n=42).**

Group	Pre		Post	
	Female	Male	Female	Male
Culinary I	20	5	20	5
Culinary II	12	5*	12	6*
*Difference in number is due to one student being absent.				

To determine whether there was a change in nutrition knowledge and behavior due to the education provided, pre and post scores were calculated and compared to see if the mean difference in pre and post scores was zero. A two-tailed test was performed.

For the Culinary I group, there were 25 pre/post question pairs. On average, the post scores were greater than the pre-scores in each section of the survey. See Table 3. Although students improved in every section of the test, only sections 3 and 4 showed a significant improvement. However, in total the difference of the pre and post-tests was significant ( $p=0.003$ ), see Table 4.

For the Culinary II group, there were 17 pre/post question pairs. As Table 5 shows, on average the post scores were greater than the pre-scores in each section. See Table 5.

Improvement was seen in all test section 3, towards the improvement was statistically significant in Section 1 ( $p=0.027$ ), Section 4 ( $p=0.007$ ) of the survey and in total ( $p=0.003$ ) as evidenced by the p-values highlighted, in Table 6.

**Table 3: Culinary I Scores pre-test and post-test.**

Section	Possible Points	Average score	Percent age	Female Ave.	Male Ave.
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Pre					
Section 1	17	11	64.71%	11.25	10
Section 2	31	18.08	58.32%	18.50	16.4
Section 3	12	7.12	59.33%	7.60	5.2
Section 4	19	10.88	57.26%	11.6	8
Total	79	47.08	59.59%	48.95	39.60
Post					
Section 1	17	12.24	72%	12.48	11.25
Section 2	31	20.24	65.29%	21.05	18.25
Section 3	12	8.2	68.33%	8.48	7.25
Section 4	19	12.32	64.84%	12.90	10.25
Total	79	53	67.09%	54.90	47

**Table 4: Culinary I statistical analysis of pre-test vs. post-test.**

	Mean	S.E.	t-value	p-value
Section 1	0.905	0.613	1.476	0.156
Section 2	1.667	0.972	1.715	0.102
Section 3	0.905	0.377	2.398	0.026
Section 4	1.571	0.550	2.856	0.010
Total	5.048	1.495	3.376	0.003

For Culinary I, a McNemar test was used to determine if the nutrition intervention had an effect on the responses to the AFHC. In Table 7, the numbers of good choices versus poor choices pre-intervention and post-intervention are summarized for all twenty-three questions and for each participant that completed both a pre- and post- survey. An explanation of the entries in the table are as follows: there were 162 responses that indicated a good choice on both the pre- and post- surveys, there were 61 responses that indicated a poor choice on the pre-test and a good choice on the post.

Lastly, the test statistic for the McNemar test was used to determine if the AFHC test scores were correlated to the improvement in nutrition knowledge. The test statistic for the McNemar test was 0.4261 ( $p\text{-value}=0.5139$ ), indicating that was no significant impact of the nutrition class on the responses of the Food Habits survey for the Culinary I students. The change pre- and post- for the AFHC survey was compared with the change from pre- to post- on the knowledge survey. The correlation between habits and

knowledge was -0.4113 indicating that better habits were negatively correlated with increased nutrition knowledge.

**Table 5: Culinary II Scores pre-test and post-test.**

Section	Possible Points	Average score	Percent age	Female Ave.	Male Ave.
<b>Pre</b>					
Section 1	17	11.47	67.47%	11.83	10.6
Section 2	31	20.59	66.41%	20.08	21.8
Section 3	12	8.29	69.12%	8	9
Section 4	19	11.59	60.99%	11.67	11.4
Total	79	51.94	65.75%	51.58	52.8
<b>Post</b>					
Section 1	17	13.11	77.12%	13.17	13
Section 2	31	21.89	70.61%	21.25	23.17
Section 3	12	8.56	71.30%	8.5	8.67
Section 4	19	13.67	71.93%	13.42	13.17
Total	79	57.22	72.43%	56.33	59

**Table 6: Culinary II statistical analysis of pre-test vs. post-test**

	Mean	S.E.	t-value	p-value
Section 1	1.706	0.701	2.435	0.027
Section 2	1.353	0.675	2.005	0.062
Section 3	0.412	0.438	0.941	0.361
Section 4	2.118	0.680	3.114	0.007
Total	5.588	1.572	3.555	0.003

**Table 7: Culinary I responses on AFHC pre-test vs. post-test.**

		Post- Results	
		Good Choice	Poor Choice

Pre-Results	Good Choice	162	54
	Poor Choice	61	161

The same McNemar test was conducted for Culinary II from the responses to the AFHC. The responses to all 23 questions were included for all participants that had both pre- and post- surveys completed. The results are summarized in Table 8. The table is interpreted in a similar manner as Table 7. For the Culinary II students, there were 106 responses on the AFHC survey that correspond to good choices in the pre- test and post-test. There were only 29 responses that represented good choices in the pre- test that changed to poor choices in the post- test.

**Table 8: Culinary II Responses on AFHC Pre-test vs. Post-test.**

Pre-Results		Post- Results	
		Good Choice	Poor Choice
	Good Choice	106	29
	Poor Choice	51	160

The test statistic for the McNemar test was 6.05 ( $p=0.01391$ ), indicating that the nutrition course did effectively change the AFHC responses. When compared, the number of pre- poor choices that changed to good choices in the post- test 51 to the number of pre- good choices that changed to poor choices 29 it is clear that the majority of change was an improvement in AFHC responses.

The change pre- and post- for the Food Habit survey was compared with the change from pre- to post- on the knowledge survey. Pearson's correlation coefficient was 0.1942, indicating a moderate positive correlation between the participants Food Habit scores and their knowledge scores.

## Conclusion / Discussion

In conclusion, the knowledge of nutrition increased in both Culinary I and Culinary II students. Culinary II students had a previous nutrition class in Culinary I (taught





by the Culinary Instructor), however the Dietetic Intern provided more in depth information. This is evident in the higher pre-scores when compared to the Culinary I scores. The higher scores in Culinary II group show that the students retained previous knowledge obtained in their Culinary I classes. Having a dietetic intern teach high school culinary students has proved to be an effective way to teach high school students about nutrition. Implementing nutrition education in all high schools can increase knowledge about food potentially decreasing the rate of obesity, diabetes, and hypertension.

Vardanjani, et al reported that nutrition education in a primary school, where 72 females were provided education on the dangers of junk food, reducing the intake of these foods and how to increase more nutritious foods was provided in 4 sessions. (5) Students in this study showed an improvement in knowledge, attitude and performance related to nutrition. Another research dissertation, where female high school students took a nutrition education class (n=17) showed improved nutrition intake compared to the control group (n=5). (6) Although these were not culinary high school students, these results support the current study, that proper education can improve nutrition knowledge and behaviors.

Future research would involve multiple high schools in the county to have a one-year (2 semesters) program teaching nutrition along with a pre-test and post-test to determine increase in nutrition education. Lessons would include field trips to farmers' markets and grocery store tour (5).

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## PEER REVIEW

Not commissioned. Externally peer reviewed.

