

APPLICATION OF AN ANDRAGOGICAL APPROACH AND EXPERIENTIAL
LEARNING FOR TEACHING CULINARY NUTRITION TO CULINARY ARTS
STUDENTS

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by
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ABSTRACT

Excessive consumption of calories, protein, fat, and salt has been linked to obesity, cardiovascular diseases, diabetes and many other diseases. The nutrients provided to consumers by restaurant food, including calories, protein, fat, and salt, pose challenges for the health status of Americans and may fuel the obesity epidemic, contributing to otherwise preventable diseases. Chefs are in the unique position of creating healthier menu choices. Since many chefs may have limited knowledge of culinary nutrition, educating culinary arts students on applied nutrition is a viable strategy for improving the healthiness of restaurant menus, thereby improving the health of the population.

This research project consists of two sub-studies: Study I and Study II. Study I included administering two surveys to identify potential gaps in knowledge of culinary nutrition using a sample of $n=41$ students in the southeast region of the U.S. and an online sample of $n=250$ students nationwide. Both surveys determined that the majority of students were familiar with nutritional characteristics of fat and protein but were lacking in applied knowledge related to dietary sodium.

Study II was a randomized controlled trial that compared the effectiveness of traditional lecture as the control group (C), demonstration presentation (DP), online lecture capture presentation (OP), and the combination of (OP+DP) to inform culinary arts students on ways to reduce sodium in recipes. Interventions were designed using andragogical principles and a tradition of experiential learning. To conduct the evaluation a convenience sample of $n=139$ students were randomized to receive either the C, DP,

OP, or OP+DP intervention. To measure effectiveness of each instructional method, a nutrition survey was administered as a pre-test, a post-test, and an eight-week follow-up. There was no statistically significant difference in performance between DP, OP, and OP+DP groups on each subscale. Yet, participants' performance following the DP, OP, or OP+DP methods was superior compared to the traditional lecture method (C). In general, OP+DP results suggested that this intervention is possibly more effective as compared to OP or DP. There was evidence of long-term program effectiveness at the eight-week follow-up, and resultant outcomes were higher when compared to pre-intervention status. These three (DP, OP, and OP+DP) methods also resulted in approximately the same level of student satisfaction. Utilizing the findings of Study I and Study II, the project evaluated strategies to improve students' knowledge level regarding sodium and sought to equip them with skills to prepare flavorful foods with minimal sodium content.

DEDICATION

I first assign my deepest thanks to *Allah*, the almighty, for the accomplishment of this work. May I forever use my knowledge and talents in ways that are pleasing to Him.

I lovingly dedicate this work to:

- King Abdullah Bin Abdulaziz Al-Saud, the former king of Saudi Arabia, who was always supportive to women. King Abdullah was the founder of the King Abdullah Scholarship Program that I had been awarded to pursue my higher education in the United States. May Allah have mercy on him.
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CHAPTER ONE

INTRODUCTION

Preventable non-communicable diseases (NCD) account for a large proportion of morbidity, mortality, and healthcare costs in the United States (U.S.). Research revealed that treating people with NCD accounts for at least 80% of health expenditures in this country (Murray et al., 2013; Ward, Schiller, & Goodman, 2014). As of 2012, over 117 million Americans have at least one chronic disease. Chronic diseases represent 7 out of the top 10 causes of death (Ward et al., 2014). Cardiovascular diseases (CVD) and cancer accounted for over 50% of all deaths in the U.S. (N. B. Johnson et al., 2014). The major modifiable risks that result in premature morbidity and mortality are smoking, physical inactivity, substance abuse, and poor diet (Calitz, Pollack, Millard, & Yach, 2015).

More specifically, modifiable risk factors of CVD, the number one cause of death in the U.S., include diet, hypertension, diabetes, physical inactivity, obesity, smoking, and others. These factors are interlinked with each other. For example, obesity is a significant factor that was independently linked to diseases, such as stroke, hypertension, dyslipidemia, and endometrium, breast, and colon cancers (Simons-Morton et al., 2010; Kenchaiah et al., 2002). Conversely, people can reduce their chance of CVD by exercising, quitting smoking, maintaining normal weight, and eating a healthy and balanced diet. The present study focuses on the modification of dietary factors through chef education to reduce the risk of developing CVD and some other diseases.

Although adopting healthy diets seems like an easy intervention, there are many cognitive, psychological, and environmental determinants that interfere with adoption of healthy eating behaviors. People consume food prepared at home or purchase prepared food from various food establishments. The later category is also known as food-away-from-home (FAFH) and includes quick-service and full-service restaurants. People have more control over nutritional content of their food when cooking at home, but they are less likely to make healthy food choices when eating out. Frequent consumption of FAFH has been linked to overconsumption of many nutrients including fat, protein, and salt, which together may increase risks of various chronic diseases, such as obesity and CVD (Fulkerson et al., 2011). Unfortunately, a host of cultural, social, and economic factors have resulted in the increased FAFH consumption over the last few decades (The Keystone Center, 2006). Consumers cannot simply abandon their eating habits overnight; therefore, it is unrealistic to expect the trend of eating out to change in the near future.

Since consumers are unlikely to markedly reduce eating FAFH, a possible venue for reducing undesirable health impact of FAFH is by making restaurant foods healthier and more nutritionally balanced. Chefs and restaurant owners control which ingredients are used in food preparation. Restaurant operators, fearing decline in revenues, have been reluctant to make changes to their menus (Scourboutakos & L'Abbé, 2014; Wu & Sturm, 2014). Even though restaurant operators exercise ultimate control over food content, it can be argued, chefs are, at the very least, partially responsible for the type of food consumed by patrons. Furthermore, chefs have the ability to make foods healthier without any impact on attractiveness of menus to consumers and/or profitability of restaurants.

For example, when designing menus, chefs may replace unhealthy ingredients with healthier alternatives, such as reducing dietary sodium and replacing it with herbs and spices. Unfortunately, chefs may have insufficient knowledge about the health impact of the food they prepare and may lack practical skills to select healthier alternatives (Condrasky, Baruth, Wilcox, Carter, & Jordan, 2013). Thus, chefs can benefit from learning health conscious cooking practices, and many culinary arts programs do include topics about healthy nutrition in the curriculum.

Currently, the research on the nutrition competence of culinary arts students is very limited. In fact, a search of major academic databases found no peer-reviewed articles addressing the problem of education of culinary arts students regarding their culinary nutrition confidence. Thus, there is a gap in the literature as it is unknown what would be the optimal way to design culinary nutrition education programs that would produce students well versed in the preparation of healthy and great-tasting food.

CHAPTER TWO

LITERATURE REVIEWS

Culinary Arts and Nutrition Education

What is culinary arts?

To get a clearer idea as to how nutrition education could improve menus and impact the eating habits of those who eat out, it is necessary to understand what culinary arts and nutrition are. According to the Merriam Webster definition, culinary is a word “relating to the kitchen or cookery” (Culinary, 2014). Cooking is “the practice or skill of preparing food by combining, mixing, or heating ingredients” (Cooking, 2014). Thus, the culinary arts is the art of preparing or cooking food. A culinarian or a culinary artist is a person working as a “chef, cooker, and cook” to prepare food for eating (Culinarian, 2014). Culinarians work in different places and work environments where kitchen responsibilities may vary depending on the type of institution or business, such as restaurants and other eating establishments, traveler accommodation, special food services, and other amusement and recreation industries (U.S. Department of Labor, 2014).

Culinary Arts/Chef training programs as defined by the U.S. Department of Education, (2010), is

a program that prepares individuals to provide professional chef and related cooking services in restaurants and other commercial food establishments. Such a program includes: instruction in recipe and menu planning, preparing and

cooking of foods, supervising and training kitchen assistants, the management of food supplies and kitchen resources, aesthetics of food presentation, and familiarity or mastery of a wide variety of cuisines and culinary techniques (U.S. Department of Education, 2010, para.1).

Culinary arts programs typically parallel laboratory practice with classwork to provide students with fundamental cooking techniques and skills with an emphasis on professionalism in the culinary industry.

According to Adapon et al. (2002), culinary arts is defined as the preparation of food. Gustafsson (2004) details how rather than just focusing on the preparation of food, culinary arts focuses on the stylistic history and social aspects of food, the architectural aspects of food, social interactions in different groups, and the design of food. All of these things are held in high regard when it comes to ensuring the success of a menu, as they all go a long way towards guaranteeing customer satisfaction. A great deal of further thought goes into each category, including meeting the expectations of those who will be selecting from a menu and eating the food prepared.

What is nutrition?

Nutrition is a science that studies relationships between nutrients and maintenance of health, growth, reproduction, and well-being of individuals. Insel (2009) pointed out that good nutrition is not just about what people eat, it is also about what happens when they do not eat everything that is needed to make sure they maintain their overall health. Consequently, when preparing dishes, chefs need to take into account whether they are nutritionally balanced (Shickle, Lewis, Charny, & Farrow, 1989). Although it will not

always be practical to produce a meal that guarantees a customer is getting everything they need to meet their nutritional needs for the respective part of a day, a chef's awareness of basic nutritional concepts may improve the quality of food.

The difference between nutrition education and culinary arts education

Nutrition education and culinary education are two separate disciplines, but that does not mean that the two cannot be tied together (M. Condrasky, Graham, & Kamp, 2006). As Condrasky suggested, it is possible to combine the two symbiotically so that culinary nutrition is developed. Nutrition education aims to inform people about the health choices they need to make voluntarily in order to ensure they stay healthy (Contento, 2010). According to a study by Maclellan et al. (2011), nutrition education can include practices such as cooking classes. Maclellan's paper shows that there is evidence of cooking classes leading people to voluntarily adopt healthy eating practices, which ties in with Contento's definition. In contrast to nutrition education, the culinary arts are notably different. The culinary arts, according to Donovan (2004), place emphasis on guests' satisfaction through food presentation and taste.

Ellis (2003) went even further towards demonstrating how culinary education is different from nutritional education. Ellis (2003) pointed out that the rise of the celebrity chef has placed more of an emphasis on image, thereby allowing culinary education to focus more on taste and image than overall nutrition.

What is Culinary Nutrition?

According to Condrasky and Hegler (2010), "Culinary nutrition is the application of nutrition principles combined with food science knowledge and displayed through a

mastery of culinary skills” (p.1). In other words, culinary nutrition is a combination of culinary arts and nutrition science to prepare dishes that are healthy, highly palatable, and aesthetically pleasing.

Overview of Culinary Arts Programs

Culinary arts programs include career opportunities in a variety of sectors, such as services within restaurants, catering, institutional food providers, hospitality establishments, and recreational as well as entertainment venues. For chefs to reach the point where they can practice culinary arts, they must take part in at least one of several training programs. These range from basic apprenticeship and certification programs to certificates and degrees that specialize in the culinary arts. With regard to professional certification, candidates in the United States must fulfill a number of requirements, which include work experience, academic, and specialized training (Hu, Leong, Wei, & Yeh, 2005).

Currently, the American Culinary Federation is the largest professional chefs’ organization in North America with more than 20,000 members across the U.S. ACF accredits almost 156 secondary programs and 430 postsecondary programs in 376 institutions (The American Culinary Federation, Inc, 2013, para.5). Specific knowledge and competency areas required by the Accrediting Commission of the American Culinary Federation include the following knowledge areas: “introduction to food service, sanitation and safety, food preparation, food cost accounting, beverage management, and dining room service, nutrition, garde manger, menu planning, basic baking, purchasing and receiving, and supervisory management” (The American Culinary Federation, Inc,

2011, p.31). These areas of knowledge and competence are developed to state the expectation of culinary professionals for students' knowledge upon completion of a two-year, post-secondary education program (The American Culinary Federation, Inc, 2011).

Culinary arts curriculum varies depending on the certification. Emphasis in these programs is on technique and business management. Practical experience in the kitchen or the dining room attached to the school is typically included in the program. In the most traditional culinary arts associate degree programs, students take at least one basic nutrition course. In fact, almost 83% of 232 associate degree culinary arts programs evaluated in a study by Hertzman and Stefanelli, (2008), required at least one nutrition course.

Overview of Food Service Industry

Many types of restaurants exist in the U.S. Their characteristics vary from quick- and casual-service to full-service dining places. Eating places within the commercial restaurant segment are classified by the National Restaurant Association (NRA) as follows: table-service restaurants, which include fine dining and casual dining, quick-service restaurants (also known as fast-food restaurants), cafeterias and buffets, social caterers, as well as snack and nonalcoholic beverage bars. (National Restaurant Association, 2014a).

According to the NRA, representing nearly 500,000 restaurant businesses in the U.S., it is estimated that the food service industry will add 1.3 million jobs for chefs, cooks, and food service workers over the next decade. In the past decade, the number of restaurant employees has increased from 11.9 million in 2004 to 13.5 million in 2014.

This number is expected to reach 14.8 million by 2024, which is close to 10% of the total U.S. workforce (National Restaurant Association, 2014b). The United States Department of Labor reported that there were 941,520 cooks employed by restaurants. This number includes 489,060 fast-food cooks (U.S. Department of Labor, 2014).

The increasing number of restaurants and restaurant employment is rising because restaurants are becoming an essential part of daily life in the U.S. Surveys suggest that 93% of Americans enjoy going to restaurants, and 45% of adults think that restaurants are an essential part of their lifestyle (National Restaurant Association, 2014a). Americans are dining out more than ever and have increased the amount of money spent at restaurants, from 25% in 1995 to nearly half of their food dollar expenditures in 2013. Food expenditures have been growing for the last 40 years to a total of \$683.4 billion in 2014. This accounts for the \$1.8 billion restaurant-industry daily sales (National Restaurant Association, 2014a).

Americans in the highest income groups spend almost 48% of their food budget on away- from-home food, while the lowest income groups spend only 30%. The lowest income group also spends the majority of their annual food expenditures income on food at home. This may also reflect the type of dining they chose while eating away-from-home. The most consumed meal while eating away-from-home for both lowest and highest income groups is dinner followed by lunch and breakfast and finally snacks and nonalcoholic beverages (US Bureau of Labor Statistics, 2010).

Kant et al. (2004) showed that Americans ate out more frequently from 1999 to 2000 than they did from 1987 to 1992. In 1999 and 2000, almost 2.8 meals per week

were consumed away from home by 24% of Americans, and an average of three or more meals per week were consumed away from home by 41%. Thus, Americans today consume a majority of their nutrients through away-from-home food sources. For this reason, the nutritional value of the foods offered in these outlets become more significant to the general quality of the diet. Therefore, the certification process within the culinary arts field should emphasize knowledge about how to cook and serve nutritionally balanced meals side-by-side with food presentation and taste.

Factors Motivate Consumers to Eat Out

It has been well documented that a shift towards eating out more and cooking at home less has occurred. However, not all customers' motivations are the same. According to International Food Information Council (IFIC)' Food & Health Survey (2011), people vary regarding their motivation for eating out. Generally, taste is the most important factor that influences the consumer's selection of food in restaurants (69%) (IFIC, 2011). However, according to their 2013 Food & Health Survey, even though taste remains the most important factor for motivating the consumer's food selection (89%), price (71%), healthfulness (64%), convenience (56%), and sustainability (36%) are also important factors that contribute to consumers' selections of food (International Food Information Council, 2013). This section discusses factors that motivate consumers to eat out.

Taste

Taste is one of the most important factors that motivate consumers to eat out (National Restaurant Association, 2014b). Sixty-eight percent of adults participating in

the NRA's survey indicated that flavor and taste sensations found in their favorite restaurant foods cannot easily be replicated at home. Palmer and Leontos (1995) established that what consumers actually do when it comes to making menu selections in restaurants is not necessarily consistent with what they said is most important to them from a health perspective. For example, American consumers report that they are more careful about their choices when dining out and that they actively look for low-fat items on the menu. Yet, their behavior suggests that, regardless of their concerns, they still make their choices at the table based primarily on taste and on their expectations about taste more than any other factor (Palmer & Leontos, 1995).

Cost

Most consumers take into account price when they make their decision to eat away from home or when they choose the restaurant type (US Bureau of Labor Statistics, 2010). According to the NRA (2014a), 79% of their survey respondents said that they would dine out more often if prices of menu items were lower during off-peak times. This indicates that cost of away-from-home foods play an essential role in consumers' decisions when deciding to eat out.

Social, Enjoyment, and Convenient

Alongside the areas discussed, issues such as social aspects, enjoyment, and convenience are considered important reasons why people eat out. According to the NRA survey, 93% of adult respondents enjoy going to restaurants, and 79% of adults believe that eating away from home with family and friends offers an opportunity to socialize and provides a better way to make use of leisure time rather than cooking at home (National

Restaurant Association, 2014a). In addition and as suggested by Powers and Hess (2013), convenience is an important factor that motivates consumers to eat out since time and cooking skills may be limiting factors for the home cook. Kowrygo and Halicka (2011) study also showed that customers want food that is fast and convenient.

Nutrition value

Today, the level of nutrition knowledge among the general public has become relatively high. The NRA (2014a) reported that 81% of consumers who participated in their study selected healthy options from restaurant menus, as compared to two years ago, and 76% were more likely to visit an eating establishment that offered a variety of healthy options (National Restaurant Association, 2014a). Furthermore, 34% of consumers have used the Internet to search for nutritional information about restaurant food (National Restaurant Association, 2014a). International Food Information Council (IFIC)'s Food & Health Survey (2011) also found that consumers thought that the total nutritional value was significant when they think about the overall healthfulness of food in restaurants, and 70% of Americans consider stating calories on menus as helpful in making informed decisions about what they eat (IFIC, 2011).

Lin et al. (1999) showed that those who ate away from home were impacted by what chefs produce. In addition to eating more calories than they should, those who eat away from home also get less iron and more sodium than recommended. It may be the case that trained chefs are producing meals that are not always nutritionally balanced since they may not be equipped with the knowledge to do so.

Communication with the consumer is important. When a menu includes only a limited number of nutritionally balanced options or when those options are presented in a separate “dietary modified” section of the menu, consumers tend to revert to their previous habits of opting for the more familiar dishes whose description creates the expectation of more enjoyment (Guthrie, Lin, & Frazao, 2002). Palmer and Leontos (1995) also demonstrated that chefs had the opportunity to overcome those expectations and other behavioral barriers that could improve choices for patrons. If chefs who receive training are able to make the nutritionally balanced dishes as palatable as their other offerings, then consumers may become more receptive to those nutritious choices and change their behavior.

A study of chefs’ attitudes and knowledge of healthy eating by Middleton (2000), illustrated that when chefs practice healthy cooking principles, they must be patient. The so-called demand for healthier menu items may vary from the actual purchasing of healthy menu items by patrons. Some chefs see this unsubstantiated desire of patrons as a barrier to adding more healthy items to the menus. On the other hand, Johnson, et al. (2002) established that chefs do not believe that nutritional considerations necessarily play a significant role in choices of restaurants made by consumers or that the notable proportion of consumers interested in more nutritionally balanced foods is increasing. There was a consensus among chefs that nutritional quality is an important consideration in menu planning, but the survey revealed that the primary determinant of the effort that individual chefs put into nutritional planning was a function of their personal vocational experience, health conditions, and interests, as well as whether or not they had recently

participated in any culinary education emphasizing nutritional quality (Johnson, Raab, Champaner, & Leontos, 2002). This study suggested that there was considerable variation among professional chefs on the degree to which they recognize the importance of incorporating nutrition concepts into their work. An earlier study by Middleton (2000) suggested that in order for the food industry to get involved in the role of nutrition and successfully implement the practice of nutritional eating principles, education and training needed to be considered as key factors in changing industry knowledge, perceptions, and practices.

Culinary Nutrition Can Improve Population Health

Generally, nutrition has a huge impact on the health of individuals. However, today, nutrition is not just a matter of individual health, but it is also a matter of public health. For instance, four of the top ten causes of deaths in the United States, heart disease, cancer, cerebrovascular diseases, and diabetes, are related to poor eating patterns (Murphy, Xu, & Kochanek, 2013). The percentage of adults that meet the American Heart Association (AHA)'s five components for "Ideal Healthy Diet," a dietary pattern that emphasizes fruits, vegetables, whole grains, low-fat dairy products, poultry, fish, and nuts while limiting red meat and sugary foods and beverages, is less than one percent. AHA recommends that as people make their daily food choices, they should choose and prepare foods with little or no salt. However, AHA found that sodium reduction and increasing whole grain consumption offer the biggest challenges (Go et al., 2014). Many common chronic diseases in addition to obesity are preventable with simple changes in lifestyle and eating habits.

Nutrition and Health

Obesity

Today, obesity has emerged as one of the most important health concerns in the United States with increasingly disturbing proportions of the population facing serious long-term health problems directly linked to poor eating habits. This may reflect poor food preparation skills, and/or the lack of knowledge about nutritional concepts. The AHA showed the trends of overweight, obesity ($BMI \geq 30 \text{ kg/m}^2$), and the associated health risks, such as diabetes mellitus, CVD, asthma, cancer, and renal disease on the rise. In fact, almost 68% of the U.S. population over 20 years of age is overweight or obese while the prevalence of overweight and obesity in all age groups of children from ages 2 to 19 years old is 32% (Go et al., 2014).

Although it could be argued that most of the responsibility for healthy eating comes from the home, as explained in the preceding sections, Americans are eating out often (National Restaurant Association, 2014a). This means adverse health outcomes can arise from food choices outside of the home.

Diabetes

Type 2 diabetes is the most common form of diabetes. High blood sugar can harm many parts of the body, such as the eyes, heart, blood vessels, nerves, and kidneys. It can also increase the risk for other health related complications. According to the Go et al. (2014) publication, a little more than 8% of the adult population in the United States suffers from type 2 diabetes, and nearly 38% have a

pre-diabetes condition. Diabetes is ranked seventh according to the number of associated deaths (Murphy et al., 2013).

The key to treating type 2 diabetes is to keep blood sugar levels controlled and in the target range. For most diabetics, changes in diet and activity patterns are effective ways to manage their condition. As an example, one study by Anderson (1999) suggested that increasing fiber, especially the water-soluble kind, in the diet might decrease blood sugar by reducing the absorption of carbohydrates into the blood.

Heart diseases, stroke and other cardiovascular diseases

“Prevalence and control of cardiovascular health factors and risks remain an issue for many Americans” (Go et al., 2014 p.2). According to the Murphy & Kochanek (2013), heart disease and stroke are two of the main causes of death. Go et al. (2014) noted that in 2010, heart disease, stroke, and other cardiovascular diseases caused more than 787,000 deaths in the U.S. One in six deaths is caused by heart disease while cardiovascular diseases kill more people than all forms of cancer combined. Direct and indirect costs of cardiovascular diseases and stroke total more than \$315.4 billion.

The level of low-density lipoprotein (LDL) cholesterol is high in almost one of every three Americans. At the same time, high-density lipoprotein (HDL) cholesterol level is low in about 22% of Americans (Go et al., 2014). Scientific research has shown that incorporating more fiber in diet will help in reducing high cholesterol and triglycerides, thereby decreasing the risk of heart disease and stroke.

According to a meta-analysis study of sixty-seven controlled studies, it was found that some types of soluble fiber have an effect in decreasing the LDL without changing the HDL level (Brown, Rosner, Willett, & Sacks, 1999).

Over recent decades, eating behaviors have dramatically changed. Between 1971 and 2004, women consumed 22% more calories daily. Men consumed 10% more calories per day according to government figures (Go et al., 2014). According to the *2010 Dietary Guidelines for Americans*, solid fats and added sugars (SoFAS) contribute to an average of 35% of daily calories or 800 calories. Thus, reducing intake of calories from SoFAS is recommended. Solid fats tend to raise LDL levels in the blood; this, in turn, increases the risk for heart disease. Most of SoFAS foods are energy dense, high in calories, and can contribute to empty calories. Since SoFAS often do not contain nutrients, such as vitamins and minerals, the more calories that come from SoFAS, the more difficult it becomes for people to get their essential nutrients and adhere to their calorie limits (Dietary Guidelines for Americans 2010, 2011).

Practical strategies aimed at incorporating more fiber into recipes will help consumers and food service students and professionals to better understand and apply their knowledge when preparing and serving foods.

Blood pressure

According to Go et al. (2014), about 33% of U.S. adults have high blood pressure (nearly 1 in 3). Sixty-nine percent of people who have a first heart attack, 77% of people who have a first stroke, and 74% of people who have congestive heart failure have a blood pressure higher than 140/90. Go et al. (2014) reported that high blood pressure

(hypertension) was recorded as one of the primary or contributing causes of death by coronary heart disease in 2010.

A recent report by the Institute of Medicine (IM) (2013) regarding dietary sodium intake concluded that excess sodium intake can lead to hypertension (Institute of Medicine, 2013). According to the Centers for Disease Control and Prevention (CDC) (2013) dietary sodium reduction has been found to be effective in the treatment and prevention of hypertension. The United States *Dietary Guidelines 2010* recommends the Dietary Approaches to Stop Hypertension (DASH) eating plan as an instrument to reach sodium reduction goals (Dietary Guidelines for Americans 2010, 2011). Learning practical strategies for reducing sodium in recipes and the sources of sodium in the diet will help consumers and food service students as well as professionals apply their knowledge to food choices.

Sodium contributes to human health and risk of certain diseases:

Excess salt intake has been linked to a higher risk for the development of gastric cancer (Tsugane, Sasazuki, Kobayashi, & Sasaki, 2004), high blood pressure and may contribute to cardiovascular diseases (He & MacGregor, 2007). Several studies document that sodium-dependent high blood pressure causes anomalies in the metabolism of calcium, which in turn leads to severe calcium loss by osteoporosis. In some cases, secondary activation of the parathyroid gland as well as more degrees of loss of calcium from the skeleton increase risk of urinary tract stones (Heaney, 2006; De Wardener & MacGregor, 2002; Cohen & Roe, 2000; Cappuccio, Kalaitzidis, Duneclift, & Eastwood, 2000). High blood pressure is also related to the aggregation of platelets and acceleration

of the progression of renal functional (De Wardener & MacGregor, 2002). High levels of dietary sodium can also cause increases in the left ventricle mass as well as thickening of the coronary and renal arteries. It is also related to incidents of strokes and cardiac failure (He & MacGregor, 2007). The Center for Science in the Public Interest (CSPI) reported that sodium content in restaurants and packaged foods had not been lowered significantly between 2005 and 2011. In fact, during this period, 78 items of the 159 products sampled found in chain restaurants in the United States increased salt content by 2.6% (Jacobson, Havas, & McCarter, 2013).

Responsibility of Chefs

Food plays an important role in human health since it may contribute to obesity, heart disease, diabetes, and/or hypertension in some individuals. According to the AHA (2014), the rates of adverse coronary events have been steadily increasing over the last few years (Go et al., 2014). Although much of the responsibility for healthy eating comes from home, eating out plays a substantial role in food choices and health outcomes. Thus, restaurant menu choices have the potential to impact the health of the nation. Therefore, it can be hypothesized that the training of culinary arts students in the principles of nutrition may result in healthier menus and possibly reduction of CVD and many other diseases.

Since chefs play a key role in preparing and serving healthful food and in improving the nutritional quality of FAFH, training culinary arts students to apply nutrition principles may improve menu quality. This may shift consumer tastes towards healthier food alternatives. Ideally, the blending of nutrition education and culinary arts

would promote the culinary nutrition approach that could contribute to the overall health of the population (Condrasky & Hegler, 2010).

Considering the impact of diet on population health, it is essential that education of culinary arts students include the technical means of translating theoretical knowledge about nutrition into practical food preparation techniques. More specifically, the culinary education program should emphasize the preparation of food with less reliance on sugar, salt, simple carbohydrates, and unhealthy fats while simultaneously satisfying the seemingly contradictory requirement of creating highly palatable and satisfying dishes. Obviously, consumers cannot make nutritionally balanced choices when they eat out if these choices are not offered on the menu. Thus, contribution of chefs to nutritionally balanced menu items is important for helping customers make the best food choices. For professional culinary arts educational programs to be successful, it is essential that the designers of these programs and the educators responsible for implementing and delivering them undertake an analysis of what elements of educational programs contribute maximally to effective learning. In that respect, it is helpful to consider the comparative advantages, disadvantages, strengths, and weaknesses of different conceptual approaches to learning.

Integrating Human Health and Culture into Culinary Education

When designing a culinary educational program, it is crucial to understand factors that contribute to healthier menu items and address these factors accordingly. Condrasky and Hegler (2010) emphasized that even though it is important to increase the availability

of vital nutritional information, this information must be accompanied with simultaneous practical nutrition training to enable students to translate their knowledge into practice.

Not only does education of culinary arts students improve their approaches to menu design, but it also changes what they eat themselves. Condrasky, Corr, and Cason (2007) expanded this idea by suggesting that if individuals are expected to make better nutritional choices, they should be more involved in the actual preparation of their meals. They found that there was a fundamental psychological detachment that occurs when the individual is completely uninvolved in the preparation of his or her meals. People who shop to select their own ingredients and then prepare and cook their own meals have a natural tendency to incorporate nutritional information more than people who are merely end-users of meals produced entirely by others (Condrasky, Corr, & Cason, 2007). The effect is apparent at virtually every age from childhood to adulthood. Especially during their first year, college students frequently adopt nutritionally poor habits, which are functions of their lack of ability to prepare their own meals. While they indicate the desire to eat more healthily, college students report that they resort to fast-food and junk food substantially more because they lack the necessary skills to prepare more healthful cuisine.

Naturally, this feature of college life is most pronounced during the first year of college by virtue of the immediate transition from eating meals prepared for them by their parents (in most cases) to being entirely responsible for their food choices (Johnson et al., 2002). For consideration, even culinary arts students preparing to enter the field may be

susceptible to this principle, thus they need to improve their own nutrition habits before they can incorporate them into their professional practice.

The Need for Increasing Nutritional Awareness in Culinary Education Programs

It is important to increase nutritional awareness among culinary arts students as that awareness relates to the typical role and responsibility of professional chefs. Chefs frequently determine both the composition and the portion sizes of their food offerings and these determinations should directly relate to the nutritional needs and concerns of customers (Condrasky, Ledikwe, Flood, & Rolls, 2007).

Ma et al., (2014) studied chefs' attitudes and knowledge of healthy eating and found that chefs feel that they had good nutrition knowledge even when their nutrition knowledge was no better than that of the average person. This could be explained by the limited amount of nutrition education and training among chefs. The study brought into question the chef's ability to build nutritionally balanced menus and practice healthy cooking. Middleton (2002) suggested that nutrition training and education could have a significant role in changing chefs' knowledge, perceptions, and practices regarding nutritionally balanced menu options.

Many chefs are unaware of correct portion size and nutrient requirements. For example, Condrasky, Ledikwe, Flood & Rolls, (2007) reported that chefs' responses in a survey indicated that the average steak entrée they served was several times greater than the recommended protein amount for an entire day. With the reference portion of 5.5 ounces (oz.) per day, the survey of 300 chefs found that 48% offered a 12-oz portion of steak while 28% offered an 8-oz portion. Seventy-six percent of the chefs thought they

were serving the right portion. In total, 83% of respondents served portions greater than the recommended 5.5 oz.

Furthermore, when chefs were asked whether they considered portion control (or, more accurately, portion consumption control) to be the responsibility of the chef or of the patron, chefs differed. Thirty-nine percent responded that it was their responsibility as chefs while 58% consider it to be entirely up to the diner (Condrasky, Ledikwe, Flood, & Rolls, 2007). Beyond the ethical and nutritional questions, there are practical, economic, and environmental implications surrounding portion sizes. The size of a serving affects overhead costs of restaurants and can take an environmental toll on the ecosystem if modern food production methods and practices are not managed wisely. Whoever makes the decision over portion size maintains a considerable influence with implications in all these spheres.

The author of this document reviewed websites of culinary arts programs in the U.S. and found that while some leading culinary arts programs offer degrees of practice in their nutrition courses, those programs do not identifying a clear scientific foundation for their training. Nutrition subjects in most culinary arts programs are often being taught in a traditional lecture method rather than in conjunction with culinary techniques. It appears that instructors often give lectures about nutrition using the assigned book with an emphasis on human nutrition science and little information regarding culinary applications. On this basis, it can be hypothesized that the possible lack of practical training may result in suboptimal educational outcomes. The review of facts on nutrition for students appears insufficient for practical mastery. Culinary students need to see

solutions in ways that are more applicable to their career. “An analysis of the evidence from 300+ studies shows that nutrition education is more likely to be effective when it focuses on behavior/ action (rather than knowledge only) and systematically links theory, research and practice” (Contento, 2008 p.176). Thus, a practical approach to teaching nutrition to chefs should include both nutrition training as well as practical culinary arts applications.

In addition to promoting improvements to the nutritional quality of FAFH, it would be prudent to educate chefs on overcoming barriers to healthful commercial food preparation. The current literature identifies barriers, such as the need for additional time, staff training (Gase, Dunning, Kuo, Simon, & Fielding, 2014), customer demand, the relative economic cost of dish components, customer expectations, the degree to which portion size affects presentation (Condrasky, Ledikwe, Flood & Rolls, 2007), and the attitudes of restaurant owners (Gase et al., 2014).

Culinary students should learn how to ensure that consumers would reorder healthful dishes by making these at least as nutritious and palatable as traditional dishes. In principle, the formal training of chefs should include every element of addressing known barriers, practical culinary application of nutrition concepts, etc., which could ultimately encourage consumers directly or indirectly to make choices that are more nutritious when they eat FAFH.

Among other things, Guthrie, Lin, and Frazao (2002) determined that restaurant- and caterer-prepared foods purchased by consumers tend to be higher in total fat content contain less dietary fiber, calcium, and iron than the foods those consumers prepared at

home. However, in principle, there is no reason why meals purchased outside of the home should be less healthful than meals prepared at home (Guthrie et al., 2002). Thus, it is a plausible assumption that educating chefs about healthy culinary nutrition may improve the quality of restaurant food.

According to Pongjata, Naunboonreang, and Amma (2009), issues of retaining nutritional value during food preparation and quality control are fast becoming some of the more essential areas of substantive knowledge among professional chefs. Most professional chefs in this study indicated that their attitude toward increasing their knowledge in these areas is positive and that they genuinely desire educational opportunities of this nature (Pongjata, Naunboonreang, & Amma, 2009). However, nearly three-quarters of them also indicated that they were unlikely to be able to devote the necessary time within the traditional continuing education format. They specifically expressed their interest in obtaining related training through self-learning media to allow them to do so with minimal expense of time (Pongjata et al., 2009). This data comes from professional chefs who were already working and whose schedules were less capable of allowing them to attend in-person educational seminars or classes.

Beyond teaching culinary students actual food composition relative to the nutritional value of their dishes, culinary education should also emphasize the degree to which chefs can thereafter contribute the same objective in the organization of menus. The description of their dishes can go a long way to overcoming barriers on consumer choice. The literature suggests that one of the specific barriers on the consumer side is the reluctance of customers to order foods that they perceive as dietary modified or healthy

and their assumptions that nutritious foods will not taste as good as traditional menu choices (Guthrie et al., 2002).

Another potentially important issue highlighted by the literature is the need for better coordination among professional chefs and other employees (including servers and hospitality managers) in the overall objective of recognizing and accommodating consumers' nutrition needs. In that regard, Hamm, Schnaak, and Janas, (1995) demonstrated that the substantive knowledge deficiency about culinary nutrition is much greater among non-chef employees involved in food service. Moreover, the relative knowledge was lowest among employees of restaurants that are ancillary parts of other hospitality facilities, such as hotels and resorts, as compared with the knowledge of their professional counterparts working within stand-alone restaurants (Hamm, Schnaak, & Janas, 1995).

The formal training of chefs may not be limited to their direct areas of contribution to the overall food service process. Rather, their education should also include leadership skills to enable chefs to gain support from their fellow non-chef employees in order to market/sell healthy dishes and maintain sales levels of menus. In principle, the ideal situation for selling healthy menu items in restaurants is equipping food service managers as well as food servers with a solid knowledge base of basic nutritional science. Culinary arts students should also receive appropriate training on how to provide on-the-job nutrition awareness and importance to their coworkers.

Theoretical Framework

Teaching students practical skills in culinary nutrition must be based on theoretical approaches that include experiential learning (EL) and andragogy. Details about these approaches are discussed in the following sections.

Experiential Learning

Experiential learning refers to learning from experience. The key assumption of this learning paradigm is that people learn best by experience (Moss & Van Duzer, 1998). Under this approach learners do not only talk and think of the learning material, but they are also directly involved with the application of the material being studied. Testimony to the effectiveness of EL can be found in the words of Dewey (1938), who stated, “There is an intimate and necessary relation between the processes of actual experience and education” (p.7). Dewey also explained that, “Experiential learning takes place when a person involved in an activity, looks back and evaluates it, determines what was useful or important to remember, and uses this information to perform another activity” (Keen & Thatcher, 2010, citing Dewey 1938, p.35). Learners use their own experience and their own reflection about the experience in order to gain knowledge (Johnson, 1998).

According to Merriam, Caffarella, and Baumgartner (2012), EL enables students to gain a variety of perspectives, refine their observational and reflective skills and construct and assimilate ideas from observation in order to build a better understanding of a phenomenon (abstract conceptualization). At the end of the experience, learners acquired the knowledge and ability to apply that knowledge in different situations. The

more experience students are exposed to, the better equipped they are to learn new ideas (Miettinen, 2000).

Kolb et al., (1984) proposed a model to explain experiential learning by suggesting that experience can be grasped through concrete, real life experience or abstract conceptualization. Furthermore, he says that experience can be transformed through reflective observation and active experimentation. Kolb's theory is built on the work of pioneers such as Dewey to offer a dynamic theory based on action/reflection and experience/abstraction. Kolb's theory focuses on learning at an individual capacity whereas learning, as Dewey (1938) proposed, is a social process. Both Kolb and Dewey believe that experiential learning transforms the desires of concrete experience to higher-order purposeful action (Kolb & Kolb, 2005). In Kolb's theory, the concrete experience serves as the platform for providing the information, which in turn serves as the basis for reflection. The assimilation of information into abstract concepts comes after the reflection. Using these concepts, the learner can then develop new theories in regards to any other situation they might encounter (Truluck & Courtenay, 1999).

Andragogical approach

Because many culinary students are adults, the design of a culinary educational program should utilize andragogical principles. "Andragogy is the art and science of helping adults learn" (Carlson, 1989 p.1). Malcolm Knowles is considered "the father of andragogy". Knowles used Dewey's work on form of andragogy (adult learning), He described the adult learner as someone who

(1) has an independent self-concept and who can direct his or her own learning, (2) has accumulated a reservoir of life experiences that is a rich resource for learning, (3) has learning needs closely related to changing social roles, (4) is problem-centered and interested in immediate application of knowledge, and (5) is motivated to learn by internal rather than external factors (Merriam, 2001, p.5).

The most apt summary of what andragogy meant to Knowles is that an “adult learning experience should be a process of self-directed inquiry, with the resources of the teacher, fellow students, and materials being available to the learner but not imposed on him” (Carlson, 1989, citing Knowles 1950, para. 26).

Knowles used the assumptions described above to propose his theory of experiential learning but with his main focus on adult learners. Specifically, Knowles suggested that adults should be involved in the planning and evaluation of their learning instruction manuals (Knowles, 1950). Being older, years of accumulated culinary arts experiences provide these students a basis for learning activities. He also realized that adults are more interested in learning about subjects that have an immediate relevance to their real-life situations, be it job-wise or in their personal lives (Knowles, 1962).

Knowles’ theory of experiential learning has been lauded for presenting learning as a self-directed endeavor, which allows the learner to take control of his learning.

Furthermore, the approach is broad-based, as opposed to Kolb’s narrow view, and therefore, can be implemented in a variety of educational situations (Knowles, 1962).

Justification for the Selected Learning Strategies

It can be argued that an EL program based on andragogical principles is far more suitable for the culinary arts professionals (chefs) as compared to lecture-style material delivery. Chefs do not just need to acquire nutritional knowledge through lectures, but they also need to be able to implement it. At the time of writing there were no published studies that directly tested learning outcomes associated with EL program based on andragogical principles for culinary arts students. However, EL has been successfully applied in educational disciplines such as nursing, event management, sustainability, engineering, and other areas (Ayob, Hussain, Mustafa, & Shaarani, 2011; Bower, 2014; de Oliveira et al., 2015; Dieleman & Huisinigh, 2006) . On this basis, it can be hypothesized that EL may be effective for improving learning outcomes for culinary arts students.

Diem (2001) makes some relevant points about the considerable potential benefits that accrue from EL. One is the estimation that we remember approximately “20 percent of what we read and hear, and 30 percent of what we see, we will remember approximately 50 percent of what we see and hear, 70 percent of what we see, hear and discuss and 90 percent of what we see, hear, discuss and practice” (p. 2).

De Oliveira et al. (2015) found the EL approach to be successful in teaching nursing students skills related to interpersonal interaction. Bower (2014) described successful application of EL to event management, and Ayob, Hussain, Mustafa, and Shaarani, (2011) discovered positive results of EL in engineering education. Dieleman and Huisinigh (2006) shared positive experiences of application of EL for sustainability

education. Therefore, evidence is strongly suggestive that EL may benefit culinary arts students.

Application approach to self-directed learning (SDL) has also been shown to be an effective way to improve learning outcomes. Stastny (2009) suggested that students could learn more and become higher-level thinkers if given an opportunity to use the SDL process. Cazan and Schiopca (2014) pointed out that SDL is positively correlated with academic achievement. A similar conclusion was obtained by Suknaisith (2014), who reported that not only was students' knowledge higher due to SDL but also resulted in a greater level of satisfaction with teaching. Montgomery (2009) found that SDL enhances learning experiences of nursing students while improving their clinical skills and sense of responsibility. These and many other studies suggest that SLD, as the core andragogical principles, can be an effective mechanism for improving students' knowledge and satisfaction with learning.

The above discussion suggests that EL strategy based on sound andragogical principles may help chefs to meet the challenge of creating food that is tasty, nutritious, and fast. EL can further assist chefs in implementing nutritional knowledge into their daily practice.

Laboratory training can also be supplemented with online education/e-learning. Technology can, if appropriately applied, be a major asset in terms of flexibility and cost-effective availability of instruction. One can argue that the use of technology is applicable in experiential learning environments. Havice and Havice (2005) propound this view by noting that "distributive learning has become a popular term," which describes this

“emerging electronic learning environment which can deliver” both “synchronous and asynchronous instruction” (p. 3). Thus, students can be engaged both on campus and off campus and the inconvenience and non-productiveness associated with time barriers can, at least, be reduced. The distributed learning environment can, therefore, be a means for not only integrating but also deepening the interactive involvement of students, in terms of computing and multimedia with learner-centered approaches that include “collaboration, discovery learning and active learning” (Havice & Havice, 2005, p.3). It is clear that the essential elements of andragogy and EL may take place in an online environment, thus reducing costs and dismantling logistical barriers. Petty (2013) reviewed 11 empirical studies on SDL in the e-learning context and arrived at the conclusion that SDL can be successfully applied in e-learning environments.

The above discussion suggests that EL combined with SDL may be an effective educational intervention for face-to-face and online education. For these reasons, these approaches were implemented when designing educational intervention for the second part of this project.

Research Overview

In this project, a review of the literature, a pilot study in the classroom as well as an online query reflected gaps in nutrition knowledge among culinary arts students. Using the input from the pilot study, applied culinary nutrition education interventions administered. These interventions and their combinations are compared to a traditional lecture to identify the most effective intervention for culinary arts education.

Purpose of the Study

This culinary nutrition project possessed several goals. First, it attempted to foster effective culinary nutrition education to equip chefs with the knowledge and ability to prepare nutritionally balanced dishes that are as enjoyable as traditional foods. Second, the study sought to facilitate the distribution of information between peers to promote scientific and sound culinary nutrition practice. The third goal was to enable and encourage culinary arts student to prepare dishes that adhered closely to the Dietary Guidelines for Americans and the Recommended Daily Allowance (RDA). The last goal was to empower future chefs to address consumer reluctance to try nutritionally balanced foods by incorporating creative descriptions on menus and in their food presentations.

Finally, the purpose of the study was to identify knowledge gaps about nutrition and healthy cooking techniques among culinary arts students attending culinary programs. The plan was to utilize these findings in designing and evaluating a four-arm randomized controlled trial (RCT) for an experiential culinary education program to address these gaps. The four-arms of the RCT were: traditional lecture (C), face-to-face demonstration (DP), online demonstration (OP), and the program delivering DP followed by OP. It is expected that DP and OP will outperform traditional lecture (C) due to utilization of experiential learning methods based on andragogical theory.

Significance of the Study

Even though, many studies addressed education of chefs, no studies specifically addressed nutritional education of culinary arts students through experiential learning driven by andragogical theory. This study focused on the education of culinary arts

students by evaluating effectiveness of the experiential learning approach for teaching students about healthy cooking techniques and increasing their awareness of the nutritional impact of their dishes. Knowledge about actual effectiveness of experiential learning methods for imparting knowledge on culinary nutrition may improve culinary educational programs nationwide and serve as a foundation for future research in the field of culinary nutrition education. Greater emphasis on healthy cooking may improve nutritional value of FAFH and lead to improved population health outcomes.

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CHAPTER THREE

PILOT ASSESSMENTS FOR THE NEED FOR IMPROVING NUTRITION

AWARENESS IN CULINARY ARTS PROGRAMS

Abstract

Current literature supports a growing interest and demand for nutrition as well as taste, perceived value/cost, and convenience. In the economic and commercial environment of a restaurant, the chef's success lies in satisfying customer demands while taking into account many different needs. The successful chef balances a variety of patrons, staff, and management. Chefs need to be trained to ensure their menus are nutritionally balanced while meeting the demand for taste, low cost, and convenience.

Objectives: The study sought to evaluate two educational intervention lessons to improve knowledge about dietary protein and sodium among culinary arts students using a pre-test/post-test design. Another purpose of the study was to assess knowledge about dietary fat, protein, and sodium among culinary arts students nationwide.

Methods: This study reports the results of two related, but separate, surveys. Educational intervention lessons to improve knowledge about dietary protein and sodium were administered to two different groups ($n1=20$) and ($n2=21$) of post-secondary culinary arts students. Separately, an online survey about general nutrition knowledge was administered to senior-level, post-secondary culinary students across the country ($n=250$).

Results: Educational intervention lessons improved knowledge on protein and sodium.

The difference before and after the education program on protein was statistically significant for 14 out of 19 survey items. For the sodium intervention lesson, changes for eight items out of 26 were statistically significant. The descriptive online nationwide survey of $n=250$ suggests that knowledge about dietary fat, protein, and sodium was less than satisfactory. The fraction of incorrect responses varied between approximately 30% and 70% depending on the item.

Conclusion: Cross-sectional surveys suggest inadequate knowledge about dietary fat, protein, and sodium. The evidence suggests that the intervention lesson for imparting knowledge about dietary proteins was effective, yet evidence for the effectiveness of the sodium intervention lesson is less convincing. It is recommended that further testing of both intervention lessons be conducted on larger trials. Additionally, it is recommended that culinary arts post-secondary programs incorporate reinforcement lessons on the applications and the techniques of healthy cooking into their curricula.

Significance of the research: Decisions on academic emphasis based on nutrition knowledge and current trends contribute to future recipe and menu research and development (R&D). The depth and level of applying nutrition concepts to food preparation behavior is affected by the experiences of the culinary professional.

Keywords: nutrition, nutrition education, culinary arts, culinary education

3.1. Introduction

Cardiovascular disease (CVD) was the leading cause of death in the United States responsible for approximately 800,000 deaths in 2010 and 2013 (Murphy, Xu, & Kochanek, 2013; Centers for Disease Control and Prevention (CDC), 2011). Some of these deaths may have been prevented since modifiable risk factors, such as obesity or hypertension, were evident (CDC, 2013). Obesity incidence is also associated with musculoskeletal disorders, hypertension, cancer, stroke, diabetes, and cardiovascular disease, furthering its burden on the national healthcare system (CDC, 2013).

Unfortunately, the prevalence of the obesity has been increasing over the last few decades and reached epidemic proportions in the early 21st century (Flegal et al., 2010). Frequent consumption of FAFH at full-service and quick-service restaurants has been linked to higher obesity rates and to overconsumption of many nutrients, including fat, protein, and salt (Fulkerson et al., 2011).

Over the last few decades, the interaction of social, cultural, and economic factors resulted in the increased consumption of FAFH (The Keystone Center, 2006). The food became cheaper for Americans, as in 1970 the proportion the disposable income spent on food by families and individuals was 15.3%, and in 2013 this proportion decreased to 11.4% (USDA-ERS, 2014). Also during this period, the proportion of the food consumed at home and away from home shifted towards away-from-home consumption. In 1970 3.9% of the disposable income was spent on away-from-home food while in 2013 the proportion increased to 5.3% (USDA-ERS, 2014).

Americans are dining out more often than ever. A study by the National Restaurant Association (NRA) found that consumers increased the amount spent at restaurants from 25% in 1995 to nearly half of their food dollar expenditures in 2013. Food expenditures have risen from the last 40 years to a total of 683.4 billion in 2014. This represents \$1.8 billion of restaurant-industry daily sales (National Restaurant Association, 2014). The number of opportunities to consume FAFH has also increased as the number of restaurants increased from 491,000 in 1972 (The Keystone Center, 2006) to over 990,000 in 2013 (National Restaurant Association, 2014).

Multiple research studies have identified a relationship between FAFH and obesity, CVD, as well as other diseases. Fulkerson et al., (2011) conducted a cross-sectional study and found that those families that purchased at least one FAFH food per week were more likely to be obese (odds ratio (OR)=1.2-2.6). Typically, these individuals were also characterized with abnormal profiles in cholesterol, HDL-C, LDL, triglycerides, high fasting glucose, insulin, and systolic blood pressure (Fulkerson et al., 2011).

FAFH not only results in overconsumption of calories but also in overconsumption of dietary sodium. Dietary sodium is a risk factor most strongly linked to hypertension (Whelton et al., 2012). Despite the documented negative effects of sodium on cardiovascular health, restaurants tend, for various reasons, to use more than recommended by the *Dietary Guidelines for Americans* 2010 per day (2300 milligrams) (*Dietary Guidelines for Americans* 2010, 2011). The AHA recommended an intake of dietary sodium of less than 1500 milligrams (mg) per day for at-risk groups, and 2300 mg

per day for other adults. Restaurant meals can contribute to daily consumption in excess of 4000 mg of sodium and sometimes as high as 7000 mg (Whelton et al., 2012).

Powell and Nguyen (2013) found that eating at fast-food and full-service restaurants resulted in increased consumption of saturated fat and protein. Consumption of the former has also been linked to CVD independently of obesity (Siri-Tarino, Sun, Hu, & Krauss, 2010). Intake of healthy proteins, such as fish, poultry, and nuts, reduces the risk of coronary heart disease (CHD). Yet, one's consumption of high-fat red meat protein sources may contribute to the risk of CHD (Bernstein et al., 2010). Thus, Bernstein et al. (2010) emphasize the importance of shifting some protein away from sources, such as red meat, to other sources that may promote health.

Considering the high impact of FAFH on human health, policy makers and researchers have proposed various interventions to improve the quality of FAFH foods. At some point, there were expectations that consistent with the social responsibility mandate, the restaurant industry would improve nutritional quality of their menus. Yet, despite the push for healthier menu items, many food service units, possibly fearing the decrease in profits, have been reluctant to modify items on a menu (Scourboutakos & L'Abbé, 2014; Wu & Sturm, 2014).

One possible reason that restaurants are wary of reducing sodium is because dietary sodium (salt) has many important culinary applications. Sodium improves palatability and texture of the food (Hutton, 2002) as well as preserves and extends the shelf life of food (Institute of Medicine, 2010). Food preparers also use salt to mask

undesirable flavors, such as strong vegetable or lipid oxidation flavors (Hutton, 2002; Kuntz, 2000).

When the restaurant industry recognized that public's desire for healthier food, they responded with marketing and public relations programs to create an impression that restaurant menus had become fresher and healthier (Wu & Sturm, 2014). However, Wu and Sturm (2014) tracked nutritional properties of food served by 213 unique restaurant-brand food between 2010 and 2011. They found the sodium content of the food did not change significantly, and while mean caloric values in children's menu items decreased by 40 kcal, there were no real changes in the adult menu. Scourboutakos & L'Abbé (2014) conducted a similar and longer study over the period covering 2010 to 2013 in Canada, tracking 3,878 foods served by 61 Canadian restaurant chains. These authors found that sodium levels went down 30.1% in foods, stayed the same in 53.6% of menu items and increased 16.3% in foods offered. Although restaurants detected an average decrease in sodium content of 25 mg per serving, the effect size is negligible. Overall, the current evidence suggests that voluntary sodium reduction by restaurants has been slow and unlikely to have measurable impact on public health in the near future. However, it is clear that the solution to the problem of restaurants serving less than healthy or unbalanced meals lies not in the plan of changing the behavior of the food service industry as a whole. Rather, change is needed at some other level, such as within public health policies, education of the public, and training of food service professionals. Perhaps some of this can be accomplished with support of the food-manufacturing sector.

Intuitively, it is evident that chefs play an important role in determining nutrient composition of the food and in affecting the food choices available for consumers. This notion is supported by Cohen et al. (2012), who evaluated how chefs impacted school lunch consumption. In their pilot, these researchers evaluated performance of school cafeteria staff trained in preparation of healthier school lunches. It was found that trained cooks prepared healthier lunches that contained more vegetables, had larger selection of whole grain menu items and a lower energy content of the food. As a result, students consumed healthier items. This example suggests that the approach to train chefs to prepare healthier and more nutritionally balanced foods may be effective at micro-level and have substantial impact on a level comparable to large scale public health interventions. Training only one chef in nutrition can affect lives of hundreds or even thousands of consumers.

Chefs generally agree that they need more education to equip themselves with skills necessary for the preparation of healthy food. According to survey results reported by Obbagy, Condrasky, Roe, Sharp, and Rolls (2011) chefs generally were receptive to the idea of making dishes healthier but faced some barriers to act on this idea. Approximately 93% of respondents agreed that the caloric intake could be reduced by up to 25% without any impact on food palatability. It was also found that 24% of chefs believed that they needed additional training to prepare healthy dishes.

There is the evidence of a lack of awareness or skills among chefs regarding preparation techniques for healthy and nutritionally balanced foods. Howard, Adams, & White (2012) conducted a study of recipes offered by television chefs and found that not

a single one of them complied with World Health Organization (WHO) recommendations. Specifically, they found that these recipes resulted in dishes with more than the recommended amount of calories, protein, as well as fat and lower than the recommended amount of fiber (Howard, Adams, & White, 2012). The study highlights that celebrity chefs may have a profound impact on the composition of food that people consume at home by followers of their televised cooking demonstrations.

There were positive reports of chefs' education regarding nutritional quality of foods. Condrasky, Baruth, Wilcox, Carter, & Jordan (2013) tested a hands-on culinary nutrition program called Cooking with a Chef (CWC) using a sample of cooks who prepare food for church related functions. A professional chef and nutrition educator, who taught chefs how to make existing menu items healthier, delivered CWC. For example, they modified the recipe of a chicken salad typically served with added salt and mayonnaise. The new recipe contained plain low-fat yogurt with reduced-fat mayonnaise and reduced sodium. Garlic and turmeric were added for flavor profile enhancement (Condrasky et al., 2013). The program increased participants' self-reported cooking skills scores from 6.5 pre-test to 7.9 post-test. These cooks' self-confidence scores to prepare healthy foods also increased, and they reported that they incorporated what they learned during training into their cooking practices during a follow-up (Condrasky et al., 2013).

Chefs frequently determine both the composition and the portion sizes of their food offerings (Condrasky, Ledikwe, Flood, & Rolls, 2007). Portion sizes often provide greater than the recommended allowance of protein for a meal, given the reference portion of 5.5 oz. per day. Almost half of the 300 chefs that participated in the Condrasky

et al (2007) study reported serving 12-oz portions while 28% reported serving 8-oz portions, and 83% of the participants reported serving portions greater than the 5.5 oz. Seventy-six percent of chefs thought that they are serving the right portion. Furthermore, when chefs were asked whether they consider portion consumption control to be the responsibility of the chef or of the patron, chefs differed in their answers. Thirty-nine percent responded that it is their responsibility while others (58%) considered it to be entirely up to the diner (Condrasky et al., 2007). These observations suggest that chefs may need education not only in portion control but also in how to incorporate and complement healthy plant proteins into their menu.

Naturally, culinary arts programs offer nutrition education to train students in the preparation of healthier foods. Yet, the research about how these programs are structured related to application of nutrition concepts in the foods lab is limited. In fact, the search of major academic databases, such as Elton B. Stephens Company (EBSCO) Information Services, Public/Publisher MEDLINE (PUBMED), the Cumulative Index of Nursing and Allied Health Literature (CINAHL), for the terms “nutrition,” “culinary arts,” “chef training,” and “education” as well as their combinations located no peer-reviewed studies that specifically discussed scientific bases of culinary nutrition application in culinary arts programs. The absence of this information suggests that culinary arts programs may have a very limited basis for the design of applied culinary nutrition concepts. At the very least, there is no peer-reviewed mechanism for sharing educational innovations’ research between institutions of culinary education. Therefore, support to develop a foundation for sharing scientific and educational research on solid evidence may be useful to these

institutions. This situation clearly represents the break from a positivist tradition, and very likely the majority of culinary schools teach whatever they perceive to be the most important concepts about healthy menus and applied nutrition. However, educational theory would systematize and guide this applied culinary nutrition educational intervention. There is clearly a gap about optimal design for educational programs to teach culinary arts students about healthier nutrition applications. Additionally, the study by Obbagy, Condrasky, Roe, Sharp, and Rolls (2011) indirectly suggested that culinary schools may not have been as successful in imparting culinary nutrition application in the past since approximately a quarter of chefs surveyed felt they could use additional training to design specific menu niches.

Before the question of designing an applied culinary nutrition program can be approached, it is necessary to identify knowledge and practical components that should be reinforced by the instructors with students. Otherwise, such a program may appear to be protracted in time and suffer from redundancies. Thus, the purpose of this study was to identify areas of culinary nutrition that should be taught to culinary arts students. Once knowledge gaps are identified, specific educational programs can be designed and evaluated. The investigation will be restricted to students' knowledge about fat, protein, and sodium, with the understanding that fiber, carbohydrates, and portion control also deserve attention. However, due to practical considerations, the investigation will be limited only to the former three domains.

3.2. Pilot Assessments (I): Evaluation of Applied Nutrition Concepts in Culinary Arts Education

The objective of this pilot assessment was to determine if there is a change in students' knowledge, perceptions, and practices regarding nutrition science pertaining to protein, sodium, and healthy cooking techniques as a result of using an applied nutrition intervention lesson.

3.2.1. Materials and Methods

Site Description

With permission from a community technical college's administration and the research institution's Institutional Review Board, the convenience sample of $n=41$ culinary arts students was recruited. The participants in this study were from a culinary arts program at a technical college that provides an associate degree in culinary arts within the southeast region of the United States. The culinary arts program curriculum included one nutrition course. In this setting, the nutrition course required was basic human nutrition science. In most traditional culinary arts associate degree programs (and required for ACF accredited programs) students take a minimum of 30 hours of nutrition. Emphasis for these programs is on culinary technique as well as business management. All participating students in this pilot study were enrolled in at least one nutrition class. Chef instructors, professional kitchen helpers, and the research team supported the educational intervention lesson.

Description of the Evaluations

Study Design: The diagram explaining the study design is presented in Figure 3-1. The student sample was randomized into two groups. Two groups were assessed for and received an educational intervention about protein ($n1=20$) or sodium ($n2=21$). The students received a survey before and after one of the two separate lesson presentations to assess their culinary nutrition knowledge.

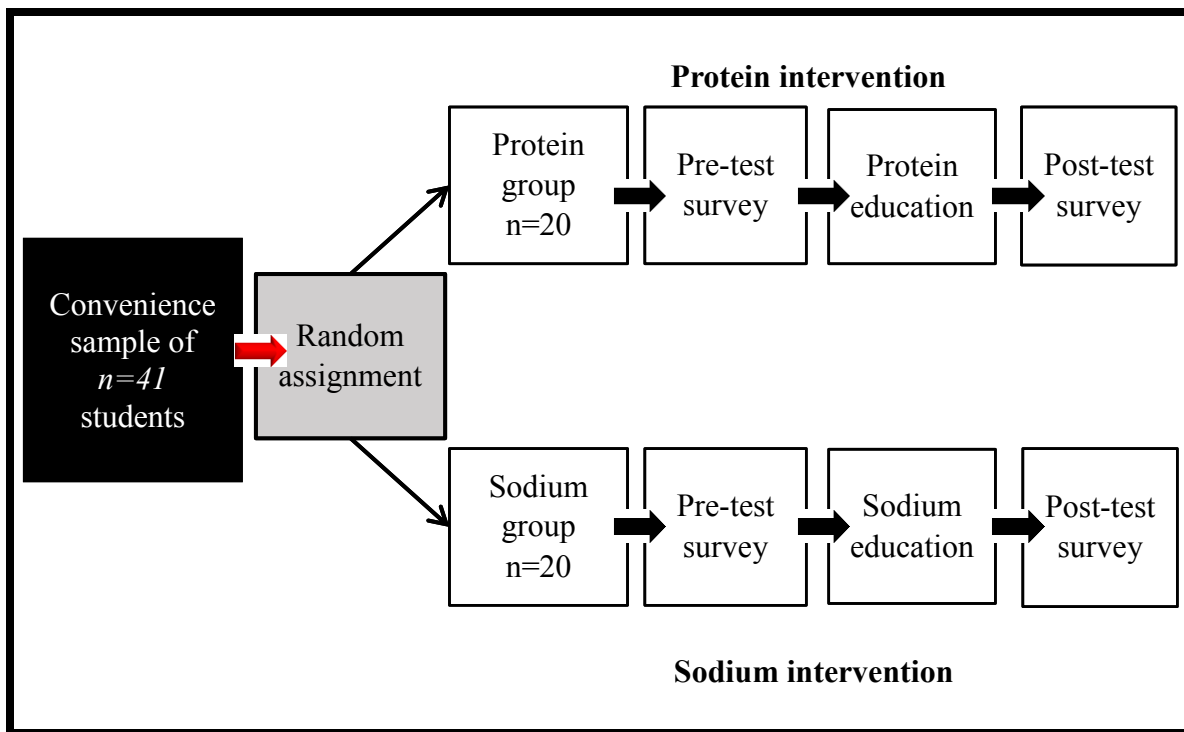


Figure 3-1. Study (I) Design (pilot, in class)

Survey Design: The surveys were guided by previous work administered to professional chefs at the national level on the topics of fat, protein, sodium, and healthy cooking techniques. The surveys were developed using interviews with culinary educators, research team discussions and by drawing on earlier research studies. Experts

in foods and nutrition reviewed the first draft of both surveys for intended purpose, usefulness, and comprehensiveness. Subsequently, the surveys were revised and reviewed again by experts to establish content validity. Since each survey measured factual knowledge rather than complex constructs, the validity of each survey was established by examining survey questions. Such examination suggested that the face-validity of the survey was at an appropriate level.

The goal of developing the surveys was to use them to determine if there was a change in nutrition knowledge, perceptions, and practices as a result of using applied lessons to teach nutrition concepts. The information collected from both surveys would help in developing materials on culinary nutrition to support the ongoing work of culinarians. This study also provided a conduit for the research team to learn more about how chefs make food ingredient selections for menus.

Each survey included a brief demographic section (three items) (Appendix B) followed by questions on nutrition knowledge, nutrition perception, and practices relating to protein or sodium. The protein survey had 19 questions: six items focused on nutrition knowledge and had a best answer, and 13 items did not have a best answer but were designed to determine students' perceptions and practices about nutrition and healthy cooking techniques (Table 3-1, and Appendix C). The questions on the protein survey covered key points about protein and portion size, customer demand, vegetarian concepts, as well as factors limiting the feasibility of placing vegetarian or less meat dishes on the menu. The sodium survey had 26 questions: items 1 through 5 had a best answer and pertained to nutrition knowledge, and items 6 through 26 did not have a best answer but

were designed to determine students' perceptions and practices about nutrition and healthy cooking (Table 3-1, and [Appendix D](#)).

[Table 3-1](#)

<i>Factors Measured on the Pilot Survey Instrument</i>			
Factors Measured	Number of Items		Response Format
	Protein survey	Sodium survey	
1- Knowledge	6 items	5 items	- Choose the best answer.
2- Perceptions and practices	13 items	21 items	- Choose the best answer, - (easiness, and agreement) Likert scale
demographic items	3 items		- Choose the best answer.

Prior to participating in each culinary nutrition lesson, participants received a consent form describing the goal of the survey, the number of items, the time needed to answer the survey, the contact information of the primary investigator, and their rights as a research participant ([Appendix A](#)). Students were asked to complete the surveys on their own. Students completed the demographic form ([Appendix B](#)) and a pre-survey before the intervention lessons. These surveys took approximately 15 minutes to complete. Following this, students participated in an applied culinary nutrition lesson. The lesson included a PowerPoint on one topic, a cooking demonstration, and sample tasting. Following the lesson, students completed the post-survey. The pre- and post-treatment surveys were identical. Students were instructed to complete the survey on their own.

Intervention Lessons Design (Protein & Sodium): Experiential learning enhances learning outcomes and knowledge while fostering critical thinking (Miettinen, 2000). Two educational intervention lesson presentations for culinary arts students were developed and tested to evaluate whether the lessons improved the culinary arts students' knowledge, perceptions and practices toward healthful culinary applications. Each group of students experienced a face-to-face applied nutrition presentation with a live cooking demonstration. The presentations used the PowerPoint program. One lesson focused on protein and one on sodium as key nutrition topics. These intervention lessons strove to communicate the rationale, science, and application of protein portion size and sodium reduction in away-from-home foods.

These applied lessons aimed to produce sustainable healthy cooking behavior through developing applied culinary nutrition skills. The lessons helped student chefs develop strategies to use nutrition information in real life situations and emphasize the importance of providing balanced food options to guests. Table 3-2 shows the elements of each intervention lesson.

[Table 3-2](#)

Intervention Lessons Design and Objectives (pilot)

Technique used	Lessons objectives	
	Protein	Sodium
PowerPoint presentation	<ul style="list-style-type: none"> -Examine the reasons for offering less meat. -Discuss proteins and amino acids as they relate to non-meat foods. -Review the protein needs of customers. -Explore ‘the right portion’ for non-meat items and traditional meat favorites. 	<ul style="list-style-type: none"> -Recognize how much sodium is in salt. -Recognize the current 2010 Dietary Guidelines related to sodium. -Recognize how much sodium is used when making a recipe. -Determine where the sodium is found in the American diet. -Determine the level of sodium in different ingredients. -Recognize strategies to reduce sodium levels in menu items -Experiment with flavorful, low-sodium ingredients
Live cooking demonstration: preparing recipes that pertain to each topic, display the ingredients used, and explain the scientific reason of each step.		
	Handouts	
Distribution of Printed handouts including information that pertain to each topic and the cooking demonstration recipe used in the lesson.	Balancing protein: Culinary Science Strategies for Chefs (Appendix E)	Cut the Salt, Keep the Flavor (Appendix F)

Lesson Plan: The intervention lessons on protein and sodium were planned for both groups (Table 3-3). Each lesson had predetermined dates for completion. A demonstration table was pre-set for the lesson demonstrations. Food modules, spices, and some ingredient samples were assembled on the demonstration table for students to preview. Food samples were prepared for the group as were the ingredients for the chef-led demonstration. Lists of all students participating in the study were prepared and coded. Computer and projector devices were also prepared for the PowerPoint presentation.

The total time needed for the preparation phase of each lesson was 70 minutes. The total time needed for each lesson was 95 minutes. The activities accomplished during this time included distributing and collecting the pre-survey, reviewing each survey to ensure all survey questions were answered, presenting the PowerPoint presentation, answering students' questions, demonstrating cooking techniques, distributing food samples, distributing and collecting the post-survey, and distributing handouts pertaining to each topic.

[Table 3-3](#)

Detailed Outline and Activities Completed for Both Groups

Tasks	Time
Preparation	
- Set up table for the lesson demonstration (food models, spices...)	10minutes
- Prepare food sample for the group	20 minutes
- Prepare food ingredients for demonstration	30 minutes
- List of the students who participated in the study. (All surveys were coded)	05 minutes
- Prepare a computer for the presentation	05 minutes
Total time need for pre sitting	70 minutes
- Distribution of the pre- survey	15 minutes
- Collect the survey and make sure they answered all the survey questions.	02 minutes
- Present the power point presentation with Q&A	30 minutes
- Live cooking demonstration	15 minutes
- Food sample distribution	05 minutes
- Bottles of water to be distributed with food sample.	03 minutes
- Distribution of the post- survey	15 minutes
- Collect the survey and make sure they answered all the survey questions.	05 minutes
- Distribution of Protein Handouts: BALANCING PROTEIN: Culinary Science Strategies for Chefs/ Distribution of Sodium Handouts: Cut the Salt, Keep the Flavor	03 minutes
Total time need for the lesson	95 minutes

Data Collection and Sampling Plan: The researcher collected data from October 13, 2011, to March 6, 2012. The present pilot study was a controlled field trial. Due to time and cost constraints, the researcher used a convenience sample. Culinary arts

students received the self-administered survey during regular school hours. Participants did not receive any incentive. The technical college visit was divided into two phases:

Phase I: On the predetermined dates, all the enrolled participants of the respective groups were asked to answer the pre-treatment survey to assess their knowledge, perception, and practices regarding culinary nutrition topics (protein and dietary sodium).

Phase II: On the same predetermined dates, all participants were requested to answer the post-treatment survey regarding the culinary nutrition topics to assess their knowledge, perception, and practices after attending comprehensive face-to-face presentations with live cooking demonstrations. All students received instructions not to leave any answers blank. They had sufficient time to consider and record their answers. Forty-one students ($n=41$) were examined: ($n=20$) in the first group (protein) and ($n=21$) in the second group (dietary sodium).

Data Analysis Plan: The researcher calculated percentages and frequencies to assess changes in students' responses regarding knowledge, perception, and practice items. The data analysis began with the generation of descriptive statistics to understand demographic characteristics of the groups. The changes in scores of each survey item of pre- and post-test were compared using paired t-test for Likert-type items and Fisher's exact test for the categorical items. Changes in average scores and percentages that were statistically significant were identified. Because the study was a pilot, non-statistically significant changes were also reviewed to determine if the direction of change was consistent with predicted outcomes.

Institutional Review Board (IRB) Approval

The IRB at Clemson University reviewed all data collection protocols of this research to ensure that all requirements on research with human subjects were met. The IRB approved the data collection protocol (IRB2011-288) on September 12, 2011, using exempt review procedures (Appendix J). The researcher submitted an amendment on January 27, 2012, to update final edits on the survey and information pertaining to the timeline for data collection. The IRB granted approval on February 10, 2012 (Appendix K).

Human Subjects Research Training: The principal investigator and co-investigator completed the Social and Behavioral Science Research track modules as required by the IRB and were certified by the Collaborative IRB Training Initiative (CITI) prior to beginning data collection. The Social and Behavioral Science Research track modules are available on the CITI website.

3.2.2. Results & Discussions

The researcher examined responses from $n=41$ students, with $n1=20$ in the protein group and $n2=21$ in the sodium group. Table 3-4 shows socio-demographic characteristics. Almost 80% of the participants in both groups were aged 19 to 29 years. This indicates that most of the participants did not have long work experience in the field of culinary arts.

[Table 3-4](#)

<i>Demographic Characteristics (pilot, in class survey)</i>		
	Protein Group (n=20)	Sodium Group (n=21)
Age		
19-29	80%	81.0%
30-39	15%	4.8%
40-49	5%	9.5%
50 and over	0%	4.8%
Gender		
Male	45%	42.9%
Female	55%	57.1%
Work Facility Characteristic		
Casual/Family Restaurant	10%	9.5%
Fine Dining	15%	4.8%
Quick Service/Fast Food	15%	9.5%
On-Site/Contract feeding	0%	9.5%
Culinary arts student	25%	42.9%
Other (please specify)	35%	23.8%

In the first survey pertaining to protein (Table 3-4), 20 participants (25%) indicated that their work facility characteristic was that of a culinary arts student while 25% indicated working in either fine dining, casual, or family restaurants. Of the participants, 15% worked in quick- service or fast-food facilities. The majority of participants (35%) reported “other” but did not specify what kind of job they held. In the second survey pertaining to sodium (Table 3-4), 43% indicated their worked facility characteristic was that of a culinary arts student while 14% worked in either fine dining, casual, or family restaurants. Of the participants, 19% worked in quick service, fast food, or on-site contract feeding.

Protein Survey Results

The results of the protein survey are provided in Table 3-5. In this table, only Likert-type items were included (items 4 through 14). Most of the changes were statistically significant. To test for the difference categorical variables for items 1 through 3 and 15 through 19, Fisher's exact test was used (Table 3-6). There was not a statistically significant difference between pre- and post-test responses for the item 1 ($p=0.61$), while there were statistically significant different for items 2 ($p<0.01$) and 3 ($p<0.01$). There were statistically significant differences for the distribution of responses for each of items 15 through 19 ($p<0.01$). The results in Table 3-6 suggest that the proportions of correct answers substantially increased.

[Table 3-5](#)

Paired t-tests for Likert-Type Items on Protein Survey.

<u>Questions</u>	<u>Pre-test</u>		<u>Post-test</u>		<u>T</u>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
<i>Circle your response from strongly agree to strongly disagree</i>					
4. Vegetarian or meatless diets are lacking in essential nutrients and protein.	3.75	1.21	4.4	0.50	4.81*
5. Serving more vegetarian dishes reduces food cost which may increase profitability	2.9	1.07	1.8	0.77	-2.76*
6. Americans eat more protein than they actually need.	1.55	1.10	1.3	0.47	-6.22*
7. Reducing the portion size of meat offered in dishes would result in a decrease in business.	2.55	0.83	3.25	1.07	-5.64*
<i>Rate the importance of each of the following factors in limiting the feasibility of placing vegetarian or meatless dishes on the menu.</i>					
8. Need for specific staff skills and training.	4.05	1.05	2.35	1.60	-4.14*
9. High labor costs.	2.55	1.32	2	1.03	-3.58*
10. Limited ingredient availability.	3.1	1.37	2.9	1.21	0.61
11. High ingredient cost	2.95	1.15	2.4	1.14	2.46*
12. Short ingredient shelf life.	3.35	1.23	3.1	1.48	0.60
13. Consumer Demand.	3.75	1.29	3.9	1.37	0.24
<i>Rate how confident you are in developing a vegetarian menu that contains complementing proteins.</i>					
14. How confident you are in developing a vegetarian menu	3.15	1.50	4.15	0.99	-9.97*

*Significant at 0.05 α level

Table 3-6

Fisher's Exact Test for the Changes in Categorical Items on Protein Survey

Questions	Responses	Pre, %	Post, %	P-Value
1. Providing vegetarian meals offers a benefit to my establishment in terms of sales	1-True 2- False	85 15	95 5	0.61
2. There are no plant sources for complete proteins	1-True 2- False	60 40	5 95	p<0.01
3. Customer demand is NOT large enough to place vegetarian items on the menu	1-True 2- False	55 45	5 95	p<0.01
15. Complementary proteins are:	1- One food item providing all of the essential amino acids	15	5	p<0.01
	2- Two or more incomplete protein foods that when paired together give all of the essential amino acids.	25	85	
	3- Two protein sources that can be combined for enhanced flavor.	15	5	
	4- Are only found in animal-based foods.	45	5	
16. Which of the following non-meat foods provide complete proteins?	1- barely	0	0	p<0.01
	2- peanut butter	5	5	
	3- garbanzo beans	10	0	
	4- soybeans	15	80	
	5- spinach	5	0	
	6- None of the above	10	0	
	7- All of the above	55	15	
17. The recommended daily allowance of protein per kilo gram for an adult male is approximately:	1- 0.5 gram	10	0	p<0.01
	2- 0.8 gram	30	100	
	3- 0.9 gram	30	0	
	4- 1.0 gram	30	0	
18. Examples of complementary proteins are:	1- Macaroni and Cheese	5	0	p<0.01
	2- Peanut Butter and Jelly Sandwich	20	0	
	3- Beans and Rice	30	10	
	4- Hummus and pita bread	5	0	
	5- None of the above	10	5	
	6- All of the above	30	85	
19. The recommended daily allowance of protein for a 70kg (~154 lb.) adult male is approximately:	1- 105 grams	45	0	p<0.01
	2- 42 grams	0	0	
	3- 56 grams	20	95	
	4- 78 grams	30	5	

*Correct answers are shown in bold

*Significant at 0.05 α level

Protein Survey Discussion

Regarding knowledge items in the pre-survey (Table 3-6), the participants demonstrated a weak knowledge base regarding the Recommended Daily Allowance (RDA) of protein, sources of protein, and complementary proteins. However, after the educational intervention lesson, the knowledge about dietary protein increased. Most of the changes were statistically significant, which suggested that the educational intervention lesson was effective. Additionally, the proportion of questions answered correctly increased, which was another indication of the lesson efficiency.

The post-survey showed that students continued to rate consumer demand as a highly important factor in limiting the feasibility of placing vegetarian or meatless dishes on the menu. Their consistent opinion regarding consumer demand indicated that consumer demand is one of the most important factors for controlling what is on the menu (Johnson, Raab, Champaner, & Leontos, 2002).

Sodium Survey Results

In general, students' knowledge increased after participating in the applied nutrition sodium lesson (Table 3-7 and Table 3-8). Only 38% recognized the 2010 Dietary Guidelines regarding the reduction in the upper limit for sodium from 2,300 mg/day to 1500 mg/day. This item increased to 90% in the post-treatment survey. In addition, 62% answered incorrectly that sea salt is a healthier alternative to table salt while only 14% answered this question incorrectly in the post-survey.

For categorical survey items 1 through 7 (Table 3-7), there was a statistically significant difference between pre- and post-test responses for item 1 ($p < 0.01$), 2

($p<0.01$), 3 ($p<0.01$) and 5 ($p=0.02$). The results for Likert-type items on the sodium survey are presented in Table 3-8. At significance level $\alpha=0.05$, it appeared there was a statistically significant increase in knowledge about strategies to use unsalted butter in place of salted butter, to avoid pickles, and cooking with wine instead of soy or barbeque sauces.

[Table 3-7](#)

Fisher's Exact Test for the Change in Categorical Variables on Sodium Survey

Questions	Responses	Pre N%	Post N%	p-value
1. The 2010 Dietary Guidelines recommends reducing the upper limit for sodium intake for at risk groups from 2,300 mg/day to ____ mg/day.	2,000 1,750 1,500 1,200	14.29 28.57 38.1 19.05	0.00 4.76 90.48 4.76	$p<0.01$
2. What percentage of Americans are concerned with their sodium consumption?	25% 36% 40% 53%	14.29 42.86 14.29 28.57	4.76 4.76 0.00 90.48	$p<0.01$
3. Sea salt is a healthier alternative to table salt.	True False	61.9 38.1	14.29 85.71	$p<0.01$
4. When preparing a pasta dish with meat sauce, approximately how many times do you add salt from start to finish?	1 2 3 4 > 5 times	0.00 14.29 42.86 19.05 23.81	42.86 23.81 19.05 4.76 9.52	$p=0.245$
5. What do you think is the maximum percentage of sodium reduction before customers would notice?	10% 25% 45% 55%	47.62 28.57 19.05 4.76	0.00 38.1 57.14 4.76	$p=0.02$
6. Do you ever use purchased bases, such as stocks and sauces, when making dishes?	Yes No	95.24 4.76	95.24 4.76	$p=1.0$
7. If you answered "Yes," do you ever seek out low-sodium or sodium-free bases?	Yes No	38.1 61.9	66.67 33.33	$p=1.0$

*Correct answers are shown in bold

*Significant at 0.05 α level

[Table 3-8](#)

Paired t-tests for Likert-Type Items on Sodium Survey

	Pre-test		Post-test		T
	M	SD	M	SD	
Do you think that:					
8. If gov't regulation restricted salt content on restaurant menu items, how difficult would it be for your establishment to comply?	2.81	0.93	2.43	1.08	1.50
Will following strategies be effective in reducing sodium?					
9. Use fresh tomatoes instead of canned.	4.24	0.70	4.43	0.51	-1.45
10. Use herbs and spices instead of using salt to add flavor.	4.29	0.56	4.48	0.51	-1.45
11. Use unsalted butter in place of salted butter.	4.15	0.75	4.57	0.51	-2.63*
12. Skip the pickle.	3.14	1.24	3.81	1.03	-4.18*
13. Cook with wine and vinegar instead of soy / bbq. sauce.	3.71	0.90	4.38	0.50	-3.35*
Easiness to change to produce reduced-sodium dishes					
14. Use fresh tomatoes instead of canned.	2.00	1.00	1.81	0.75	0.89
15. Use herbs and spices instead of using salt to add flavor.	1.71	0.64	1.62	0.50	0.57
16. Use unsalted butter in place of salted butter.	1.86	0.96	1.57	0.60	1.19
17. Skip the pickle.	2.14	0.96	2.00	0.71	0.68
18. Cook with wine and vinegar instead of soy / bbq. sauce.	2.29	0.85	2.05	0.97	1.56
Do you think that:					
19. A reduced-sodium menu will lead to complaints from your guests	2.48	1.03	2.33	0.73	0.77
20. Sodium will not be a major challenge to chefs in terms of flavor	3.52	0.98	3.67	1.02	-0.77
21. Simple flavor additions can enhance dishes with reduced sodium	4.10	0.55	4.14	0.73	-0.81
22. Establishments should promote lower sodium menu items	4.00	0.77	4.05	1.02	-0.18
23. Education programs are needed to teach sodium reduction strategies	4.10	0.54	4.24	0.62	-1.14
24. Consumers prefer salty food and will resist change.	3.19	0.98	3.10	1.14	0.32
25. High salt content foods must be labeled.	3.62	0.97	3.81	1.25	-0.78
26. It is very costly for the restaurant to reduce salt in food products.	2.76	0.94	2.43	0.93	1.28

*Significant at 0.05 α level

Sodium Survey Discussion

A recommendation by the Institute of Medicine (2010) stated, “Food manufacturers and restaurant/foodservice operators should voluntarily accelerate and broaden efforts to reduce sodium in processed foods and menu items, respectively” (Henney, Taylor, & Boon, 2010 p.288). As stated earlier, consumer wishes are very important for chefs (Johnson et al., 2002). The same percentage of respondents (76%), in both pre- and post-surveys, reported that reduced-sodium menus would lead to complaints from guests. This was even after the applied nutrition lesson when most participants agreed that sodium reduction would not be a major challenge to chefs, in terms of flavor, if they used their creativity in cooking. Ninety percent agreed simple flavor additions could enhance dishes containing reduced sodium, and 67% agreed that food service establishments should promote lower sodium versions of their menu items to guests.

Most students saw the importance of the training lesson. Ninety percent agreed that educational programs must be developed and adapted for employees working in the various sectors of the food industry in order to inform them about sodium and the sodium reduction strategies. Only 48% agreed to the same statement before participating in the applied nutrition education lesson.

At significant level $\alpha=0.05$, There was no statistically significant evidence that the sodium education lesson reached effectiveness. However, the lack of statistical significance does not automatically indicate that the program was ineffective because pre-test scores on many survey items, especially opinion items, were relatively high. In

other words, students were already familiar with much of the material and for this reason the program provided limited benefit to this audience. This finding may indicate that the sodium education program redundantly targeted knowledge domains that students were already familiar with, as relevant to current trends in away-from-home food service. For this reason, an option of refocusing the sodium lesson could be considered for future applications.

3.2.3 Conclusion

Some of the changes in students' knowledge, perceptions, and practices regarding nutrition science of protein and sodium were statistically significant. This pilot provided the research team with needed experience with the target audience of culinary arts students as well as practice with PowerPoint lessons and the live demonstration strategy. The lack of statistical significance was likely due to the study being underpowered and possibly a need to focus on more relevant knowledge domains. However, the direction of the changes in survey scores suggested that experiential learning worked successfully in teaching nutrition to culinary arts students. Hence, experiential learning is a promising method to teach nutrition within culinary arts programs. This approach needs additional development before it can be recommended for culinary nutrition lesson implementation.

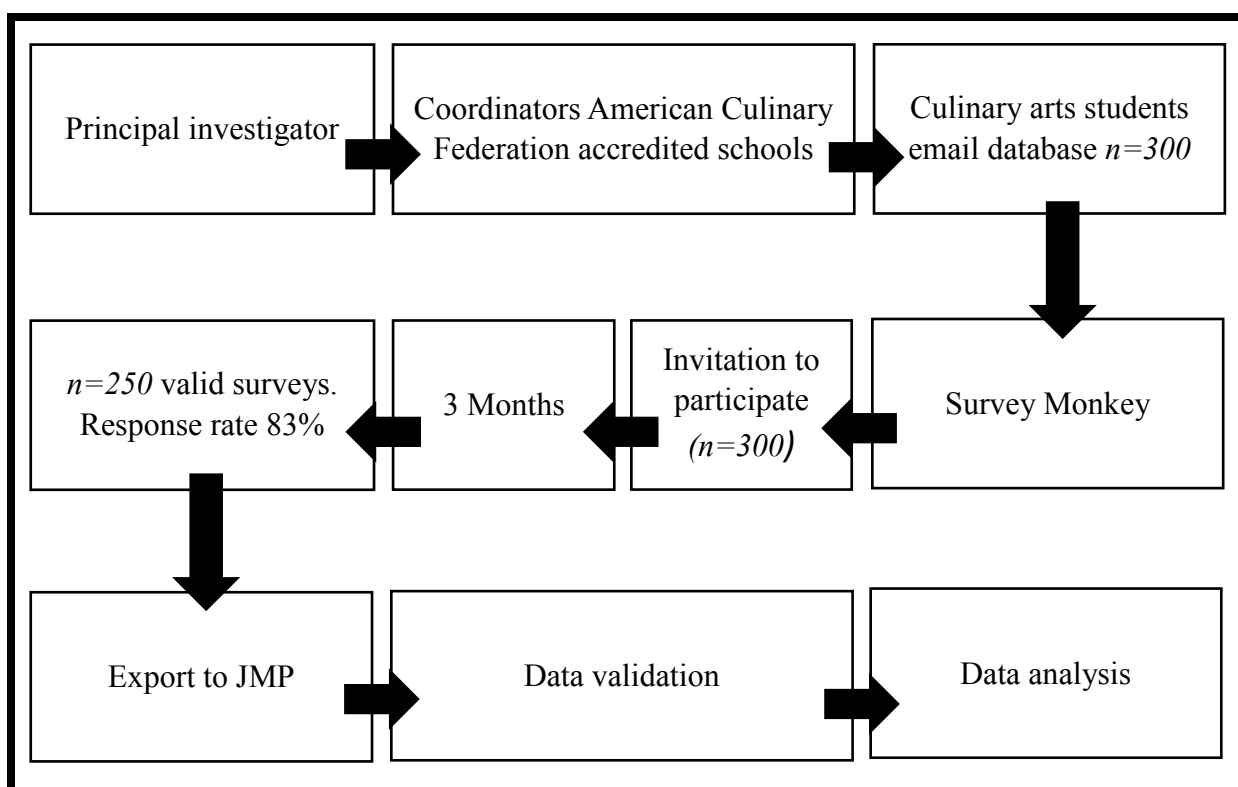
3.3. Pilot Assessments (II): Assessment of Culinary Students' Knowledge, Perceptions and Practices of Nutrition Science

Nutritional knowledge of culinary arts as well as Culinology® students, who represent future food preparers and product developers, is critical, yet little is known of their opinions on fat, protein serving determinants, sodium, overall portion sizes, and healthy food preparation techniques. By investigating nutrition knowledge relevant to trends at a baseline, researchers and culinary arts program directors can interpret and modify the future curriculum that may impact the quality of food prepared by today's culinary students. This assessment sought to make a contribution to the design of applied nutrition education models in culinary arts education.

3.3.1. Materials and Methods

Site Description

After being approved by the IRB, the principal investigator recruited human subjects by contacting accredited culinary arts program coordinators with a request to invite their senior culinary students to participate in an online survey via Survey Monkey™. The American Culinary Federation accredited all culinary arts programs participating in this study (Figure 3-2).



[Figure 3-2. Study \(II\) Design \(pilot, online\)](#)

Description of Evaluations (Methodology)

Survey Design: The researcher developed a survey with the guidance of previous surveys administered to professional chefs at the national level on the topics of fat, protein, sodium, and healthy cooking techniques. The research team discussed the survey with culinary educators and experts in food and nutrition and reviewed the first draft of the survey for its intended purpose, usefulness, and comprehensiveness. Subsequently, the survey was revised and reviewed again by experts to establish content validity. Since the survey measured factual knowledge rather than complex constructs, the validity of the

survey was established by examining survey questions. Such examination suggested that the face-validity of the survey was appropriate.

The survey included a brief demographic section, containing seven items (Appendix H), followed by nine items that measured nutrition knowledge and perception. The survey focused on fat (three items), protein (three items), and sodium (three items) as key nutrition topics or factors (Table 3-9, and Appendix I). The information collected from this survey helped in determining the most important topics for which culinary arts students may benefit from additional exposure.

Prior to completing the survey, participants received a consent form describing the goal of the survey, the number of items, the time needed to answer the survey, the contact information of the primary investigator, and their rights as a research participant. Students were requested to complete the survey on their own (Appendix G).

[Table 3-9](#)

<i>Factors Measured on the Pilot Survey Instrument</i>				
Factors Measured	Number of Items			Response Format
	Fat	Protein	Sodium	
- Knowledge, perceptions and practices	3 items	3 items	3 items	Choose the best answer.
Demographic items		7 items		Choose the best answer.

Data Collection and Sampling Plan: The data was collected using an online self-administered survey over a ten-day time period in April 2012. The selection of participants proceeded in two phases. In the first phase, the principal investigator contacted program coordinators from the American Culinary Federation’s accredited

schools list with the request to invite their senior students to participate in the survey. In the second phase, email invitations with links to Survey Monkey™ were emailed to $n=300$ senior students. Each email contained an explanation of the purpose of the survey and explanation on why their participation was beneficial. A total of ($n=250$) responded, which constitutes the response rate of 83%.

Data Analysis: Descriptive statistics of the sample were generated to understand characteristics of the target population and their nutritional knowledge level on the sodium, fat, and protein items. Subsequently, four new variables were generated to represent the number of correct answers on each subscale and for the overall survey. Histograms showing distribution of the correct answers were generated to better illustrate knowledge gaps on these specific nutrient items.

To assess the impact of socio-demographic factors on the level of knowledge, multiple analysis of variance (ANOVA) was conducted. For the ANOVA, the dependent variables represented the number of correct responses while independent variables represented socio-demographic characteristics.

Institutional Review Board (IRB) Approval

The IRB at Clemson University reviewed all data collection protocols of this research to ensure that all requirements on research with human subjects were met. The IRB approved the data collection protocol (IRB2012-101) on March 22, 2012, using exempt review procedures (Appendix L).

Human Subjects Research Training: The principal investigator and co-investigator completed the social and behavioral science research track modules as required by the IRB and were certified by CITI prior to beginning data collection.

3.3.2. [Results](#)

The sample demographics are presented in Table 3-10. Examination of the table suggests that the sample was relatively well balanced with good representation of different socio-demographic groups. Table 3-11, Table 3-12, and Table 3-13 detail the distribution of responses on each subscale. These tables suggest that the proportions of incorrect responses pertaining to sodium were high.

[Table 3-10](#)

Demographic Characteristics (pilot, online survey) n=250

Age	
19-29	45.8%
30-39	18.9%
40-49	19.7%
50 and over	15.7%
Gender	
Male	42.0%
Female	58.0%
Ethnicity	
Black, not of Hispanic origin	13.3%
White, not of Hispanic origin	73.8%
Other	12.8%
Location of the school? (Region)	
Northeast	19.3%
Southeast	33.7%
Central	24.9%
West	22.1%
Years in the food industry?	
No industry experience/Less than 1 year	28.4%
1 to 5 years	44.0%
6 or more years	27.6%
Position at work	
No industry experience	14.9%
Cook/Line Cook/Sous Chef	39.1%
Bakery/Pastry/Kitchen Helper/Culinary Apprentice	20.2%
Other	25.8%
Place of work	
No industry experience	11.4%
Casual/Family Restaurant	19.5%
Fine Dining	23.2%
Quick Service/Fast Food/Catering	13.0%
On-Site/Contract Feeding/Culinary School/Health Care	17.1%
Other	15.9%

[Table 3-11](#)

Responses on Fat Subscale

Questions	Response options	Response
1. Many foods labeled “fat-free” are generally higher in sugar, refined carbohydrates and calories.	Strongly Agree*	29.3%
	Agree*	53.7%
	Neither Agree or Disagree	11.0%
	Disagree	4.9%
	Strongly Disagree	1.2%
2. Which is the best source of monounsaturated fat?	Olive*	71.8%
	Palm	3.2%
	Fish	9.3%
	Canola	13.7%
	Corn	2.0%
3. What type of fat do you primarily use to sauté?	Butter	12.2%
	Vegetable oil (corn, canola, etc.)*	24.1%
	Olive oil*	58.4%
	Specialty oil	5.3%

**Correct answer*

[Table 3-12](#)

Responses on Protein Subscale

Questions	Response options	Response
4. The USDA’s recommended portion size for a single serving of meat for the average adult is?	2 to 4 ounces*	66.7%
	5 to 7 ounces	30.9%
	8 to 10 ounces	2.0%
	11 to 12 ounces	0.4%
5. Complementary proteins are:	One food item providing all of the essential amino acids.	6.0%
	Two or more incomplete protein foods that when paired together give all of the essential amino acids*	85.1%
	Two protein sources that can be combined for enhanced flavor.	7.2%
	Are only found in animal-based foods.	1.6%
6. Which of the following modifications to the normal hamburger and fries meal at a restaurant do you feel would be perceived as the most acceptable among children?	Using ground turkey meat with finely minced vegetables	11.7%
	Substituting regular fries with baked sweet potato fries	17.4%
	Using a whole-wheat bun	14.6%
	Scaling back the portions of both the burger and fries*	56.3%

**Correct answer*

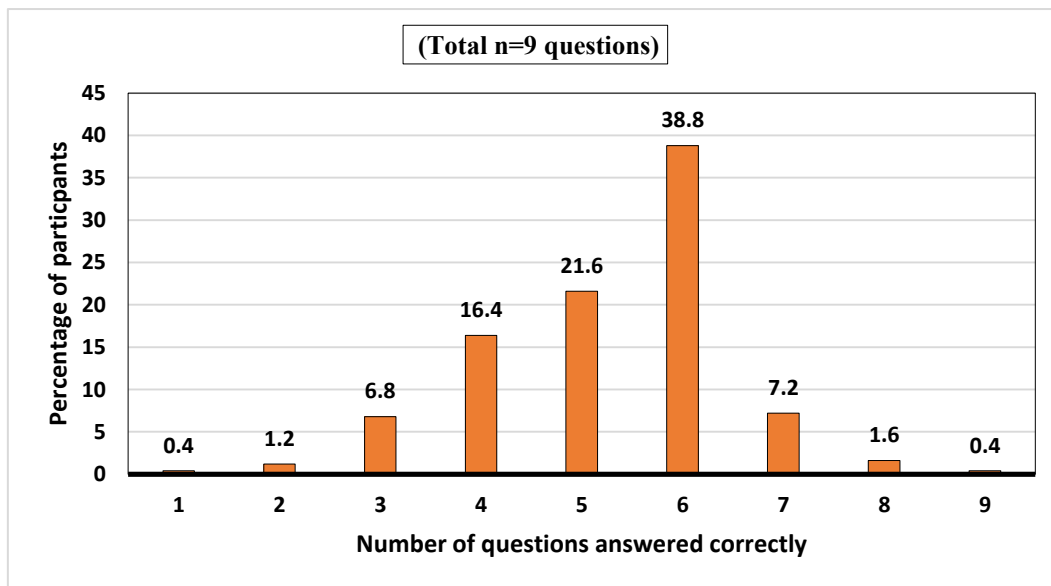
[Table 3-13](#)

Responses on Sodium Subscale

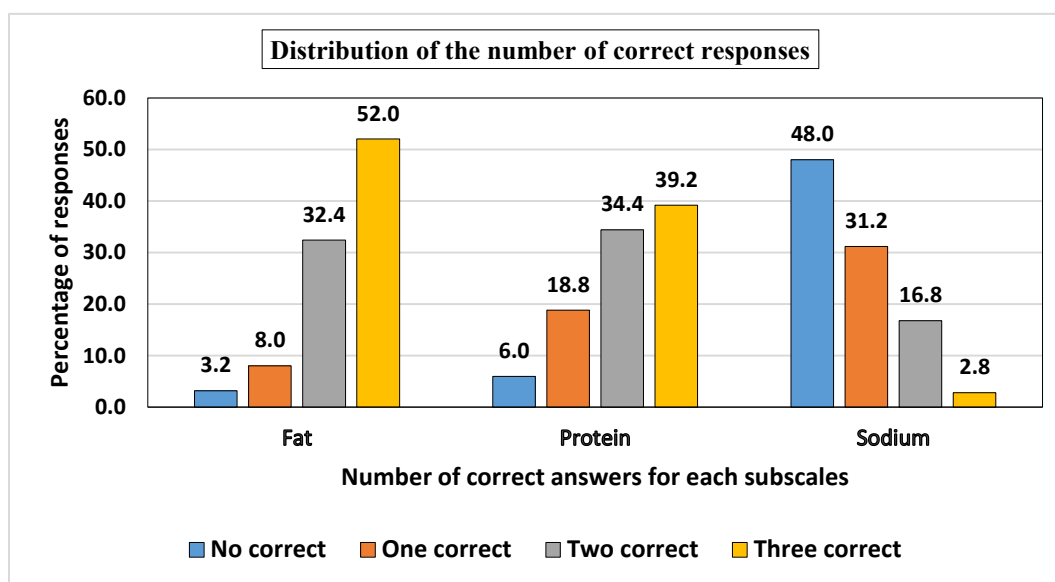
Questions	Response options	Response
7. In January 2010, the American Heart Association announced the sodium recommendation for all Americans should be reduced to 1,500 mg a day. Which food item below contains the daily recommendation for sodium of 1500 mg?	1. $\frac{3}{4}$ teaspoon of table salt	43.8%
	1 can of soup	11.6%
	1 cup grated Parmesan cheese	10.8%
	All of the above*	33.7%
8. Which of the following is a better alternative to table salt to reduce sodium?	Sea salt	44.0%
	Kosher salt	19.2%
	Non-iodized salt	10.8%
	None of the above*	26.0%
9. When preparing a pasta dish with meat sauce, approximately how many times do you add salt from start to finish?	1 time *	14.1%
	2 times	33.9%
	3 times	41.5%
	4 times	8.9%
	5 times or more	1.6%

*Correct answer

Figure 3-3 and Figure 3-4 depict the overall distribution of the number of correct responses, and the distribution of the number of correct responses for fat, protein and sodium subscales.



[Figure 3-3. Distribution of the Number of Correct Responses](#)



[*Figure 3-4. Distribution of the Number of Correct Responses for Subscales*](#)

To determine which socio-demographic characteristics affected the number of questions answered correctly, factorial ANOVA models were fitted with the dependent variable representing the number of questions answered correctly on each of the three subscales and the overall total of the correct answers (Table 3-14). For each dependent variable, the model of the following form was fitted with appropriate transformation of categorical predictors to dummy variables.

$$y = \mu_0 + Age_i + Gender_j + Ethn_k + Region_l + Exp_m + Empl_n + Facility_p + \epsilon_{i...p}$$

In this model, interaction effects were omitted because the sample size was not sufficiently large enough to achieve reasonable statistical power with the larger number of free parameters required for the model with interaction effects.

[Table 3-14](#)

Multivariate ANOVA: demographic characteristics impact on knowledge about fat, protein, and sodium

Independent variable	Dependent Variable	F	p-value
Age	Fat	0.688	0.560
	Protein	0.984	0.401
	Sodium	1.646	0.180
	Overall	0.701	0.553
Gender	Fat	2.292	0.132
	Protein	3.310	0.070
	Sodium	2.762	0.098
	Overall	1.224	0.270
Ethnicity	Fat	1.337	0.265
	Protein	0.265	0.768
	Sodium	1.479	0.230
	Overall	1.397	0.250
Region	Fat	0.855	0.465
	Protein	2.843	0.039*
	Sodium	0.116	0.950
	Overall	3.526	0.016*
Experience	Fat	1.887	0.154
	Protein	1.413	0.246
	Sodium	1.720	0.182
	Overall	0.202	0.818
Employment	Fat	1.094	0.353
	Protein	1.849	0.139
	Sodium	4.302	0.006*
	Overall	0.092	0.965
Facility Type	Fat	2.144	0.062
	Protein	2.938	0.014*
	Sodium	2.217	0.054
	Overall	1.476	0.199

*Significant at 0.05 level

**Dependent variables represents the number of questions answered correctly

The analysis suggests that the “Region” was associated with the total number of answers on the protein survey $F(3, 206)=2.843, p=0.039$ and overall number of questions answered correctly $F(3, 206)=3.526, p=0.016$. Type of the employment was associated with the number of questions answered correctly on the sodium survey $F(3, 206)=4.302, p=0.006$. The facility type was also strongly associated with the number of correct

responses on the protein survey. No other demographic variables were statistically significant.

For the statistically significant variables, post-hoc tests were run to determine which factor levels accounted for the differences. Least significant difference (LSD) post-hoc test suggested that only central and southeast regions were different from each other, both for the overall number of the questions answered correctly $M_C=5.53$ versus $M_{SE}=4.92$, $p=0.009$ and for the protein survey $M_C=2.25$ versus $M_{SE}=1.88$, $p=0.046$. With respect to the “Employment” variable, those who worked in the areas of “Bakery/Pastry/Kitchen helper/Culinary Apprentice” were different from all other groups on the sodium subscale. On average this group had lower knowledge about sodium than those with “No industry experience” ($p=0.038$), “Cooks/Line Cook/Sous Chef” ($p=0.024$) and “Other” positions ($p<0.001$). Those who worked at “Fine Dining” facilities had better knowledge about protein as compared to those working in “Fast Food” service $\Delta M=0.47$, $p=0.02$, or had “No industry experience” $\Delta M=0.59$, $p=0.005$ or worked “Other” $\Delta M=0.68$, $p=0.001$.

Finally, to compare the average number of questions answered on sodium, protein, and fat surveys, repeated measures of ANOVA was used. Repeated measures ANOVA was selected in order to focus on the change in scores over time and to achieve higher statistical power since this procedure separates between subjects’ differences from the error (Ott, 2010, p. 545). There was a statistically significant difference within subject effect $F(1,235)=368.811$, $p<0.001$. The series of paired post-hoc t-tests revealed that the average number of correctly answered questions was different for each subscale.

Subscale means and standard deviations for fat, protein, and sodium subscales correspondingly were $M_{fat}=2.39$, $M_{prot}=2.09$, and $M_{sod}=0.74$.

Overall, the data suggested that those located in the Southeast scored lower on the protein survey and overall as compared to any other region. Those who worked at fine dining facilities were better informed about protein than any other group. Finally, those employed in a bakery or pastry department scored the lowest on the survey.

3.3.3. [Discussion](#)

The results suggest that the knowledge items about the specific nutritional practices were low. Only 0.4% of the respondents answered all nine questions correctly. The overwhelming majority 90.8% answered correctly only six or less questions out of total nine questions (Figure 3-2). Knowledge about sodium was the least correct, with 48% of students answering no questions correctly. Meanwhile fat and protein items had similar percentages of correct answers, 3.2% and 6% respectively. These rates of correct responses have room for improvement (Figure 3-3).

The regional differences detected on the protein survey are of interest and cannot be explained. Likewise, there is no satisfactory explanation for the effect of the facility type on knowledge about protein. Those who were employed by a bakery or a pastry department scored low in knowledge about salt. Possibly their work with bakery formulas provided little flexibility in seasonings and limited application of sodium in food preparation. Another interesting finding is that demographic characteristics appear unrelated to knowledge level about nutrition.

3.3.4. Conclusion

The present research found that most of the students seem to have a better sense of fat and protein basic knowledge competencies as compared to sodium. This finding is largely unrelated to demographic characteristics. For most practical purposes, it can be assumed that lack of knowledge about healthy nutrition was relatively uniform across socio-demographic strata. Therefore, everyone can benefit from education about healthy nutritional guidelines as applied to sodium, fat, and protein. For the purposes of any curriculum development, it should be taken into account that, in general, culinary arts students are most familiar with nutritional information about fat and least familiar with sodium while their level of knowledge about protein falls in between those two.

3.4. Overall Conclusion from Pilot Assessments I and II

The cross-sectional survey found that there was insufficient applied knowledge and competence about nutritional guidelines regarding protein, fat, and sodium topics. The lack of knowledge was independent of participant demographic characteristics. Even though some participant groups scored higher as compared to other groups, in absolute terms, the level of nutritional knowledge was less than satisfactory.

There is reason for optimism. The experience gained from the two educational intervention lessons suggested that even relatively simple brief educational interventions may be effective in increasing students' knowledge about the relevant domain of knowledge. Both educational intervention lessons can serve as starting points in developing more advanced educational materials that improve knowledge of students about healthy cooking and dietary practices. Knowledge about health and applied

nutrition are important for culinary arts students. Applied instructions were sufficient for noticeable improvement in students' knowledge about nutrition. Therefore, applied culinary nutrition educational programs can improve students' knowledge, perceptions, and practices.

3.5. Limitations

- This first study was a field trial and limited to one location, one project, and a small sample size due to time and cost constraints. This limitation presents a constraint to the generalization of the findings but also provides opportunities for future research. A greater sample size would improve external validity.
- Due to the non-experimental nature of the study, its internal validity was low. It is not possible to establish causal relationships between educational program and learning outcomes.
- Reliability properties of the survey, such as reproducibility coefficients, inter-rater reliability, and test-retest coefficients, will benefit from additional investigation. Examination of validity was limited only to content validity while other types of validities, such as construct or criterion, will benefit from additional investigation.
- The researcher used convenience samples in both studies due to time and cost constraints. For convenience samples, sampling biases are a possibility. Therefore, conclusions made based on biased samples may not be valid.
- The researcher did not use a control group to compare results with student perceptions regarding the instructional method in the first assessment.

3.6. Recommendations and Further Research

The researcher offers the following recommendations for further research:

Recommendation 1: Request a research sample to participate in further longitudinal research to deepen understanding of how students learn best and to assess their knowledge, perceptions, and practices over time.

Recommendation 2: Develop innovative practical instructional methods to teach nutrition in practical (kitchen) settings.

Recommendation 3: Assess the practical application of nutritional concepts, so student chefs will be prepared for their future work.

Recommendation 4: Investigate the impact of such practical programs on the future working conditions of cooks.

Recommendation 5: Investigate different methods of assessment, as one mode is not always appropriate for all learning styles. For example, a future project might include a comparison of different student assessments of lecture versus demonstration versus online or self-learning.

Recommendation 6: Conduct more research to assess culinary students' knowledge regarding other nutrition concepts, such as gluten.

Recommendation 7: Assess culinary arts students' satisfaction with different delivery methods of teaching nutrition concepts.

Recommendation 8: Improve surveys by conducting in-depth analysis of validity and reliability.

Recommendation 9: Utilize control group when testing an educational intervention.

Recommendation 10: Improve sampling methodology to reduce probability of biases.

Instead of convenience, use multi-stage sampling.

Recommendation 11: Administer different version of a survey before and after the intervention.

Recommendation 13: The promising venue of research is to identify healthy substitutions for unhealthy ingredients while preserving palatability and texture of the dish.

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CHAPTER FOUR

EXPERIENTIAL INSTRUCTIONAL METHODS ON APPLIED NUTRITION FOR ENHANCING CULINARY KNOWLEDGE, PERCEPTIONS, AND PRACTICES AMONG CULINARY ARTS STUDENTS

Abstract

Many nutrition courses for culinary arts students are theoretical in nature. Students are often not taught how to translate knowledge about nutrition into practice. For example, students may be taught to use a smaller amount of sodium in their cooking, but they may not know how to implement this recommendation without adversely affecting the palatability of the food. Therefore, effective culinary nutrition education must enable chefs to prepare nutritionally balanced dishes that may meet sodium reduction goals while also satisfying consumer expectations for taste. Pilot assessments suggest that combining educational theories and nutrition research with cooking applications through nutrition education programs for culinarians are key for long-term success of menu changes. This study was a randomized controlled trial comparing the effectiveness of traditional lecture (control group (C), face-to-face demonstration (DP), online lecture capture (OP), and the combination of (OP+DP) to enhance culinary arts students' application skills related to sodium usage in food preparation.

Objectives: The study sought to (1) compare relative effectiveness of the four instructional methods with respect to knowledge about dietary sodium, ease of use of sodium reduction techniques, strategies to reduce sodium, and attitudes on the use of

dietary sodium in cooking and (2) compare student satisfaction with the instructional methods.

Methods: A convenience sample of $n=139$ students was randomized to receive the C, DP, OP, or OP+DP intervention. To measure effectiveness of each instructional method, a nutrition survey was administered as a pre-test, post-test, and an eight-week follow-up. Repeated measures ANOVA was used to detect if there were statistically significant differences on any of the four survey subscales. Repeated measures ANOVA was selected because it focuses on the change in scores over time and achieves higher statistical power. This procedure separates between subjects' differences from the error (Ott, 2010, p. 545). To evaluate satisfaction with instructional methods, satisfaction scores were collected only at post-test and the follow-up and then analyzed using repeated measures ANOVA.

Results: There was no statistically significant difference in performance between DP, OP, and OP+DP groups on each subscale. However, each of these methods performed significantly better than the control group (C). For DP, OP, and OP+DP groups, there was no statistically significant difference for outcomes measured on knowledge and attitude subscales between post-test and the follow-up. However, ease of use and strategies subscales of DP, OP, and OP+DP groups recognized statistically significant decreases in scores between post-test and the follow-up. At the follow-up there were no differences in satisfaction scores for DP, OP, and OP+DP groups.

Conclusion: DP, OP, or OP+DP methods were superior to the control group (C). In general, OP+DP resulted in the largest effect sizes, suggesting that this intervention was

possibly more effective as compared to the OP or DP. There is preliminary evidence of long-term program effectiveness. Resultant follow-up outcomes were higher as compared to pre-intervention status. These three methods resulted in approximately the same level of student satisfaction.

Significance of the research: Future culinarians can benefit from learning about health-conscious sodium reduction cooking practices as seen in the nutrition education sector. As culinary education programs are expanded, the benefits can become more evident in the way chefs construct their menus. The ultimate goal of this applied nutrition approach to culinary education is to empower chefs to prepare flavorful food with health benefits for consumers.

Keywords: nutrition education, culinary education, experiential learning, dietary sodium, andragogy.

4.1. Introduction

Currently, four of the top ten causes of death in the United States, heart disease, cancer, cardiovascular diseases (CVD), and diabetes, can be related to poor eating patterns (Calitz, Pollack, Millard, & Yach, 2015; N. B. Johnson et al., 2014). Because of the magnitude of the problem, nutrition is not just a matter of individual health but also a matter of public health. Conversely, many of these diseases, in addition to obesity, are preventable with changes in lifestyle and eating habits (Calitz et al., 2015).

Restaurant food, also known as food-away-from-home (FAFH), is a significant source of calories, protein, fat, and salt—nutrients that had been implicated as contributors to the above mentioned diseases (Fulkerson et al., 2011). Since chefs exercise a large degree of control over what kind of food is offered to consumers, collectively they play an important role in the health of the nation. It can be hypothesized that modification of chefs' cooking habits through education may have a positive impact on reduction of sodium content in FAFH.

Because chefs are in the position to modify food that Americans eat away from home, it is important to increase the level of nutritional awareness among them, encouraging them to influence consumer choices by voluntarily incorporating healthful nutrition concepts into their dishes and menu. The ultimate goal is to help educate their guests by disseminating nutritional information, so customers can make nutritionally appropriate choices. Chefs should strive to ensure that increasing the nutritional value of their products does not detract from its palatability. Ideally, the blending of nutrition

education and culinary arts would promote an applied culinary nutrition approach that contributes to the overall health of the population (Condrasky & Hegler, 2010).

A cursory review of websites of top culinary programs suggests that educational programs that include healthy nutrition education for culinary arts students are theoretical in nature. Students may not be given experience in how to translate knowledge about healthy nutrition into practice. For example, students may be taught to use smaller amounts of sodium in their cooking, but they may not know how to implement this recommendation without adversely affecting the palatability of the food. Therefore, teaching abstract concepts about nutrition is not enough to bring about changes in current cooking practices (Contento, 2008). Students who are preparing to become health professionals, nutrition educators, or chefs should be given appropriate practical knowledge and skills to prepare food as recommended by current Dietary Guidelines.

Condrasky and Hegler (2009) outlined that individual courses in vegetarianism and healthy eating can encourage chefs to creatively provide meals that do not compromise on taste, even when incorporating low-calorie options. To ensure that chefs have developed the ability to transfer the technical and scientific skills as well as nutrition concepts to their menus, appropriate educational programs should be selected.

To determine the relative effectiveness of a culinary nutrition continuing education program, Michaud (2007) reviewed subjects' responses on a survey to compare competence in areas including: cooking attitude, behavior toward cooking, self-efficacy for produce consumption, cooking techniques with vegetables, as well as seasonings. A cooking knowledge test was also utilized.

According to Michaud (2007), chefs' participation in nutritional education programs allow them to transfer learned skills into cooking practices. This transfer of skills is something that is echoed by Byrd-Bredbenner (2005), who placed emphasis on the evidence that points towards healthier menus being developed when adults are knowledgeable on how to cook healthy foods efficiently. Both of these studies provided strong evidence for the idea that applied nutrition training encourages healthier menu planning.

Abdulsalam (2015) found that there was sufficient applied knowledge on protein and fat among culinary arts students, but these students had insufficient knowledge related to sodium. Accordingly, an efficacious education intervention should focus on the application of knowledge for dietary sodium. More specifically, applied and practical educational programs could further enhance students' practices on how to reduce the amount of sodium used in recipes as well as during the cooking process. However, search of major databases indicated that there is a gap in the literature regarding the best approach to practical education of culinary students.

To address the gap, this study evaluated instructional methods that concentrated on experiential learning (EL) based on andragogical principles. The goal was to assist culinary arts students in liquidating any disconnect between their theoretical knowledge about nutrition and their practical culinary applications. Supplemental applied nutrition lessons were developed and used as an intervention module with different instructional methods that included a face-to-face applied nutrition presentation with a live cooking demonstration, and/or an online applied nutrition presentation using the Mediasite™

program. Mediasite™ is a lecture capture and webcasting technology that completely automates the recording, distribution, management, and analytics of high-quality video and multimedia presentations (Sonic Foundry Inc., 2014).

This study evaluated whether practical nutrition information would change students' knowledge, competency, and attitudes toward culinary use of sodium to a greater extent as compared to the traditional lecture method. The ultimate goal of the applied nutrition approach to culinary education was to empower chefs to prepare flavorful food that reflects healthy ingredient selection and cooking technique. Thus, chefs would contribute healthier food choices for their customers.

The Importance of Controlling Consumption of Dietary Sodium

Cardiovascular diseases (CVD) are the leading causes of death in the United States (N. B. Johnson et al., 2014). While sodium is an essential component of the human diet, excessive sodium intake has been found to be associated with CVD and some other chronic diseases. Excessive sodium intake has been investigated as a link to elevated blood pressure, a risk factor for cardiovascular diseases (Aburto et al., 2013). High levels of dietary sodium may cause increases in the left ventricle mass, as well as thickening of the coronary and renal arteris. It is also related to incidents of strokes and cardiac failure (He & MacGregor, 2007). Go et al. (2014) reported that hypertension was recorded as one of the primary or contributing cause of death by coronary heart disease in 2010. High blood pressure is also related to the aggregation of platelets and acceleration of the progression of renal dysfunction (De Wardener & MacGregor, 2002). Not surprisingly, it has also been shown that individuals that have high blood pressure can benefit from

reducing their intake of dietary sodium.(Paterna, Gaspare, Fasullo, Sarullo, & Di Pasquale, 2008; De Wardener & MacGregor, 2002). Although environmental, genetic, and the interactions between environmental and genetic factors can play a role in the occurrence of high blood pressure, existing evidence shows that dietary factors also play a substantial role. According to the (Centers for Disease Control and Prevention (CDC), 2013), dietary sodium reduction has been found to be effective in the treatment of hypertension and the prevention of associated diseases (Aburto et al., 2013). For this reason, there has been intense public health programing to reduce sodium consumption.

Yet, these public health programs have had only moderate success. According to the AHA (2014), about 33% of U.S. adults have high blood pressure (nearly 1 in 3 U.S. adults), and roughly another third have pre-hypertension. About 69% of people who have a first heart attack, 77% of people who have a first stroke, and 74% of people who have congestive heart failure have blood pressure higher than 140/90. The AHA reported that hypertension was reported as one of the primary or contributing causes of death by coronary heart disease in 2010 (Go et al., 2014).

Several studies have documented that sodium-dependent high blood pressure causes anomalies in the metabolism of calcium, which in turn, leads to severe calcium loss with osteoporosis. In some cases secondary activation of the parathyroid gland as well as more degrees of loss of calcium from the skeleton can increase the risk of urinary tract stones (Cappuccio, Kalaitzidis, Duneclift, & Eastwood, 2000; Cohen & Roe, 2000; De Wardener & MacGregor, 2002; Heaney, 2006). Excess salt intake has also

been linked to a higher risk for the development of gastric cancer (Tsugane, Sasazuki, Kobayashi, & Sasaki, 2004).

Considering the potential effect of excess sodium consumption on health, The Dietary Guidelines for Americans 2010 recommends that individuals consume no more than 2,300 mg of sodium per day as an upper safe limit and not a recommended daily allowance (Dietary Guidelines for Americans 2010, 2011). However, certain demographic groups that are sensitive to sodium, such as African Americans, people over the age of 51, and anyone with high blood pressure, diabetes, or kidney disease, should limit sodium to 1,500 mg per day (Institute of Medicine, 2010).

The goal to reduce sodium consumption does not imply that sodium intake has to be completely eliminated from the diet because sodium does play an important role in many physiological processes. Sodium is the main cation found within extracellular fluids in the body. Sodium levels are associated with fluid balance by regulating or maintaining the volume of blood, balancing water content, and controlling the potential of the cell membrane. Sodium also plays a role in maintaining the acid-base balance, the transmission of nerve impulses, and the contraction process of body muscles (Cappuccio et al., 2000; Sheng, 2013). The correct control of the volume as well as the osmolality of body fluids is important in carrying out many cellular processes that help in survival. Sodium chloride (NaCl) contains Na^+ and Cl^- ions as the determinants of the osmolality of the plasma and the volume of extracellular fluids (Antunes-Rodrigues, de Castro, Elias, Valenca, & McCann, 2004). For this reason, complete elimination of sodium from the diet is not only impossible but also harmful.

The Role of Sodium in the Development of Hypertension

Since sodium helps in regulating the fluid balance, it also has an impact on blood pressure. Due to serum sodium, the body is able to carry out water retention, which helps in maintaining fluid volumes. The presence of sufficient fluid levels in the body provides protection against low blood pressure (Graudal, Hubeck-Graudal, & Jurgens, 2012).

Sodium plays a part in the activation of angiotensin II, which is a protein molecule that causes constriction of the arteries as part of the process for maintaining blood pressure at normal. Due to the impact which sodium has on blood pressure, excess consumption of sodium can contribute to elevated high blood pressure and eventually lead to the development of CVD.

Salt as a Key Element for Chefs

Salt has many important culinary applications that make efforts to reduce sodium intake more complicated. Salt is used to enhance flavor and to improve food texture. Chefs use salt extensively in stocks, gravies, sauces, and salad dressings to improve flavor, stability of emulsions, and food preservation. Chefs also use salt to control the stickiness of doughs (Hutton, 2002) or to help mask other undesirable flavors, such as lipid oxidation flavor upon storage (Hutton, 2002; Kuntz, 2000). Salt extends the shelf life of food by drawing out moisture and inhibiting microbial growth and chemical reactions (water activity) (Institute of Medicine, 2010).

In this exploratory study, the research team noted that some chefs self-reported putting more salt in a single dish than is recommended for an entire day. Salt is often added or layered several times during food preparation for flavor enhancement. For

example, study participant chefs reported that they add salt two to three or more times during the preparation of a pasta dish with meat sauce. In another exploratory study by Johns and Orford (2011), participants ($n=50$) were concerned with chefs' knowledge, attitudes, and behavior with regard to salt. They determined that chefs' level of understanding about salt and sodium is similar to the general population. For example, only nine out of 50 participants knew the current guidelines regarding daily salt intakes. Data indicated that sources of dietary sodium are abundant in the food supply. Some mixed dishes, including pizza, soups, stews, and casseroles, contained high amounts of salt. The combination of ingredients that constituted those dishes, such as pepperoni, sausage, cheese, tomato sauce, and the crust, contained high levels of salt. This fact makes those dishes generally high in sodium even without adding any extra salt. Hence, a single serving that contained combinations of these ingredients can contribute significantly to the amount of sodium consumed during the day (Institute of Medicine, 2010). For example, 100 grams of pizza or bread contains more than 500 mg of sodium (Jacobson, Havas, & McCarter, 2013). According to the *Dietary Guidelines for Americans*, only 10% of one's total salt intake is found naturally in food. Five to ten percent of one's sodium is added at the table or while cooking. Processed foods by manufacturers and food from food service establishments, including restaurants, are responsible for 75% of one's total salt intake (Dietary Guidelines for Americans 2010, 2011).

In sum, versatility of salt as a food ingredient has led to the overabundance of sodium in the diet. Since the amount of sodium added to food is in the hands of chefs and

food scientists, teaching them about the potential harmful effects of excessive sodium may be a promising public health strategy for overall sodium reduction. At the same time, sodium is an essential nutrient that should not be completely eliminated from the diet.

Importance of Practical Strategies in Culinary Nutrition

Using practical strategies in teaching culinary nutrition is important. For instance, learning practical strategies for reducing sodium in recipes and the sources of sodium in the American diet will help consumers as well as food service students and professionals to prepare foods that adhere to sodium recommendations from the health community. When designing these strategies, one should rely on the field of culinary nutrition. According to Condrasky and Hegler (2010) “Culinary nutrition is the application of nutrition principles combined with food science knowledge and displayed through a mastery of culinary skills” (p.1).

The available evidence suggests that food service professionals can play an important role in the reduction of sodium consumption. However, to successfully fulfill their mission of reducing the consumption of dietary sodium, these professionals need to practice sodium reduction strategies. The positive effect of culinary education has been demonstrated in multiple studies. As shown by Cheng, Ogbeide, and Hamouz (2011), chefs who were educated in Culinology[®] produced healthier menus. Hu, Leong, Wei, and Yeh (2005) demonstrated that with education, chefs are more likely to be conscious about the nutritional values of food. Johnson, Raab, Champaner, and Leontos (2002) found that the chefs’ nutrition education heavily influenced the way they planned their menus.

Studies suggested that with intensive training, chefs are more likely to introduce healthier and more nutritionally balanced foods into their menus. Therefore, education of future chefs may have a dramatic effect on overall sodium consumption.

Learning Theories for Culinary Nutrition Education

Learning theories need to be the basis of the instructional design process in any educational setting. Research studies have found that effective teaching strategies foster student learning and help them to be high-level thinkers. A strategy such as experiential learning (EL) is vital to achieve practical outcomes. For this reason, part of this research was looking to integrate best practices in teaching and learning as relevant to advancing culinary students education and to determine which teaching strategies and learning theories can be used with culinary students for applied nutrition training programs. In addition, the research plan was to discover strategies to improve culinary arts students' nutrition knowledge and to link nutrition courses in culinary arts program curriculum to culinary students' practices.

A face-to-face demonstration of how to cook reduced-sodium items can be an effective way to equip students with relevant knowledge and skills. In 450 BC, Confucius made his famous quote “tell me, and I will forget, show me, and I may remember, involve me and I will understand” (Larkley & Maynard, 2008, cited Confucius, p.86). EL simply means learning from experience. The EL theory is entirely learner-centered and works on the assumption that people learn best by experience (Moss & Van Duzer, 1998). This theory means that not only do learners talk and think of the learning material but they are also directly involved with the material.

Experiential learning is a cyclic process, much like Kolb's (1984) theory, which involves setting goals, thinking, planning, experimenting, making decisions, and acting; after which become observation, reflection and review (Johnson, 1998). The learners use their own experience and reflection about the experience to gain knowledge (Dewey, 1938). Since this theory of learning addresses the cognitive, emotional, and physical aspect of the learner, it is effective in teaching adult learners, which goes hand in hand with Knowles' (1950) andragogy theory.

Overview of Selected Learning Theories

Variations of experiential theory relative to Dewey, Kolb, and Knowles, share the central tenet that the learning process occurs through experience. Dewey recognized that learning is social; therefore, the experience from which the information is gleaned comes from real life situations (Miettinen, 2000). While Kolb (1984) agrees that the learning process has to come from experience, he argued that the learning process is an individual process as opposed to social. He stated that the individual learns from experience, which is derived from concrete experience or abstract conceptualization. Kolb's theory differs from Dewey's (1938) and Knowles' (1950) by the fact that he incorporated models that explained the learning process. He proposed that these experiences beget learning styles, which he claims are related to the choices that one makes in life (Kolb, 1984). Knowles (1950) agreed that learning takes place through experience but focused his theory in the way adult learning takes place. Given the age of adult learners, he proposed that their years account for the experience necessary to provide information required to gain knowledge from solutions arrived at from a given situation. The basis of his theory is that

adults often require only those things relevant to their lives with which they can identify in order to deal with other real-life situations. This study followed from these theories, that cooking demonstrations for culinary arts students should involve both learning interactions between students and also individual cooking assignments to enable students to individually process their experiences.

EL theories were proposed in an era when the concept of online learning did not exist. Thus, research is limited on the application of EL in an e-learning environment for culinary professionals. One of the most powerful attributes of online learning lies in its ability to overcome imposed barriers of cost, time, and place (Havice & Havice, 2005). Furthermore, an online environment provides additional opportunities for self-directing learning (SDL) and allows the students to skip material that they are already familiar with. Considering potential advantages, e-learning deserves additional evaluation and comparison with face-to-face demonstration.

Online educational experience can efficiently be delivered through the Mediasite™ platform. Mediasite™ is a media system and webcasting technology that was designed to capture and integrate multiple inputs such as audio/video of the instruction along with presentation slides, images, documents, or course content. This software makes the integrated rich-media presentations available for live broadcasting or archiving them to servers for later access over standard web browsers. This software completely automates the recording, distribution, management, and analytics of high-quality video and multimedia presentations. The presentation sessions can be saved on CDs, DVDs, or USBs. In addition, professors can simply teach and stream their courses

online. The integrated rich-media presentations can be watched using computers or portable units, such as smart phones and tablets (Sonic Foundry Inc., 2014).

A review by Vasu and Ozturk (2008) found that Mediasite™ is user-friendly, efficient, timesaving, and enhances student engagement through flexible online access to course lectures. These authors used Mediasite™ in an undergraduate survey methodology course within the distance education format. They found that visual reinforcement of textbook lectures added a great teaching quality and efficiency to their class (Vasu & Ozturk, 2008). The study concluded that the lecture recordings using Mediasite™ technology helped students learn course material and assisted them in their studies while decreasing stress and anxiety. Students also positively responded to the recordings after they were provided with digital lecture recordings (Pilarski, Alan Johnstone, Pettepher, & Osherooff, 2008). The general idea of using technology to support learning was supported by the Suda, Bell, and Franks (2011) study. The results of focus groups, which included course directors and first- and second-year students, pointed out that students recommended viewing classroom lectures again online to review course materials. In general, repeated review of course material was recommended by students and faculty members as a main learning method (Suda, Bell, & Franks, 2011).

Thus, students can be engaged in learning both on campus and off campus with the inconveniences and non-productiveness associated with reduced-time barriers. The distributed learning environment can, therefore, be a means for not only integrating but also deepening the interactive involvement of students, in terms of computing and multimedia with learner-centered approaches that include “collaboration, discovery

learning and active learning” (Havice & Havice, 2005, p3). Thus, an online learning approach should seriously be considered as a part of an educational intervention.

Teaching and Learning Strategies for Culinary Arts Students

To maximize learning outcomes for adult culinary arts students, experiential learning should rely on sound andragogical principles. The use of an andragogical theoretical approach in the form of the experiential learning strategy in teaching and learning can be seen in a study by Taylor and Ruetzler (2010). These authors examined the efficacy of an online-based learning for culinary students and found that the key to engaging adult students was to teach them what they wanted to learn, rather than following some kind of a predetermined plan.

Group learning is another common strategy that works well with adult students. Stastny (2009) investigated experiences of students in the process of learning about various types of whole grains and found that in addition to self-direct the learning, working in groups enhanced learning outcomes. Chandler, Weber, Finley, and Evans (2008) demonstrated that rather than sticking only to classroom learning when in a college or university setting, students also needed to be able to interact in a food laboratory. By allowing students to interact, educators permit them to engage in complimentary skill transfer. This is achieved as students interact with each other and develop ideas collaboratively, and it also gives them an opportunity to engage in andragogical problem-based learning that is not in a stressful restaurant setting. These two studies demonstrated that group interaction is important for improved learning outcomes.

Motor learning can also be helpful in establishing learning skills. The effectiveness of motor learning was emphasized by Gagné (1972), who pointed out that even when people are younger they learn to perform skills flawlessly by repeated practical actions. This testifies to the idea that if chefs are going to implement nutrition knowledge into their daily practice, they need to be able to practice it consistently while training. Some culinary arts students may need to unlearn motor skills associated with automatic use of salt dispensers since through these unconscious movements, they tend to add more salt than necessary. Further motor skills associated with healthy cooking practices translate into better retention of theoretical material.

The above-mentioned theories can also be adapted to online learning. The theoretical framework guiding this application is cognitive theory of multimedia learning. This theory applies a foundation of experiential learning theories to online learning (Mayer, 2005). The assumptions of a cognitive theory of multimedia (CTM) include the following: (1) assumption of dual channels, (2) assumption of limited capacity, and (3) assumption of active processing. The assumption of dual channels assumes that when both auditory and visual processes are stimulated, learning is improved. Hence, it is better to present an explanation using two modes of representation rather than one, such as words and pictures. The assumption of limited capacity asserts that there is a limit to the amount of information that can be processed at one time by the working memory (short-term memory). The assumption of active processing assumes that if opportunities for interacting with learning materials are made available, students learn best and can apply what was presented in new situations (Mayer, 2005). It follows from CTM assumptions

that online learning should automatically adjust to student progress by tailoring material delivery to students' progress. Practically, this means that periods of information presentation should intermingle with series of questions to validate understanding of the material.

Given the premises as reviewed, a few strategies such as demonstration, hands-on training, as well as lecture capture support experiential learning strategies and encourage andragogical learning theory. Specific strategies should include self-directed learning, group interaction, motor skill learning, and multi-channeling. All these strategies should be implemented in a manner that would present a moderate level of challenge to students while avoiding information overload.

Implementation of Educational Intervention

In this study, two applied nutrition presentations on the topic of sodium were developed in accordance with the above-identified principles. The first presentation included a face-to-face applied nutrition presentation, where a chef presented live cooking demonstration. In a response to a growing demand for distance education, the second was an online applied nutrition presentation that used the rich-media computer program, Mediasite™. It is virtually identical to the face-to-face applied nutrition presentation, except with virtual demonstration and visual reinforcement. This program is commonly used to supplement traditional instructional and delivery methods.

Indeed, all of the essential elements of andragogy can take place without the extremely wasteful logistical efforts of ensuring that everybody follows the same steps in the same place at the same times (Havice & Havice, 2005). One can be argue that all of

this is not new. Distance learning has been a part of educational possibilities for decades and predates modern technology. However, such an argument misses the point that distributive learning offers the opportunity to embrace all of the advantages of being ‘on campus’ with all of the advantages of being able to learn while in situ (off campus or on-site) (Havice & Havice, 2005).

Overview

The review of literature and the information obtained from previous culinary arts students’ pilot assessments suggested that combining educational theories and nutritional concepts with cooking applications through nutrition education programs for culinarians offer a key in healthy food preparation and long-term successful menu changes. Effective culinary nutrition education must enable chefs to prepare nutritionally balanced dishes that meet sodium reduction goals while satisfying consumer expectations for taste. Applied nutrition using face-to-face presentations and online education appears to be a promising intervention for education of culinary arts students on sodium concepts in a quick and cost-effective manner.

4.2. Materials and Methods

Site Description

With permission from the technical college administration and approval by the research university’s Institutional Review Board, a convenience sample of $n=139$ culinary arts students was recruited for the study between two different culinary arts programs. This sample was collected from students attending culinary arts programs at two different community (technical) colleges in the southeastern region of the United

States. Each program included at least one nutrition course. The nutrition course varies in each program, depending on the level of nutritional instruction and method of delivery within the culinary arts programs. In addition, culinary arts curriculums vary depending on accreditation. In most traditional culinary arts associate degree programs, students take one basic nutrition course. Emphasis in programs typically is on technique and business management. Both programs provide associate degrees in culinary arts. Each program includes one nutrition course except for the Sports and Health Nutrition career path, in which students take three to four nutrition courses. All culinary arts students participating in the study were enrolled in at least one nutrition course. Chef instructors, professional kitchen helpers, and the research team were supportive of the project and carried out individual responsibilities on the day of the presentation.

Survey Design

The goal of developing the survey was to determine if there was a change in nutrition knowledge, ease of use, strategies, and attitudes as a result of using applied lessons to teach nutrition concepts. The survey included a brief demographic section (six items) (Appendix N) followed by questions on nutrition knowledge (items 1 to 10), ease of use (items 13 to 19), strategies (items 20 to 24), and attitudes relating to sodium (items 25 to 30). Questions to measure student satisfaction were different depending on the type of educational intervention received by the group. The group that received the online instruction method responded to items 31 through 34, while the group that received the face-to-face demonstration responded to items 35 through 37. The group that received both online and face-to-face demonstration responded to items 31 through 37 on the post

survey while groups that received only online demonstration or both online and face-to-face demonstration responded to additional items 38 through 45 in the follow-up survey (Appendix O). Prior to participating in the intervention lessons, participants received a consent form describing the goal of the survey, the number of items, the time needed to answer the survey, the contact information of the primary investigator, and their rights as a research participant (Appendix M).

The initial survey for this study was guided by previous research used in pilot assessments for the purpose of increasing nutritional awareness in culinary education programs, and by previous work administered to professional chefs at the national level on the topics of fat, protein, sodium, and healthy cooking techniques. In addition, interviews with culinary educators and the research team discussion facilitated the development of the survey. Experts in food science and nutrition reviewed the first draft of the survey for intended purpose, usefulness, and comprehensiveness. Subsequently, the survey was revised and reviewed again by the experts to establish content validity.

The proposed survey was pilot tested using a convenience sample of $n=25$ students matriculating within the Clemson University's Department of Food, Nutrition, and Packaging Sciences. The pilot survey included 10 knowledge items, 20 perceptions and practices items, and 8 satisfaction items.

Test-retest reliability: Test-retest correlation was high for the knowledge subscale $r=0.796$. Questions about sodium reduction showed very good correlation between test and retest for Q11 (.836) and Q12 (.736). Knowledge, ease of use, and strategies subscales had test-retest coefficients above 0.75, which suggests a high degree of test-

retest reliability (Table 4-1). For attitudes subscale, the test-retest coefficient was $r=0.523$. Satisfaction with online presentation and face-to-face presentation both showed high test-retest correlations .773 and .650, respectively (Table 4-1).

Internal consistency: Cronbach's alpha coefficient was employed to assess the internal consistency for ease of use, strategies, attitudes, and satisfaction subscales (Table 4-1). Cronbach's alpha coefficients were not computed for the knowledge subscale because this subscale was categorical rather than interval or ratio scaled.

[Table 4-1](#)

Test Retest Reliability and Internal Consistency for the Pilot Survey

Subscale	Pre-Test Coefficient Standardized Alpha		Test-Retest Correlation
	Pre-Test	Post-Test	
Knowledge	-	-	0.796
Ease of Use	0.650	0.734	0.836
Strategies	0.621	0.832	0.751
Attitudes	0.232	0.365	0.523
Satisfaction: Online Presentation	0.647	0.770	0.773
Satisfaction: Face-to-Face Presentation	0.928	0.894	0.650

No questions on the survey were modified after the pilot survey. Table 4-2 lists variables that were collected for the study.

[Table 4-2](#)

Variables Used in the Study

Variables	Type	Comments
Dependent variables		
Knowledge	Ratio	Average # of questions correctly answered
Ease of Use	Interval	Average of the items on the subscale
Strategies	Interval	Average of the items on the subscale
Attitudes	Interval	Average of the items on the subscale
Satisfaction OPG	Interval	Average of the items on the subscale
Satisfaction DPG:	Interval	Average of the items on the subscale
Independent variables		
Treatment	Categorical	Represents Groups I-IV
Time	Ordinal	Represents Pre-test, Post-test and Follow-up
Age	Categorical	
Gender	Categorical	
Ethnicity	Categorical	
Experience	Categorical	
Position at work	Categorical	
Facility Characteristics	Categorical	

Educational Intervention

The educational intervention included the following components:

i. Face-to-face applied nutrition presentation with live cooking demonstration

about sources of sodium in menu items and practical steps to reduce sodium in recipes was prepared and demonstrated face-to-face in classes with culinary arts students at two different community colleges in the southeast region of the United States. The in-class preparation stage included the following: setting up a table for the lesson demonstration (food models, spices, handout, etc.), preparing food ingredients for the demonstration, and preparing food samples for participants (Group III, and Group IV). A Southwestern Chicken Salad with less sodium was prepared for demonstrations (Appendix F).

ii. An online applied nutrition presentation on sources of sodium in menu items and practical steps to reduce sodium in recipes was prepared and utilized using the Mediasite™ program. The online applied nutrition presentation was presented to culinary arts students at two different community colleges in the southeast region of the United States. The in-class preparation stage included setting up a computer with Internet access to watch the online presentation (Group II, and Group IV). All students in Group II and Group IV were given a media CD with the applied nutrition presentation and instructions on how to use it in order to watch it again at home.

Both training programs were developed and tested to evaluate whether the specific program improved the culinary arts students' knowledge, perceptions, and practices toward healthful culinary applications. A face-to-face applied nutrition presentation with either a live cooking demonstration and/or an online applied nutrition presentation using Mediasite™ program were included in the program as separate delivery methods. The focus was sodium as a key nutrition concept. In essence, the intervention lesson sought to communicate the rationale, science, and application of sodium reduction as well as the design and preparation of away-from-home foods. Concerns about the health risks of dietary sodium are based primarily on a substantial body of research that potentially links excessive sodium intake as a risk factor to health complications. After participating in the training program, students should be able to meet the following objectives: (1) recognize how much sodium is in table salt, (2) repeat the current 2010 Dietary Guidelines related to sodium, (3) recognize how much sodium is used when making a recipe, (4) determine where the sodium is found in the American

diet, (5) list the level of sodium found within various common kitchen ingredients, (6) recognize strategies to reduce sodium levels in menu items, and (7) taste a recipe featuring flavorful, low-sodium ingredients. The take home message of this training program is: *Cut the Salt, Keep the Flavor*.

Intervention Lessons Design: (Sodium): Table 4-3 shows the intervention lessons designed for the study.

[Table 4-3](#)

Intervention Lessons Design and objectives

Technique used	Lessons objectives
PowerPoint presentation	- Recognize how much sodium is in table salt.
Live cooking demonstration: preparing recipes, display the ingredients used, and explain the scientific reason of each step.	- Repeat the current 2010 Dietary Guidelines related to sodium. - Recognize how much sodium is used when making a recipe. - Determine where the sodium is found in the American diet.
An online applied nutrition presentation about sources of sodium in menu items and practical steps to reduce sodium in recipes. The presentation prepared using Media site program.	- List the level of sodium found in various common kitchen ingredients. - Recognize strategies to reduce sodium levels in menu items. - Taste a recipe featuring flavorful, low-sodium ingredients.
Combination of PowerPoint presentation with Live cooking demonstration and An online applied nutrition presentation.	
Distribution of printed handouts including information pertain sodium and the cooking demonstration recipe that used in the lesson.	- Handouts 1: Cut the Salt, Keep the Flavor handout.+ Southwestern Chicken Salad recipe handout (Appendix F) Handouts 2: How to access the online presentation (Media site) handout (Appendix P)
Distribution of a CD and printed handouts containing links to the online lessons and information regarding how to access the online presentations.	- Media site lesson1: (password-chef) http://dle-mediasite-hehd.clemson.edu/Mediasite/Play/fb9029ca440b4055a1f6ebb3c87cb0601d - Media site lesson2: (password-chef) http://dle-mediasite-hehd.clemson.edu/Mediasite/Play/b7ee55ea4fa2406f99261a67743437d11d

Lesson Plan: Table 4-4 shows the lesson plan for the intervention, Table 4-5 shows detailed outline and activities completed for Group I (Control), Group II (online presentation), II (face-to-face presentation and live cooking demonstration), and Group IV (face-to-face presentation and live cooking demonstration followed by the online presentation).

[Table 4-4](#)

Lesson Plan

Models to be used	Sodium: Cut the salt, keep the flavor	
Audience	Culinary arts students who are enrolled in nutrition class	
Number of Participants	85 students (Greensboro campus) 54 students (Charleston campus)	
Audience Groups	GROUP I:	Control group
	GROUP II:	Online presentation group
	GROUP III:	Face-to-face presentation and live cooking demonstration
	GROUP IV:	Face-to-face presentation and live cooking demonstration followed by the online presentation

Table 4-5

Detailed Outline and Activities Completed by Groups

<i>Detailed Outline and Activities Completed for Group I (Control), and Group II (online presentation)</i>	
Tasks and Preparations	Time
- Set up computer with internet access to watch the online presentation	
- All surveys should be coded	10 minutes
- List of the students who will participate in the study.	
Total time need it for pre sitting: 10 minutes	
- Distribution of the pre- survey for (Group I, and Group II)	15 minutes
- Collect the survey	
- Watching the online presentations (only Group II)	25 minutes
- Set-up computer in order to watch the presentations	
- Link to the presentations will be sent to this group.	
- Media site lesson1: (password-chef) http://dle-mediasite-hehd.clemson.edu/Mediasite/Play/fb9029ca440b4055a1f6ebb3c87cb0601d	
- Media site lesson2: (password-chef) http://dle-mediasite-hehd.clemson.edu/Mediasite/Play/b7ee55ea4fa2406f99261a67743437d11d	
- Distribution of the post- survey for (Group II) only	15 minutes
Total time need it: 60 minutes	
- Follow-up survey will be given after 8 weeks	15 minutes
 <i>Outline and Activities Completed for Group III (face-to-face presentation and live cooking demonstration), and Group IV (face-to-face presentation and live cooking demonstration followed by the online presentation)</i>	
- Set up table for the lesson demonstration (food modules, spices...)	
- Prepare food sample for Group III, and Group IV.	10 minutes
- Prepare food ingredients for demonstration	
- Set up computer with internet access to watch the online presentation for group # 4only	45 minutes
- All surveys should be coded	15 minutes
- List of the students who will participate in the study.	10 minutes
Total time need it for pre sitting: 80 minutes	
- Distribution of the pre- survey for (Group III, and Group IV)	15 minutes
- Collect the survey	
- Present the power point presentation with Q&A	30 minutes
- Live cooking demonstration	15 minutes
- Food sample distribution	5 minutes
- Bottles of water to be distributed with food sample.	
- Distribution of the post- survey for (Group III only)	15 minutes
Total time need it for group # 3: 80 minutes (1h 20m)	
- Watching the online presentations (Group IV only)	25 minutes
- Set-up computer in order to watch the presentations	
- Link to the presentations will be sent to this group	
- Media site lesson1: (password-chef) http://dle-mediasite-hehd.clemson.edu/Mediasite/Play/fb9029ca440b4055a1f6ebb3c87cb0601d	
- Media site lesson2: (password-chef) http://dle-mediasite-hehd.clemson.edu/Mediasite/Play/b7ee55ea4fa2406f99261a67743437d11d	
- Distribution of the post- survey for Group IV only	15 minutes
Total time need it for group # 4: 105 minutes (1h 45m)	
- Follow-up survey will be given after 8 weeks	15 minutes

Data Collection and Sampling plan

Due to time and cost constraints, a convenience sample was used in this study. Each of the two colleges involved in this study were randomly assigned to four groups. The first group served as the control, while the second, third, and fourth groups received culinary nutrition training programs (experimental groups). The study was divided into three phases and carried out for a period of almost three months (February 5 to April 24, 2013). The survey was distributed to four culinary arts student groups in each program ($n=139$) to assess their knowledge, ease of use, strategies, and attitudes regarding sodium consumption and use as well as their satisfaction level with the delivery methods. All students were enrolled in at least one nutrition course. All nutrition courses in both schools use traditional delivery methods (regular lecture) with no demonstration.

Phase I: On the predetermined dates for each school, all enrolled participants of the respective schools were asked to answer the pre-treatment survey to assess their knowledge, ease of use, strategies, and attitudes regarding culinary nutrition topic (dietary sodium). All students were instructed not to leave any answers blank. Sufficient time was given to for participant to consider each question. A total of 85 students were examined at the first school, and 54 students at the second school (Figure 4-1).

Phase II: On the same predetermined dates for each school for Phase I, the research team administered an educational intervention to all participants.

Group I (Control-C): Students in this group received no informational session and served as the control. As it would be unethical to leave any group without receiving benefits, the control group also received a similar type of culinary nutrition education in a

topic related to sodium. This group only answered the pre-survey, and then after eight weeks they were given the follow-up survey.

Group II (*Online Presentation-OP*): This group answered the pre-survey and then answered the post-survey after receiving the comprehensive online applied nutrition presentation. The mode of delivery of the information was as an audiovisual aid. The lesson encompassed topics, such as how much sodium is in table salt, the 2010 Dietary Guidelines related to sodium, how much sodium is used when making a recipe, where sodium is found in the American diet, the level of sodium in various common kitchen ingredients, strategies to reduce sodium levels in menu items, and tasting a recipe featuring flavorful, low-sodium ingredients. After eight weeks they were given the follow-up survey.

Group III (*Face-to-Face Presentation with Live Cooking Demonstration-DP*): These students were enrolled in a nutrition class. This group answered the pre-survey and then answered the post-survey after attending a comprehensive face-to-face presentation, where a chef presented a live cooking demonstration. The lesson encompassed topics, such as how much sodium is in table salt, the 2010 Dietary Guidelines related to sodium, how much sodium is used when making a recipe, where the sodium is found in the American diet, the level of sodium in various common kitchen ingredients, strategies to reduce sodium levels in menu items, and taste a recipe featuring flavorful, low-sodium ingredients. After eight weeks, they were given the follow-up survey.

Group IV (*Face-to-Face Presentation with Live Cooking Demonstration Followed by the Online Presentation-DP+OP*): This group answered the pre-survey and then

answered the post- survey after attending the face-to-face presentation, where a chef presented a live cooking demonstration followed by watching the online applied nutrition presentation (Figure 4-1).

Phase III: After eight weeks from the initial survey, students' knowledge, ease of use, strategies, attitudes, and satisfaction were assessed by the investigator using the same closed-ended survey, along with the addition of eight post online presentation satisfaction items (Figure 4-1).

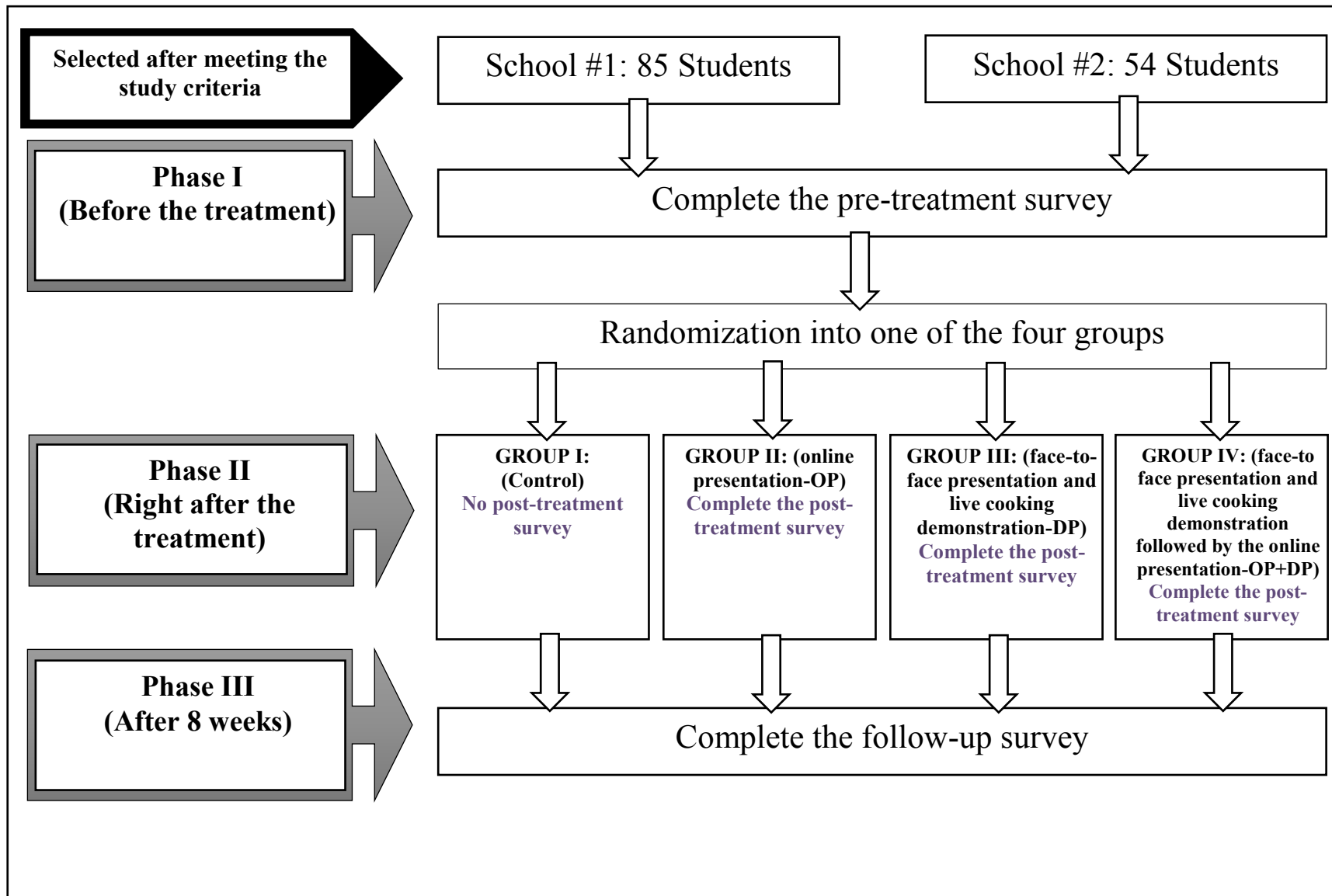


Figure 4-1. Study (III) Design

Data Analysis Plan

The first step in the data analysis was computation of the descriptive statistics. The second step in the data analysis was to use a factorial repeated measures ANOVA to determine if significant differences existed among the four treatment groups or among the three test times. Repeated measures ANOVA was selected because it focused on the change in scores over time for the same subjects and resulted in higher statistical power for determining differences among the four treatment groups (Ott & Longnecker, 2010, p. 545).

If significant differences among groups or times were detected, post-hoc tests were conducted to compare different instructional methods used in this study to the traditional instructional method (Control), in order to assess which instructional methods should be recommended to increase knowledge. To check assumptions and validate the results obtained using ANOVA, nonparametric Friedman and Dunnett's tests were conducted when appropriate. The Statistical Packages JMP® Pro (64-bit Edition) developed by the JMP business unit of SAS Institute (Version 10.0.0, 2012, SAS Institute, Inc.) was used for all data analyses.

Institutional Review Board (IRB) Approval

The IRB at Clemson University reviewed all data collection protocols of this research to ensure it met requirements on research with human subjects. The IRB approved the data collection protocol (IRB2011-288) on September 12, 2011, using exempt review procedures (Appendix Q). The researcher submitted an amendment on January 08, 2013, to update final edits on the survey and information pertaining to the

timeline for data collection. The IRB granted approval on January 31, 2013 (Appendix R).

Human Subjects Research Training: The principal investigator and co-investigator completed the Social and Behavioral Science Research track modules as required by the IRB and were certified by the Collaborative IRB Training Initiative (CITI) prior to beginning data collection. The Social and Behavioral Science Research track modules are available on the CITI website <https://www.citiprogram.org/default.asp>.

4.3. Results

Sample Characteristics

Sample characteristics are presented in Table 4-6. Although sample characteristics were recorded for the sample, there was no analysis of association between demographic characteristics and study variables.

[Table 4-6](#)

<i>Demographic Characteristics of the Sample</i>				
	<i>N</i>	<i>Percent</i>		
Age			Position at work	
Under 18	8	5.8%	Not currently working	47 33.8%
19-29	83	59.7%	No experience/ Student	10 7.2%
30-39	30	21.6%	Cook / Line Cook /Sous Chef	39 28.1%
40-49	12	8.6%	Bakery/ Pastry	6 4.3%
50 and over	6	4.3%	Kitchen helper	3 2.2%
			Other	34 24.5%
Gender			Facility Characteristics	
Male	67	48.2%	Not currently working	44 31.7%
Female	72	51.8%	Casual/Family Restaurant	21 15.1%
			Fine Dining	16 11.5%
Ethnicity			Quick Service/fast food	14 10.1%
Black, not Hispanic	39	28.1%	Catering	6 4.3%
White, not Hispanic	83	59.7%	On-site	4 2.9%
Other	17	12.2%	Culinary School	4 2.9%
			Health Care	3 2.2%
Experience			Other	27 19.4%
No industry experience	22	15.8%		
Less than 1 year	20	14.4%		
1 to 5 years	62	44.6%		
6-10 years	27	19.4%		
11-15 years	5	3.6%		
16 or more	3	2.2%		

Survey Psychometric Properties

Overall, Cronbach's alpha coefficients for subscales indicated a good degree of internal consistency on post-test and follow-up surveys (Table 4-7).

[Table 4-7](#)

Standardized Cronbach α Coefficients for Subscales

Subscales	Post-test	Follow-up
Ease of Use	0.758	0.595
Strategies	0.871	0.574
Attitudes	0.570	0.513
Satisfaction: Online Presentation	0.889	0.931
Satisfaction: Face-to-face Presentation	0.913	0.831

Descriptive statistics

To ensure group comparability, one-way ANOVA was used to test if treatment groups had the same average subscale scores. It was found that no subscales had statistically significant different average scores at pre-test (Table 4-8); thus, groups can be assumed to be comparable.

[Table 4-8](#)

One-way ANOVA for Subscales Scores Taken at Pre-test.

Subscales	F(3,138)	p-value
Knowledge Scores	1.723	0.165
Ease of Use Subscale	0.281	0.839
Strategies Subscale	0.477	0.699
Attitudes Subscale	1.266	0.289

**Significant at 0.05 α level*

Table 4-9 provides the descriptive statistics for the sample scores. Visual inspection of this table suggests that over time most of the scores have increased and that no measurements were taken for the control group at post-test. Figure 4-2 displays box-plots for each group over time.

[Table 4-9](#)

Descriptive Statistics for All Four Subscales.

		1-Pre		2-Post		3-Ppost	
	<i>n</i>	M	SD	M	SD	M	SD
<i>Knowledge Scores</i>							
Control	34	4.235	1.257	-	-	5.031	1.332
DP	32	4.375	1.264	7.844	1.743	8.000	1.519
OP	40	4.9	1.464	8.175	1.448	7.947	1.83
OP+DP	33	4.424	1.393	8.182	1.629	8.793	1.373
<i>Ease of Use Subscale</i>							
Control	34	3.513	0.515	-	-	3.737	0.363
DP G	32	3.509	0.44	4.317	0.378	4.053	0.372
OP G	40	3.425	0.459	4.268	0.497	4.162	0.41
OP+DP G	33	3.511	0.577	4.329	0.503	4.261	0.404
<i>Strategies Subscale</i>							
Control	34	3.929	0.710	-	-	4.044	0.442
DP G	32	3.850	0.556	4.694	0.387	4.400	0.430
OP G	40	3.935	0.445	4.625	0.413	4.511	0.368
OP+DP G	33	3.794	0.588	4.582	0.491	4.545	0.392
<i>Attitudes Subscale</i>							
Control	34	3.338	0.515	-	-	3.370	0.363
DP G	32	3.453	0.440	3.964	0.378	3.864	0.372
OP G	40	3.375	0.459	3.938	0.497	4.018	0.410
OP+DP G	33	3.268	0.577	3.934	0.503	3.971	0.404

Table 4-9 and Figure 4-2 also suggests that there was an increase in scores over time, with Groups II, III and IV outperforming the control groups. Therefore, statistical analysis was conducted to identify statistically significant differences.

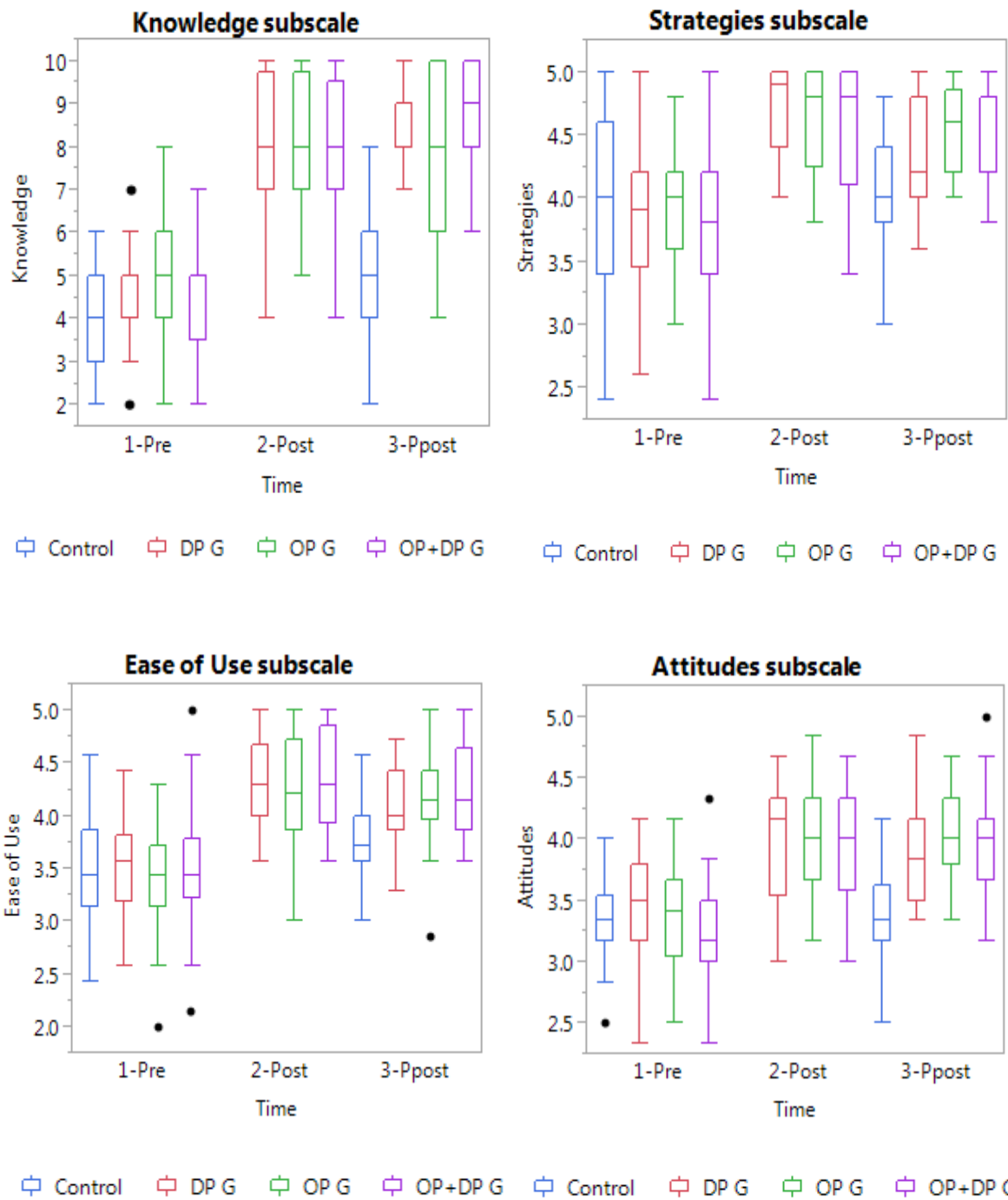


Figure 4-2. Boxplots for Each Group over Time.

Statistical Analysis

Because the data was collected at three different time points for the intervention groups and only for two time points for the control group, two distinct models were fitted. The first model included only intervention groups at three time points and the second model included only all four groups but only at two data points. In each case repeated measures ANOVA analysis was used.

Analysis without the control group

The analysis was conducted in two steps. In the first step, all variables were included into the model. Because demographic variables were not statistically significant in the first step (Table 4-10), they were dropped from the subsequent analysis and the new model was fitted without demographic variables.

The results of the model without demographic are presented in Table 4-11. The results are clear that there was effect for time, but neither treatment nor interaction effects for any of the subscales. This result suggested that all treatments were equally effective in improving constructs measured by each subscale.

[Table 4-10](#)

Repeated Measures ANOVA for Subscale Scores Taken at Pre-test, Post-test and Follow-up Without Control Group (with Demographic effects)

	DF-n	DF-d	F	p-value
Knowledge Scores				
Treatment	2	80.5	2.70	0.074
Time	2	98.8	251.84	<.001*
Treatment*Time	4	117.4	1.84	0.125
Age	4	75.0	1.32	0.272
Gender	1	75.8	0.02	0.874
Ethnicity	5	73.6	1.28	0.283
Experience	5	81.9	0.72	0.610
Employment)	5	104.8	1.33	0.257
Facility Characteristics	8	92.5	1.07	0.389
Ease of Use Subscale				
Treatment	2	84.1	0.39	0.676
Time	2	97.5	109.31	<.0001*
Treatment*Time	4	115.0	0.56	0.692
Age	4	81.9	2.16	0.08
Gender	1	80.9	1.38	0.243
Ethnicity	5	76.1	0.84	0.526
Experience	5	96.9	1.20	0.315
Employment	5	126.3	0.56	0.730
Facility Characteristics	8	118.1	0.72	0.673
Strategies Subscale				
Treatment	2	86.8	0.96	0.389
Time	2	99.2	72.61	<.001*
Treatment*Time	4	116.6	1.59	0.181
Age	4	87.3	1.07	0.376
Gender	1	84.3	0.76	0.386
Ethnicity	5	81.5	1.47	0.207
Experience	5	104.9	1.08	0.378
Employment	5	136.8	1.12	0.355
Facility Characteristics	8	124.1	0.64	0.746
Attitudes Subscale				
Treatment	2	84.1	0.78	0.463
Time	2	98.9	77.62	<.001*
Treatment*Time	4	117.0	1.92	0.112
Age	4	80.3	1.39	0.243
Gender	1	80.2	0.83	0.364
Ethnicity	5	76.5	1.84	0.131
Experience	5	91.6	0.91	0.477
Employment	5	120.3	0.91	0.079
Facility Characteristics	8	108.3	0.99	0.446

*Significant at 0.05 α level

[Table 4-11](#)

Repeated Measures ANOVA for Subscale Scores Taken at Pre-test, Post-test, and Follow-up Without Control Group (without Demographic effects)

	DF-n	DF-d	F	p-value
Knowledge Scores				
Treatment	2	101.5	1.54	0.221
Time	2	100.2	257.27	<0.01*
Treatment*Time	4	119.1	1.65	0.167
Ease of Use Subscale				
Treatment	2	101.6	0.26	0.7722
Time	2	99.5	72.61	<0.01*
Treatment*Time	4	117.9	1.42	0.2304
Strategies Subscale				
Treatment	2	101.1	0.59	0.5559
Time	2	98.9	109.76	<0.01*
Treatment*Time	4	117.4	0.75	0.5608
Attitudes Subscale				
Treatment	2	100.1	0.25	0.7779
Time	2	98.3	73.31	<0.01*
Treatment*Time	4	116.7	1.49	0.2111

*Significant at 0.05 α level

Figure 4-2 displays plots representing sample mean scores for each subscale. Visual inspection of Figure 4-2 suggested there was an increase on scores for each subscale. This observation along with results of repeated measures ANOVA presented in Table 4-11 indicated that increase in scores on each subscale were statistically significant.

Because the effect over time was statistically significant, a student post-hoc test was conducted. Post-hoc testing suggested that on the knowledge and attitudes subscale, there was no difference in post-test and follow-up scores, but pre-test scores were significantly lower than both post-test and follow-up scores (Table 4-12 and Figure 4-3). For ease of use and strategies subscales, scores were different at each point in time with

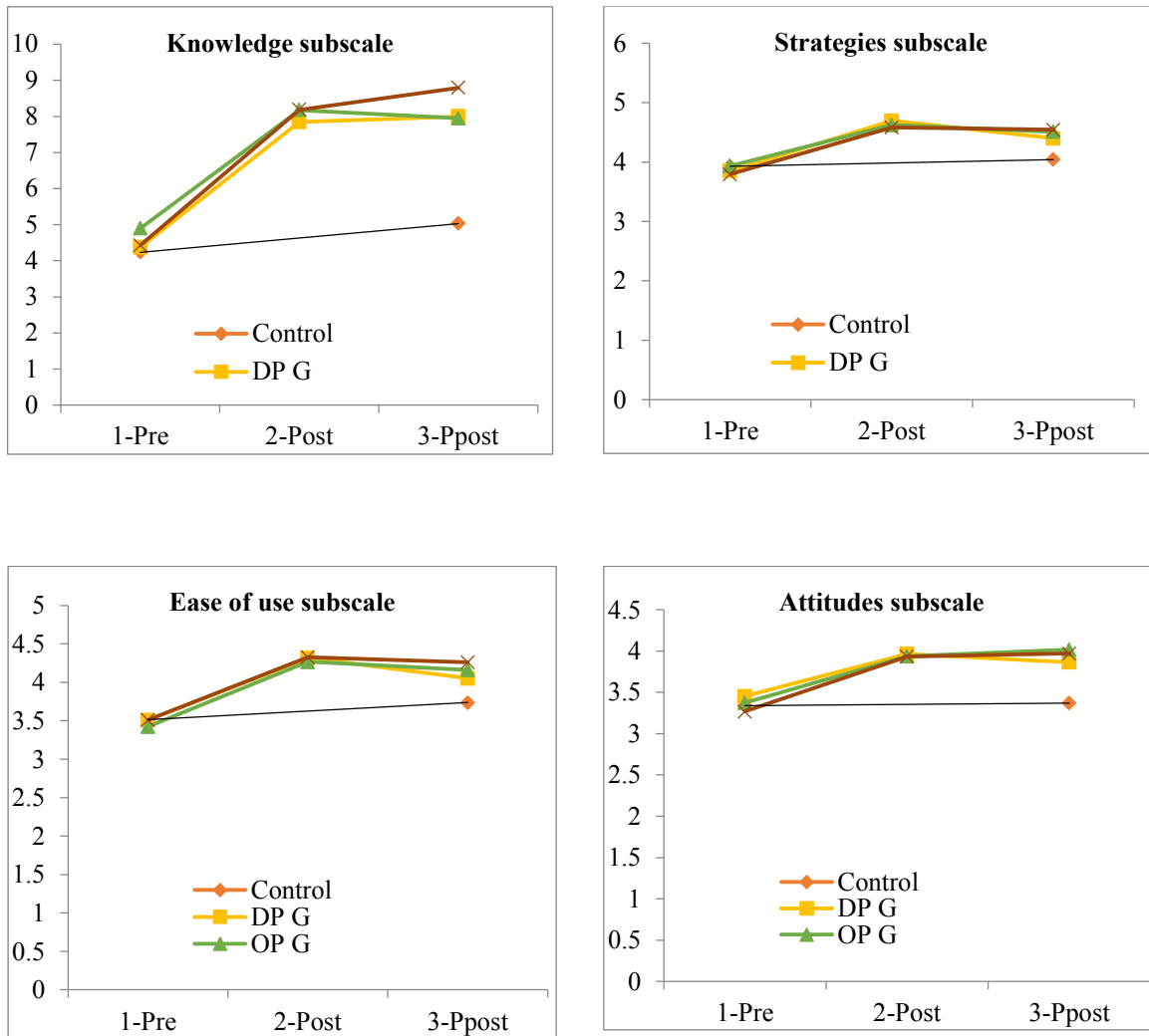
statistically significant increases of scores from pre-test to post-test followed by a statistically significant drop between post-test and follow-up.

[Table 4-12](#)

Post hoc-tests for Subscale Scores Taken at Pre-test, Post-test, and Follow-up Without Control Group.

Time 1	Time 2	Difference	DF-den	t-statistic	p-value
<i>Knowledge subscale</i>					
Pre	Post	-3.500	100.24	-19.49	<.01*
Pre	Follow-up	-3.672	100.24	-16.86	<.01*
Post	Follow-up	-0.172	100.24	-0.72	0.48
<i>Ease of use subscale</i>					
Pre	Post	-0.823	98.88	-14.74	<.01*
Pre	Follow-up	-0.683	98.88	-11.35	<.01*
Post	Follow-up	0.141	98.88	2.95	<.01*
<i>Strategies subscale</i>					
Pre	Post	-0.774	99.453	-11.91	<.01*
Pre	Follow-up	-0.627	99.453	-10.2	<.01*
Post	Follow-up	0.147	99.453	3.17	<.01*
<i>Attitudes subscale</i>					
Pre	Post	-0.580	98.305	-10.82	<.01*
Pre	Follow-up	-0.594	98.305	-11.01	<.01*
Post	Follow-up	-0.015	98.305	-0.3	0.76

**Significant at 0.05 α level*



[Figure 4-3. Plots of Sample Means for Subscale Scores for Each Group over Time.](#)

To validate repeated measures analysis, nonparametric Friedman test, which is a nonparametric analog of the repeated measures ANOVA, was used to compare central tendencies for each time point were the same or different. In other words, the Friedman test was used because samples were dependent. The results were completely in agreement with repeated measures ANOVA. For each subscale there was a statistically significant effect associated with time (Table 4-13).

[Table 4-13](#)

Friedman Test: Compare Central Tendencies for Each Time Point (n=94)

Factor	Df	χ^2	p-value
<i>Knowledge</i>	2	118.94	<.01*
<i>Ease of Use</i>	2	98.33	<.01*
<i>Strategies</i>	2	83.13	<.01*
<i>Attitudes</i>	2	76.57	<.01*

**Significant at 0.05 α level*

To summarize, there was a statistically significant increase in scores on each subscale over time as compared to pre-test scores. Changes resulting from the three educational interventions were not different from each other.

Analysis with the control group

This analysis included all four groups, but did not include post-test data. Only pre-test and follow-up data was included in this analysis. As in the analysis without the control group, repeated measures ANOVA with unstructured covariance matrix was used.

Just like the analysis without the control group, the analysis with the control group was conducted in two steps. In the first step, all independent factors were included into the model. Since it was found that none of demographic variables were statistically significant (Table 4-14), they were dropped from the subsequent analysis, and the new model was fitted without demographic variables.

[Table 4-14](#)

Repeated Measures ANOVA for Subscales Taken at Pre-test, and Follow-up with Control Group Included (with Demographic effects)

	DF-n	DF-d	F	p-value
Knowledge Scores				
Treatment	3	119.3	23.49	<.001*
Time	1	128.9	277.17	<.001*
Treatment*Time	3	127.7	18.18	<.001*
Age	4	115.1	1.60	0.018
Gender	1	115.7	0.10	0.749
Ethnicity	5	110.6	0.67	0.644
Experience	5	126.1	0.35	0.884
Employment)	5	176.4	1.01	0.415
Facility Characteristics	8	156.3	0.31	0.960
Ease of Use Subscale				
Treatment	3	106.7	2.19	0.093
Time	1	121.5	117.15	<.001*
Treatment*Time	3	120.4	4.92	0.0029*
Age	4	101.7	1.72	0.152
Gender	1	103.0	1.22	0.273
Ethnicity	5	97.2	0.56	0.726
Experience	5	112.9	1.13	0.350
Employment)	5	160.0	0.75	0.587
Facility Characteristics	8	147.4	1.95	0.056
Strategies Subscale				
Treatment	3	118.7	2.36	0.075
Time	1	132.1	82.23	<.001*
Treatment*Time	3	131.0	5.73	0.010*
Age	4	114.3	0.60	0.661
Gender	1	114.9	0.61	0.436
Ethnicity	5	108.6	0.97	0.440
Experience	5	126.8	0.61	0.691
Employment)	5	167.2	0.59	0.710
Facility Characteristics	8	162.2	1.49	0.165
Attitudes Subscale				
Treatment	3	115.9	8.76	<.0001*
Time	1	132.6	102.89	<.0001*
Treatment*Time	3	131.6	11.91	<.0001*
Age	4	112.9	1.87	0.120
Gender	1	114.6	0.24	0.628
Ethnicity	5	108.9	1.34	0.265
Experience	5	123.2	1.52	0.190
Employment)	5	169.8	1.68	0.143
Facility Characteristics	8	154.7	1.31	0.241

*Significant at 0.05 α level

The results of the analysis without demographic variables are presented in Table 4-15. Comparing these results to the analysis without the control group concluded that the statistically significant differences are due to the inclusion of the control group. This finding and examination of the Figure 4-3 suggests that groups OP and OP+DP had higher follow-up scores than the control group. Table 4-12 suggests all subscale scores increased as compared to pre-test scores.

[Table 4-15](#)

Repeated Measures ANOVA for Subscales Taken at Pre-test and Follow-up, with Control Group Included (without Demographic effects)

Factor	DF-n	DF-d	F	p-value
Knowledge Scores				
Treatment	3	128.7	23.45	<.01*
Time	1	132.9	295.41	<.01*
Treatment*Time	3	130.4	19.78	<.01*
Ease of Use Subscale				
Treatment	3	135.8	2.44	0.067
Time	1	135	82.52	<.01*
Treatment*Time	3	134.8	6.22	<.01*
Strategies Subscale				
Treatment	3	132.2	3.2	0.024*
Time	1	131.0	122.2	<.01*
Treatment*Time	3	130.8	5.8	<.01*
Attitudes Subscale				
Treatment	3	130.8	10.1	<.01*
Time	1	129.7	96.8	<.01*
Treatment*Time	3	129.5	11.4	<.01*

*Significant at 0.05 α level

Since there were statistically significant effects, multiple comparisons Dunnett's test was conducted because Dunnett's procedure is specifically focused on comparison to control group and optimally controls for experiment-wise Type I error (Ott, 2010, p. 474). Only comparisons with the control group were conducted because the analysis

without the control group established that three treatment groups were not different from each other (Table 4-16). Results suggested that the mean difference from the control was of the largest magnitude for the OP+DP for *Knowledge* ($\Delta M=3.768$), *Strategies* ($\Delta M=0.511$), and *Ease of Use* subscales ($\Delta M=0.515$). Although the difference between intervention groups (OP, DP, and OP+DP) was not statistically significant, higher average difference from the control of the OP+DP intervention indicated that it may be the most effective intervention. The lack of the statistical significance may be due to low achieved statistical power.

To summarize, the results of the analysis suggested that Groups II, III and IV at follow-up had mean scores that were higher than corresponding mean scores for the control group. This finding is suggestive that the OP, DP, or OP+DP interventions are superior to a traditional lecture that was delivered to the control group.

[Table 4-16](#)

Mean Differences from the Control Group for each Subscale at Follow-up.

	Mean difference	p-value
Knowledge		
DP G	2.978	<.01*
OP G	2.923	<.01*
OP+DP G	3.768	<.01*
Strategies		
DP G	0.364	<.01*
OP G	0.470	<.01*
OP+DP G	0.511	<.01*
Ease of Use		
DP G	0.313	0.016*
OP G	0.421	<.01*
OP+DP G	0.515	<.01*
Attitudes		
DP G	0.497	<.01*
OP G	0.648	<.01*
OP+DP G	0.600	<.01*

**Significant at 0.05 α level*

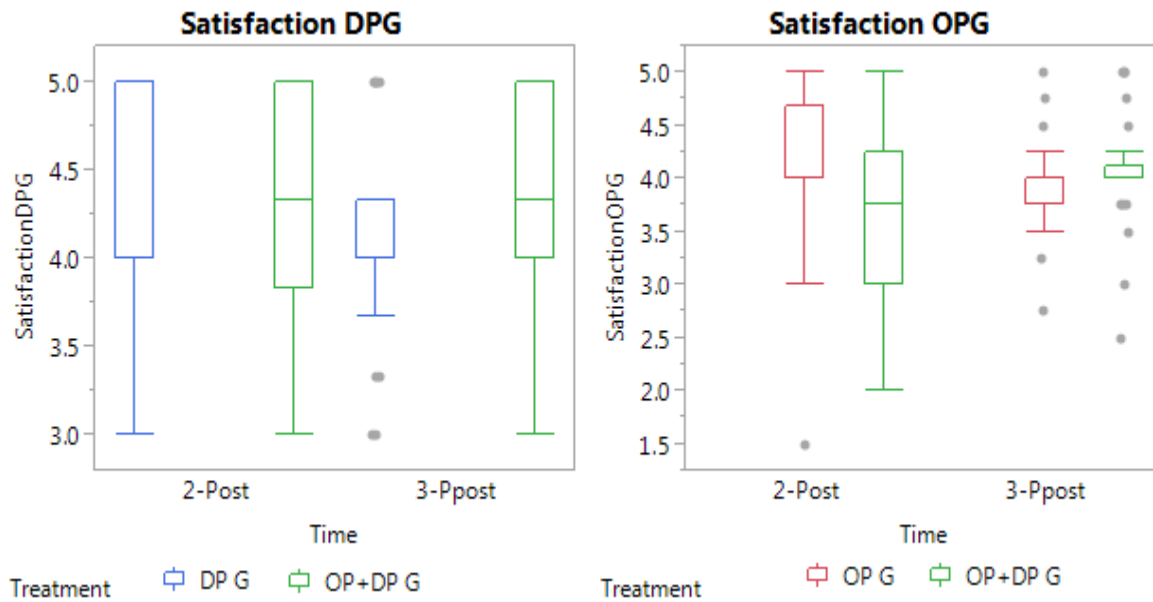
Statistical Analysis of Satisfaction Variables

Satisfaction with the instructional methods was measured using two subscales depending on which interventions a participant received. The descriptive statistics summarizing these measurements is presented in Table 4-17 and Figure 4-4. In general, it appears that differences in satisfaction scores between (DP and OP+DP) and (OP and OP+DP) were small and variability of scores at follow-up decreased as compared to post-test.

[Table 4-17](#)

Satisfactions with the Instructional Methods

	Post-test			Follow-up		
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>M</i>	<i>SD</i>
DPG subscale						
DP G	32	4.25	0.63	27	4.11	0.58
OP+DP G	33	4.27	0.68	29	4.39	0.56
OPG subscale						
OP G	40	4.20	0.67	38	3.95	0.36
OP+DP G	33	3.77	0.80	29	4.06	0.55



[Figure 4-4. Boxplots for Each Satisfaction Subscales](#)

To track if there were any changes in satisfaction subscales, repeated measures ANOVA was implemented for each subscale. The analysis was accomplished in two stages. In the first stage, full models that included all possible factors were fitted to identify statistically significant factors. The results of the first stage suggest that none of demographic variables were statistically significant. At the second stage, reduced models containing only Time, Treatment and Time*Treatment terms were fitted without demographic factors (Table 4-18, Table 4-19).

The results of the analysis of the reduced models suggest that there was no statistically significant difference for the DP satisfaction subscale (Table 4-18); however, the interaction effect was statistically significant for the OP satisfaction subscale (Table 4-19).

[Table 4-18](#)

<i>Repeated Measures ANOVA for DP Satisfaction Subscale</i>			
Source	DF	F Ratio	p-value
<i>With Demographics effects (Full model)</i>			
Treatment	1	0.08	0.774
Time	1	0.03	0.867
Treatment*Time	1	1.63	0.207
Age	4	0.09	0.984
Gender	1	0.01	0.934
Ethnicity	5	0.71	0.622
Experience	5	0.77	0.576
Employment)	5	0.58	0.718
Facility Characteristics	7	0.41	0.896
<i>Without Demographics effects (Reduced model)</i>			
Treatment	1	0.68	0.41
Time	1	0.03	0.87
Treatment*Time	1	2.68	0.11

*Significant at 0.05 α level

[Table 4-19](#)

Repeated Measures ANOVA for OP Satisfaction Subscale

Source	DF	F Ratio	p-value
<i>With Demographics effects (Full model)</i>			
Treatment	1	1.01	0.320
Time	1	0.47	0.495
Treatment*Time	1	9.64	0.003*
Age	4	1.25	0.300
Gender	1	0.00	0.959
Ethnicity	3	0.48	0.697
Experience	4	0.97	0.430
Employment)	5	1.46	0.225
Facility Characteristics	8	1.75	0.111
<i>Without Demographics effects (Reduced Model)</i>			
Treatment	1	1.88	0.175
Time	1	0.07	0.796
Treatment*Time	1	9.60	0.003*

*Significant at 0.05 α level

Because no statistically significant differences were detected for the DP subscale, no post-hoc test was necessary (Table 4-18). Students' post-hoc test for the OP subscale was conducted (Table 4-20). These results suggest that there was no difference in satisfaction at follow-up; however, at post-test, OP and OP+DP groups were different ($AM=0.427$, $p=0.015$). Over eight weeks, the difference between the two decreased with no differences detected at follow-up.

[Table 4-20](#)

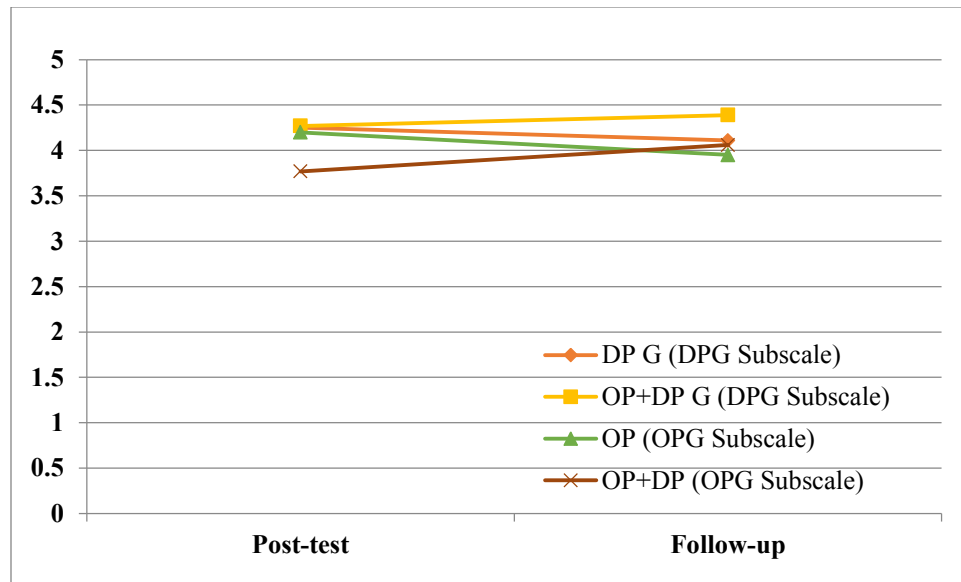
*Significant Differences for OP Satisfaction Subscale**

Treatment/ Time	Treatment / Time	Difference	p-value
OP G – Post	OP G Follow-up	0.246	0.037
OP G – Post	OP+DP G –Post	0.427	0.015
OP+DP G – Post	OP+DP G –Follow-up	-0.290	0.027

*Differences that were not statistically significant are not shown in the table

*Significant at 0.05 α level

Temporal relationships for satisfaction subscales are shown in Figure 4-5. This figure in combination with Table 4-20 suggests that the OP satisfaction ratings for all groups remained stable during an eight-week period. However, there was a statistically significant decrease in the OP satisfaction score for the OP+DP group between post-test and follow-up ($\Delta M = -0.290$, $p = 0.027$).



[*Figure 4-5. Satisfaction Scores on DP and OP Subscales.*](#)

4.4. [Discussion](#)

The results of the analysis suggest that there were no statistically significant differences between education interventions (OP, DP, and OP+DP) (Table 4-11). Although each intervention performed superior to the control group, outcomes associated with each intervention had no statistically significant differences (Table 4-15, and Table 4-16). The effect sizes for the intervention, combining online instruction and face-to-face demonstration, were generally higher than for online or face-to-face demonstrations

separately for knowledge, strategies, and ease of use. Yet, the effect size for attitudes subscale was largest for the OP group (Table 4-16).

Even though there was no statistically significant difference for Groups II, III and IV on any subscale, the mean difference from the control was of the largest magnitude for the OP+DP for *Knowledge* ($\Delta M=3.768$), *Strategies* ($\Delta M=0.511$) and *Ease of Use* ($\Delta M=0.515$) subscales. The largest average difference from the control for the OP+DP intervention indicates that it may be the most effective intervention. For *Attitudes* subscale the largest difference was produced by the OP intervention ($\Delta M=0.648$). The lack of the statistically significant differences for Groups II, III and IV may be due to low statistical power.

There was evidence of long-term program effectiveness as measured by knowledge and attitudes subscales (Figure 4-12). There was no statistically significant change in scores on these subscales between post-test and eight-week follow-up (Table 4-12). Over the same period, there were statistically significant decreases on ease-of-use and strategies subscales (Table 4-12). However, even considering the drop of score over eight-week period, the resultant scores were higher than corresponding scores at pre-test (Table 4-12).

There were no statistically significant differences in satisfaction as measured by the DP subscale. However, with respect to satisfaction measured on the OP subscale, there was a statistically significant difference between OP and OP+DP groups at the baseline, but no differences were observed at follow-up (Table 4-20).

4.5. Conclusion

There was no statistically significant difference between OP, DP, or OP+DP groups with respect to any tracked outcome. Yet, OP, DP, and OP+DP interventions produced superior outcomes as compared to the control group. These three interventions also resulted in statistically significant improvements of relevant outcomes as compared to pre-intervention status. As suggested by follow-up observations, the improvement for OP, DP, and OP+DP groups on knowledge and attitudes subscales was stable, but for ease of use and strategies subscales, there were minor declines.

The results of the study strongly suggest that the intervention of combining online and face-to-face demonstrations produced the best results for knowledge about sodium, strategies of sodium reduction, and ease of application of approaches to reduce sodium. The data also suggested that online instruction is possibly the best method to change attitudes.

Overall, it can be concluded that OP, DP, and OP+DP interventions produce reasonably stable outcomes that were superior to that of traditional lectures. There were practically no significant differences in student satisfaction with any these methods.

4.6. Limitations

- This study represents a controlled field trial and was limited to two locations, one project, and a small sample size due to time and cost constraints. This limitation presents a constraint to the generalization of the findings but also provides opportunities for future research. A greater sample size would improve external validity.

- Results are student knowledge, ease of use, strategies, attitudes, and satisfaction of the learning and teaching styles for one topic (sodium).
- The reactivity, or Hawthorne effect, has been described as follows: “Research participants sometimes favor a certain method because they know the researcher wants that result” (Leedy & Ellis, 2000, p.231). Students may favor the current study's alternative teaching method because of the Hawthorne effect.

4.7. Recommendations and Further Research

The researcher offers the following recommendations for further research:

Recommendation 1: Request the research sample to participate in further longitudinal research to deepen understanding of how students learn best and to assess their knowledge, ease of use, strategies, and attitudes over time.

Recommendation 2: Develop innovative practical instructional methods to teach nutrition in practical (kitchen) settings.

Recommendation 3: Assess the practical application of nutritional concepts in order that student chefs will be prepared for their future work.

Recommendation 4: Investigate the impact of such practical programs on the future working conditions of cooks.

Recommendation 5: Conduct more research to assess culinary students' knowledge regarding other nutrition concepts, such as gluten.

Recommendation 6: Improve sampling methodology to reduce probability of biases. Instead of convenience, use multi-stage sampling.

Recommendation 7: Increase the number of questions on each subscale to capture additional concepts, such as dangers of increased salt, fat, and protein intake. It is further recommended to include questions on the survey that pertain to specific cooking techniques that allow replacing the amount of sodium, protein, and fat. For example, recommend spices that can enhance the dish in the absence of salt.

Recommendation 8: Increase statistical power to test the hypothesis that OP+DP intervention is superior to each of these interventions separately.

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CHAPTER FIVE

OVERALL CONCLUSIONS

Culinary arts students are future chefs. They can affect the quality of FAFH (Howard, Adams, & White, 2012). The growing body of research suggests that many culinary arts students and chefs may have inadequate knowledge about culinary nutrition. Even though culinary arts students may be well aware that protein, sodium, fat, sugar, and other dietary components are less healthy if consumed in excess, they have an unclear idea of how much is too much in practical terms. Thus, culinary arts students may lack practical nutrition skills that translate nutrition information into cooking applications. For example, culinary arts students may not know the milligram equivalence of sodium within common ingredients and may underestimate the amount of sodium that they use. Greater emphasis on healthy cooking may improve nutritional value of FAFH and lead to improved population health outcomes.

Although some leading culinary arts schools offer degrees of practice in their nutrition courses, those schools are not necessarily following a scientific foundation within their training. Many schools are using lecture-style instructional method for their nutrition course. The educational effect of these courses varies in the depth and breadth of application of culinary nutrition concepts in recipes and menu design. Culinary arts education could be enhanced by the incorporation of practical strategies to infuse this knowledge within menu design and cooking practice. Building a body of knowledge on the actual effectiveness of experiential learning methods for imparting culinary nutrition

knowledge may enhance culinary educational programs nationwide. This research could serve as a foundation for future investigations within culinary nutrition education.

There is a need for culinary programs to develop curriculum that meets the needs of the future culinarians. The design of such a program should incorporate more hands-on rather than theoretical content. Furthermore, curriculum should be designed while taking into account gaps in knowledge of students. Better education of future chefs on culinary nutrition may improve consumer health and substantially save costs for the healthcare system. Moreover, nutritionally balanced food choices offered by restaurants may attract health conscious clientele and improve profits for the restaurant industry. For this reason, culinary programs should incorporate experiential education within their curriculum that is acceptable to students in order to teach nutrition concepts.

The first pilot study suggested that in an overall comparison on pre-knowledge measures on protein, fat, and sodium, sodium items were rated lower for participants across all demographics. Thus, the curriculum designed for this research project emphasized sodium concepts. However, this finding should not unnecessarily constrain the curriculum. A viable approach would consist of surveying the students in a class and depending on the results, making decisions on the culinary nutrition material to emphasize for the particular group. For example, topics such as such as gluten, healthy cooking methods, saturated fat, and others may be indicated.

The (major) study indicated that two separate experiential educational interventions, designed using andragogical principles, produced substantially better learning outcomes as compared to a control group. Face-to-face instruction, online

instruction, or the combination of the two produced identical outcomes. Thus, any of these interventions can be recommended for implementation in culinary programs. Most likely, they are appropriate not only for teaching sodium concepts, but also for food constituents, such as protein, carbohydrate, gluten, fat, and many others topics related to the healthy food preparation.

In general, Studies I, II and III utilized relatively small convenience samples. Because such samples are prone to sampling biases, they may not be adequate for inferences and generalizations. In addition, since Study I was a quasi-experiment (pre-test/post-test design), its internal validity may also be negatively impacted. Researchers should improve the sampling methodology to reduce the probability of biases. Rather than of convenience sampling, a multi-stage sampling is recommended. It is also suggested that researchers improve statistical power by increasing the sample size to test the hypothesis that the OP+DP intervention is superior to each of OP and DP interventions, separately. Furthermore, the control of experimental conditions in Study III was limited. For example, the Hawthorne effect (expectancy bias) was a possibility. That is, behavior of the participant changes depending on what a researcher expects from them (Leedy & Ellis, 2000, p.231). For future research, more control of experimental conditions as well as developing and pilot testing a more comprehensive survey for testing knowledge, perceptions, and practices regarding sodium, fat, and protein is recommended. Additional research is needed to provide a scientific foundation and to incorporate evidence-based practical training into culinary arts programs.

APPENDICES

Appendix A

Consent Form for Pilot Study I (Protein and Sodium)

Consent Form for Culinary Arts Students

You are invited to participate in a research study in which an applied nutrition demonstration model will be provided. The goal of this study was to determine if there is a change in knowledge, perceptions and practices as a result of using applied nutrition demonstration model to teach nutrition concepts. The survey includes a brief demographic section followed by questions pertain nutrition knowledge, perception and practices.

Prior to participating in the culinary nutrition lesson you will be asked to complete a demographic form and a survey, which will take approximately 15 minutes to complete. Following this you will participate in applied culinary nutrition lesson. The lesson will include a power point, a cooking demonstration and sample tasting. Following the lesson you will be asked to complete a second survey.

Please complete the survey on your own. Your answers will not be scored and the only purpose of the questionnaire will be to assist in developing teaching materials. All data will be maintained anonymously. You do not have to be in this study, your participation is voluntary. You may choose not to take part and you may choose to stop taking part at any time. You will not be punished in any way if you decide not to be in the study or to stop taking part in the study. If you decide not to take part or to stop taking part in this study, it will not affect your grade in any way.

By completing the following survey, you consent to participate in this research. The Office of Research Compliance at Clemson University has reviewed this study for the protection of the right of human participants in research studies, in keeping with federal and state regulation and can be reached at (864) 656-6460. You may keep this form for your record. If you have questions or concerns about this study, please contact Nisreen Abdulsalam PhD candidate: nmma3@yahoo.com.

Thank You!

Appendix B

Demographic Form for Pilot Study I (Protein and Sodium)

Demographic Form

1. **What is your age?**
 - a. Under 18
 - b. 19-29
 - c. 30-39
 - d. 40-49
 - e. 50 and over
2. **What is your gender?**
 - a. Male
 - b. Female
3. **How would you characterize your establishment?**
 - a. Casual/Family Restaurant
 - b. Fine Dining
 - c. Quick Service/fast food
 - d. On-Site / Contract feeding
 - e. Food Industry/ Manufacturing
 - f. Culinary School
 - g. Other

Appendix C

Pre and Post-Intervention Survey for Pilot Study I (Protein)

Circle true or false for the following questions.

1. Providing vegetarian meals offers a benefit to my establishment in terms of sales.
 - a. True
 - b. False
 - c. Not Answered
2. There are no plant sources for complete proteins.
 - a. True
 - b. False
 - c. Not Answered
3. Customer demand is NOT large enough to place more vegetarian items on the menu.
 - a. True
 - b. False
 - c. Not Answered

Circle your response from strongly agree to strongly disagree.

4. Vegetarian or meatless diets are lacking in essential nutrients and protein.	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
5. Serving more vegetarian dishes reduces food cost which may increase profitability.	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
6. Americans eat more protein than they actually need.	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
7. Reducing the portion size of meat offered in dishes would result in a decrease in business.	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree

Rate your responses from low to high as indicated

Rate the importance of each of the following factors in limiting the feasibility of placing vegetarian or meatless dishes on the menu.

8. Need for specific staff skills and training.	Low	Low to moderate	Moderate	Moderate to high	High
9. High labor costs.	Low	Low to moderate	Moderate	Moderate to high	High
10. Limited ingredient availability.	Low	Low to moderate	Moderate	Moderate to high	High
11. High ingredient cost.	Low	Low to moderate	Moderate	Moderate to high	High
12. Short ingredient shelf life.	Low	Low to moderate	Moderate	Moderate to high	High
13. Consumer Demand.	Low	Low to moderate	Moderate	Moderate to high	High

14. Rate how confident you are in developing a vegetarian menu that contains complementing proteins. (1 low confidence - 5 high confidence)	Low	Low to moderate	Moderate	Moderate to high	High
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Circle the letter that corresponds to your response.

15. Complementary proteins are:

- a. One food item providing all of the essential amino acids.
- b. Two or more incomplete protein foods that when paired together give all of the essential amino acids.
- c. Two protein sources that can be combined for enhanced flavor.
- d. Are only found in animal based foods.

16. Which of the following non meat foods provide complete proteins?

- a. Barely
- b. peanut butter
- c. garbanzo beans
- d. soybeans
- e. spinach
- f. None of the above
- g. All of the above

17. The recommended daily allowance of protein per kilo gram for an adult male is approximately:

- a. 0.5 gram
- b. 0.8 gram
- c. 0.9 gram
- d. 1.0 gram

18. Examples of complementary proteins are:

- a. Macaroni and Cheese
- b. Peanut Butter and Jelly Sandwich
- c. Beans and Rice
- d. Hummus and pita bread
- e. None of the above
- f. All of the above

19. The recommended daily allowance of protein for a 70kg (~154 lb.) adult male is approximately:

- a. 105 grams
- b. 42 grams
- c. 56 grams
- d. 78 grams

Appendix D

Pre and Post-Intervention Survey for Pilot Study I (Sodium)

Circle the letter that corresponds to your response.

1. The 2010 Dietary Guidelines recommends reducing the upper limit for sodium intake from 2,300 mg/day to _____ mg/day.
 - a. 2,000
 - b. 1,750
 - c. 1,500
 - d. 1,200
2. What percentage of Americans is concerned with their sodium consumption? Sea salt is a healthier alternative to table salt.
 - a. 25%
 - b. 36%
 - c. 40%
 - d. 65%
3. Sea salt is a healthier alternative to table salt.
 - a. True
 - b. False
 - c. Not Answered
4. When preparing a pasta dish with meat sauce, approximately how many times do you add salt from start to finish?
 - a. 1
 - b. 2
 - c. 3
 - d. 4
 - e. More than 5 times
5. What do you think is the maximum percentage of sodium reduction before customers would notice?
 - a. 10%
 - b. 25%
 - c. 45%
 - d. 55%
6. Do you ever use purchased bases, such as stocks and sauces, when making dishes?
 - a. Yes
 - b. No
 - c. Not Answered
7. If you answered "Yes," do you ever seek out low-sodium or sodium-free bases?
 - a. Yes
 - b. No
 - c. Not Answered

Circle your response from very easy to very difficult.

8. If government regulation were put in place that restricted salt content on restaurant menu items, how difficult would it be for your establishment to comply?	Very Easy	Easy	Neither Easy Nor Difficult	Difficult	Very Difficult
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Do you think the following strategies are effective for reducing sodium? Circle your response from strongly agree to strongly disagree.

9. Use fresh tomatoes instead of canned.	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
10. Use herbs and spices instead of using salt to add flavor.	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
11. Use unsalted butter in place of salted butter.	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
12. Skip the pickle.	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
13. Cook with wine and vinegar instead of soy sauce and barbeque sauce.	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree

Rank the ease of making the following changes in order to produce reduced-sodium dishes in your establishment.

14. Use fresh tomatoes instead of canned.	Very Easy	Easy	Neither Easy Nor Difficult	Difficult	Very Difficult
15. Use herbs and spices instead of using salt to add flavor.	Very Easy	Easy	Neither Easy Nor Difficult	Difficult	Very Difficult
16. Use unsalted butter in place of salted butter.	Very Easy	Easy	Neither Easy Nor Difficult	Difficult	Very Difficult
17. Skip the pickle.	Very Easy	Easy	Neither Easy Nor Difficult	Difficult	Very Difficult
18. Cook with wine and vinegar instead of soy sauce and barbeque sauce.	Very Easy	Easy	Neither Easy Nor Difficult	Difficult	Very Difficult

Circle your response from strongly agree to strongly disagree.

19. A reduced-sodium menu will lead to complaints from your guests.	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
20. Sodium reduction will not be a major challenge to chefs in terms of flavor if they use their creativity in cooking.	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
21. Simple flavor additions can enhance dishes containing reduced sodium.	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
22. Food service establishments should promote lower sodium versions of their menu items to guests.	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
23. Education programs must be developed and adapted for employees working in the various sectors of the food industry (manufacturing, distributing and food service) to inform them about sodium and the sodium reduction strategies.	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
24. Consumers prefer salty food and will resist change.	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
25. High salt content foods must be labeled.	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
26. It is very costly for the restaurant to make the necessary changes to reduce salt in food products.	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree

Appendix E

Intervention lesson Handout (Protein)

BALANCING PROTEIN

Culinary Science Strategies for Chefs

Protein Content in Food

8 oz. beef tenderloin (cooked)	56 grams of protein
5 oz. chicken breast (cooked)	45 grams of protein
1 cup firm tofu	40 grams of protein
½ cup roasted almonds	16 grams of protein
1 cup cooked dry beans	16 grams of protein
8 oz. of yogurt	11 grams protein
1 cup cooked quinoa	8 grams of protein
1 cup milk	8 grams of protein

BALANCING PROTEIN

Culinary Science Strategies for Chefs

Plant Protein Pairings

- ♦ Legumes have low levels of methionine and cysteine and can be paired with grains, nuts or seeds which are high in these Amino Acids.
 - Rice and Lentils.
 - Red Beans and Rice.
 - Hummus and Pitas.
 - Quinoa Salad with Edamame.
- ♦ Grains have low levels of lysine and can be combined with legumes which have a higher amount.
 - Peanut Butter and Whole.
 - Barley and Lentil Soup.
 - Beans and Corn Tortillas.
- ♦ Vegetables are low in lysine, methionine, and cysteine and can be paired with legumes which are high in these amino acids.
 - Tofu, Broccoli, and Almond Stir Fry.
 - Spinach Salad with Beans and Nuts.
- ♦ Dairy can be combined with legumes, nuts seeds and grains.
 - Whole Wheat Macaroni and Cheese.
 - Soybean or Chickpea Salad with Yogurt Dressing.
 - Quinoa Salad with Black Beans and Feta.

BALANCING PROTEIN

Culinary Science Strategies for Chefs

Hoppin' John

Yield: 5 servings (serving size: 1 cup of rice and ¼ cup peas. Garnish with sliced green onion)

For The Beans

- 1 cup dry Sea Island Red Peas
- 2 cups water
- 3 cups ham stock (recipe below)
- 1 green pepper, small dice
- 1 red pepper, small dice
- 1 yellow pepper, small dice
- 1 cup diced onion
- 2 cloves garlic, minced
- 2 Tbs. extra virgin olive oil
- ½ tsp. salt
- Black pepper, to taste
- Tabasco, to taste
- 2 bunches green onion, thinly sliced

Method:

1. Soak peas in water overnight. Drain.
2. Cook peas in stock for approximately 25 minutes or until beans are tender.
3. Sauté peppers, onion and garlic with the olive oil over medium heat until al dente.
4. Add peas and cooking liquid to the peppers and onions and cook for an additional 5 minutes.
5. Season with salt, black pepper and Tabasco.

Optional: Add pulled ham hock meat from stock recipe to pepper and bean mixture.

Note: For a completely vegetarian dish, substitute vegetable stock for ham stock. Black-eyed peas can be substituted for Sea Island Red Peas.

For The Rice

- 2 cups Carolina Gold Rice Grits
- 3 cups ham stock
- ¼ tsp. salt

Method:

1. Rinse the rice under cold running water until the water runs clear.
2. Place stock and salt in a pot and bring to a boil.
3. Add rice and return to a boil.
4. Reduce heat to simmer and cover.
5. Cook approximately 25 minutes or until rice is

tender.

Note: For a completely vegetarian dish, substitute vegetable stock for ham stock. White or brown rice can be substituted for Carolina Gold Rice Grits.

Ham Hock Stock

- 2 smoked ham hocks
- 3 quarts cold water
- 1 medium onion, chopped
- 1 carrot, chopped
- 2 celery stalks, chopped
- Parsley stems, as needed
- 1 tsp. black peppercorns
- 2 small bay leaves
- 5 sprigs thyme

Method:

1. Place ham hocks in a pot with water and bring to a boil.
2. Skim off fat from liquid, add remaining ingredients, and return to a boil.
3. Reduce heat to low and simmer stock for 3 hours or until desirable flavor is achieved.
4. Strain stock and reserve ham hocks.



Nutrition fact without ham: (one serving)

Calories: 560 Fat calories: 90 Fat: 10g
Sat. Fat: 2g Carbs: 96g Sugar: 6g
Fiber: 6g Iron: 3.51mg Protein: 24g
Vitamin C: 82.93mg Vitamin A: 761.92IU
Sodium: 460mg Calcium: 58.54mg

Nutrition fact with ham: (one serving)

Calories: 595 Fat calories: 105 Fat: 12g
Sat. Fat: 2.5g Carbs: 96g Sugar: 6g
Fiber: 6g Iron: 3.51mg Protein: 29g
Vitamin C: 82.93mg Vitamin A: 761.92IU
Sodium: 790mg Calcium: 58.54mg



BALANCING PROTEIN

Culinary Science Strategies for Chefs

Warm Mediterranean Farro Salad

Yield: 12 servings (serving size: 1 cup)

Ingredients:

- 2 cups Farro
- 4 cups reduced-sodium vegetable broth
- 1 medium zucchini, halved lengthwise
- 1 medium yellow squash, halved lengthwise
- 3 T. + 1 t. extra-virgin olive oil
- 1 medium orange bell pepper, seeded and chopped
- 1 medium red bell pepper, seeded and chopped
- 1 (15-oz.) can garbanzo beans, drained and rinsed
- 1 (14-oz.) can artichoke hearts, drained and cut into quarters
- 1 cup pitted and chopped Kalamata olives
- ½ cup diced red onion
- ½ cup diced sun-dried tomatoes
- 2 garlic cloves, minced
- ¼ cup red wine vinegar
- ½ cup chopped flat-leaf parsley
- ¼ cup chopped fresh basil
- 2 T. fresh chopped oregano
- ¼ t. salt
- ¼ t. freshly ground black pepper
- 3 oz. feta cheese, crumbled

Method:

1. Place Farro in large saucepan; cov-



er with broth. Bring to a boil. Cover; reduce heat. Simmer 45 minutes to 1 hour or until grains are cooked through.

2. Preheat grill or grill pan to medium high heat.
3. Toss zucchini and squash in 1 t. extra-virgin olive oil; arrange in single layer on a grill rack. Grill 4 minutes on each side or until tender and well-marked. Remove vegetables to a cutting board; chop into bite-sized pieces.
4. In large mixing bowl, combine remaining ingredients with cooked Farro and grilled vegetables. Mix well; serve immediately.

Nutrition Facts:

Calories: 170 Fat: 7g Sat. Fat: 2g
Carbs: 20g Fiber: 4g Iron: 15%
Protein: 6g Calcium: 10%
Vitamin A: 15% Vitamin C: 90%

This recipe was tested by Clemson University's Culinary Nutrition Student Research Group.



Appendix F


Intervention lesson Handout (Sodium)

Ham & Cheese Sandwich:

The “Poster Child” for Aggregating High Sodium Foods

1 sandwich= 2,080 mg sodium

- 4oz.bun=600mg
- 3oz.ham=1095mg
- 1oz.Americancheese=385mg



Top 10 Sources of Sodium in the American Diet

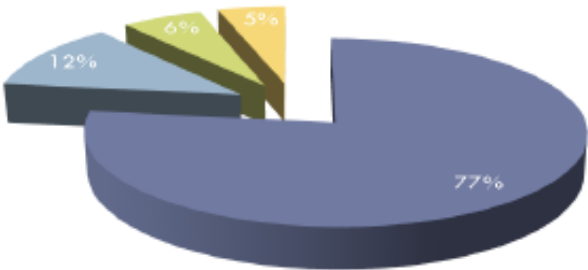
1. Breads and rolls	6. Cheeseburgers and other sandwiches
2. Luncheon meats such as deli ham and turkey	7. Cheese
3. Pizza	8. Pasta dishes
4. Poultry	9. Meat dishes
5. Soups	10. Snack foods including chips, pretzels, and popcorn

Source: NHANES 2007-2008

How Much Sodium in Salt

- ¼ teaspoon salt = 600 mg sodium
- ½ teaspoon salt = 1,200 mg sodium
- ¾ teaspoon salt = 1,800 mg sodium
- 1 teaspoon salt = 2,400 mg sodium
- 1 teaspoon baking soda = 1,000 mg sodium

Sources of Sodium



Food Processing	77%
Naturally Occurring	12%
Added at the Table	6%
Added During Cooking	5%

Source: Mattes RD, Donnelly D. Relative contributions of dietary sodium sources. J Am Coll Nutr.1991 Aug;10(4):383-93.

How Much Sodium in Salt

- $\frac{1}{4}$ teaspoon salt = 600 mg sodium
- $\frac{1}{2}$ teaspoon salt = 1,200 mg sodium
- $\frac{3}{4}$ teaspoon salt = 1,800 mg sodium
- 1 teaspoon salt = 2,400 mg sodium
- 1 teaspoon baking soda = 1,000 mg sodium

How Much Sodium in Common Foods

- 3.5 ounces smoked ham = 1,381mg
- 1 cup jarred spaghetti sauce = 1,040mg
- 1 cup canned chicken broth = 860mg
- 4 ounces sharp cheddar cheese = 720mg
- 10 medium olives = 700mg
- $\frac{1}{4}$ cup peanut butter = 280mg
- 1 teaspoon salt = 2,400mg



2 Slices Pepperoni
Pizza
= _____ mg

Ham and Cheese Sub
Sandwich with Potato
Chips
= _____ mg



Chicken Caesar
Salad
= _____ mg

Strategies for Reducing Sodium

- **Downsize portions:** You'll scale back the sodium and the calories.
- **Produce first:** Fill half the plate with fruits and vegetables.
- **Umami:** Research reveals that adding ingredients with umami properties heightens the perception of saltiness in a dish.
 - Cooked chicken, fish, beef and soybeans are naturally high in umami.
 - Some foods are high in umami are also high in sodium, including soy sauce, fish sauce, aged cheese, miso and anchovy paste.
- **Get fresh:** Choose unprocessed and minimally processed foods.
 - Processed foods are the greatest sources of sodium in the American diet.
 - "Fresh" and "natural" meats and poultry may be injected with salt solutions as part of their processing, and manufacturers are not required to list the sodium content on the label.
- **Embrace healthy fats and oils:** A savory strategy to lower sodium levels
 - Unfortunately, many product developers cut both good and bad fats out of formulations during the no-fat craze of the 90's, and in order to maintain consumer acceptance of their products, they increased levels of sugar and sodium. Be weary of fat-free salad dressings and similar products.
- **Spice it up:** Simple flavor additions can enhance food with less salt.
- **Sear, sauté, and roast:** The right cooking method can help spare the salt.
- **Rinse, wash and dilute:** you can easily cut excess sodium in processed foods with no loss of flavor.
- **TASTE BEFORE YOU SALT!**
 - Avoid "double salting" foods when cooking, and look for ways to pair salted flavors with unsalted or under-salted foods, especially fresh produce.

Southwestern Chicken Salad (4 servings)



- 1 lb. boneless, skinless chicken breasts
- 2 Tbs. Taco Seasoning Blend
- 1 Tbs. canola oil
- 8 cups salad greens
- ¼ cup Cilantro-Lime Vinaigrette
- 2 cups Black Bean and Corn Salsa
- 1 avocado, sliced
- 2 tomatoes, sliced
- ¼ cup cilantro leaves, for garnish

1. Season chicken breasts with Taco Seasoning Blend.
2. Preheat oven to 350°F.
3. Heat oil in a nonstick pan on medium heat. Brown the chicken in the pan on medium heat, transfer to a baking sheet and finish in a 350° oven until the chicken reaches an internal temperature of 165°F when checked with a meat thermometer.
4. Toss salad greens with Cilantro-Lime Vinaigrette.
5. On each plate arrange 2 cups dressed salad greens, ¼ of the sliced avocado, ½ of a sliced tomato, ½ cup Black Bean and Corn Salsa and top with 4 ounces cooked, sliced chicken breast. Garnish with cilantro leaves.

Taco Seasoning Blend (yield- ¾ cup)

- ¼ cup onion powder
- 2 Tbs. chili powder
- 2 Tbs. cumin
- 1 Tbs. crushed red pepper
- 1 Tbs. dried oregano
- 1 Tbs. garlic powder

1. Mix all ingredients together and store in an airtight container.

Black Bean and Corn Salsa (yield- 8 cups)

- 1 (16-ounce) can black beans, drained and rinsed
- 1 (16-ounce) can kidney beans, drained and rinsed
- 1 (14-ounce) can sweet yellow corn
- 1 each green, orange and red bell pepper, diced
- 3 garlic cloves, minced
- 1 jalapeño pepper, finely chopped
- ½ red onion, diced
- ¼ cup apple cider vinegar
- 2 Tbs. Taco Seasoning Blend
- 2 Tbs. canola oil
- 1 Tbs. lime juice
- ¼ cup chopped fresh cilantro

1. Mix all ingredients in a large bowl and refrigerate until ready to serve.

Nutrition Facts

Serving Size (372g)
Servings Per Container

Amount Per Serving

Calories 440 Calories from Fat 220

% Daily Value*

Total Fat 24g 37%

Saturated Fat 3g 15%

Trans Fat 0g

Cholesterol 65mg 22%

Sodium 280mg 12%

Total Carbohydrate 27g 9%

Dietary Fiber 9g 36%

Sugars 6g

Protein 30g

Vitamin A 130% • Vitamin C 100%

Calcium 10% • Iron 20%

*Percent Daily Values are based on a diet of other people's secrets. Your daily values may be higher or lower depending on your calorie needs.

	Calories	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate	Less than	300g	375g
Dietary Fiber	Less than	25g	30g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

Cilantro-Lime Vinaigrette (yield- 1 cup)

- 1 garlic clove minced
- 1 shallot minced
- ½ cup canola oil
- 2 Tbs. apple cider vinegar
- 1 Tbs. + 1 tsp. lime juice
- 1 tsp. lime zest
- 1 tsp. agave nectar
- 1 ½ tsp. Taco Seasoning Blend
- 2 Tbs. chopped fresh cilantro

1. Place all ingredients in a jar or covered container and shake well.

Appendix G

[Online Consent Form for Pilot Study II \(Online survey\)](#)

Consent Form for Culinary Arts Students

The goal for this survey of culinary arts students is to determine knowledge and perceptions of nutrition concepts. The survey includes a brief demographic section followed by 9 questions that are divided into fat, protein, and sodium.

The information collected in this survey will help us to develop materials on culinary nutrition to support the ongoing work of culinarians as well as to continue to learn more about how chefs make food ingredient selections for menus. By completing the following survey, you consent to participate in this research. Your participation is completely voluntary, anonymous, and you may quit at any time. It will take approximately 15 minutes to complete the survey.

If you have questions or concerns about this study, please contact Margaret Condrasky at Clemson University, 216 P & A, Clemson, SC 29634-0316; phone: (864) 656-6554; mcondra@clemson.edu. If you have any questions or concerns about your rights as a research participant, please contact the Clemson University Office of Research Compliance at 864-656-6460. You may keep this form for your records.

Thank You!

Appendix H

Online Demographic Form for Pilot Study II (Online survey)

1. **What is your age?**
 - a. 19-29
 - b. 30-39
 - c. 40-49
 - d. 50-59
 - e. 60 and over
2. **What is your gender?**
 - a. Male
 - b. Female
3. **How do you describe yourself?**
 - a. Black, not of Hispanic origin
 - b. White, not of Hispanic origin
 - c. Hispanic/Latino
 - d. Asian or Pacific Islander
 - e. American Indian/Alaskan Native
 - f. Mixed/Other
4. **In what region of the United States is your School located?**
 - a. Northeast
 - b. Southeast
 - c. Central
 - d. West
5. **If you have food experience how many years have you been in the industry?**
 - a. No industry experience
 - b. Less than 1
 - c. 1 to 5
 - d. 6 to 10
 - e. 11-15
 - f. 16 or more
6. **What is your primary position where you currently work?**
 - a. No industry experience
 - b. Cook / Line Cook /Sous Chef
 - c. Bakery/ Pastry
 - d. Kitchen helper
 - e. Culinary Apprentice
 - f. Other _____
7. **How would you characterize the establishment where you work?**
 - a. No industry experience
 - b. Casual/Family Restaurant
 - c. Fine Dining
 - d. Quick Service/fast food
 - e. Catering
 - f. On-Site / Contract feeding
 - g. Culinary School
 - h. Health Care
 - i. Other _____

Appendix I

Online Survey for Pilot Study II (Online survey)

The following Questions test nutrition knowledge, and determine perceptions about nutrition and healthy cooking practices. Please choose the best answer.

Fat

1. Many foods labeled “fat-free” are generally higher in sugar, refined carbohydrates and calories.
 - a. Strongly Agree
 - b. Agree
 - c. Neither Agree or Disagree
 - d. Disagree
 - e. Strongly Disagree
2. Which is the best source of monounsaturated fat?
 - a. Olive
 - b. Palm
 - c. Fish
 - d. Canola
 - e. Corn
3. What type of fat do you primarily use to sauté?
 - a. Butter
 - b. Vegetable oil (Corn, Canola, Soy etc.)
 - c. Olive oil
 - d. Specialty oil

Protein

4. The USDA’s recommended portion size for a single serving of meat for the average adult is?
 - a. 2 to 4 ounces
 - b. 5 to 7 ounces
 - c. 8 to 10 ounces
 - d. 11 to 12 ounces
5. Complementary proteins are:
 - a. One food item providing all of the essential amino acids.
 - b. Two or more incomplete protein foods that when paired together give all of the essential amino acids.
 - c. Two protein sources that can be combined for enhanced flavor.
 - d. Are only found in animal based foods.
6. Which of the following modifications to the normal hamburger and fries meal at a restaurant do you feel would be perceived as the most acceptable among children?
 - a. Using ground turkey meat with finely minced vegetables
 - b. Substituting regular fries with baked sweet potato fries
 - c. Using a whole-wheat bun
 - d. Scaling back the portions of both the burger and fries

Sodium

7. In January 2010, the American Heart Association announced the sodium recommendation for all Americans should be reduced to 1,500 mg a day. Which food item below contains the daily recommendation for sodium of 1500 mg?
- a. $\frac{3}{4}$ teaspoon of table salt
 - b. 1 can of soup
 - c. 1 cup grated Parmesan cheese
 - d. All of the above
8. Which of the following is a better alternative to table salt to reduce sodium?
- a. Sea salt
 - b. Kosher salt
 - c. Non-iodized salt
 - d. None of the above
9. When preparing a pasta dish with meat sauce, approximately how many times do you add salt from start to finish?
- a. 1 time
 - b. 2 times
 - c. 3 times
 - d. 4 times
 - e. 5 times or more

Appendix J

Institutional Review Board (IRB) Exempt Review Application for Pilot Study I

Exempt Review Application
Clemson University (CU) Institutional Review Board (IRB) (Version 4.19.2011)
[Clemson University IRB Website](#)

Office use only <input type="checkbox"/> Approved Exemption Category _____ Signature of IRB Chair / Designee _____	Protocol Number: <div style="text-align: center;"><i>Sept 2011</i></div> Date _____
---	--

1.	Developmental Approval: If you already have developmental approval for this research study, please give the IRB protocol number assigned to the study. More information available here .
-----------	---

2.	Research Title:	Culinary Nutrition applied with Culinary Students
	If different, title used on consent document(s)	
	If class project, include course number and title	

3.	Principal Investigator (PI): The PI must be a member of the Clemson faculty or staff. You cannot be the PI if this is your thesis or dissertation. The PI must have completed IRB-approved human research protections training. Training will be verified by IRB staff before approval is granted. Training instructions available here . CITI training site available here .		
	Name: Margaret Condasky	<input checked="" type="checkbox"/> Faculty <input type="checkbox"/> Staff	
	Department: Food, Nutrition and Packaging Sciences	E-mail: mcondra@clemson.edu	
	Campus address: 216 P & A	Phone: 656-6554 Fax: 656-0331	

4.	Co-Investigator(s): Co-Investigators must have completed IRB-approved human research protections training. Training will be verified by IRB staff before approval is granted. Training instructions available here . CITI training site available here .		
	Name: Nisreen Abdulsalam	E-mail:	
	Department: FNPS	Phone:	
	<input type="checkbox"/> Faculty <input checked="" type="checkbox"/> Graduate student <input type="checkbox"/> Other. Please specify. <input type="checkbox"/> Staff <input type="checkbox"/> Undergraduate student		
	Name:	E-mail:	
	Department:	Phone:	
	<input type="checkbox"/> Faculty <input type="checkbox"/> Graduate student <input type="checkbox"/> Other. Please specify. <input type="checkbox"/> Staff <input type="checkbox"/> Undergraduate student		

5.	Additional Research Team Members: All research team members must have completed IRB-approved human research protections training. Training will be verified by IRB staff before approval is granted. Training instructions available here . CITI training site available here . <input type="checkbox"/> List of additional research team members included. Form available here .
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6. **Research Team Roles:** Describe the role of each member of the research team (everyone included in Items 3, 4 and 5), indicating which research activities will be carried out by each particular member. Team members may be grouped into categories.

Description: Graduate student will work through the data collection (pre and post survey as well as post post survey); and assist the PI with the design and set up of the culinary nutrition session for the culinary arts students. PI Condrsaky will manage the communication with the instructors at the site and recruit the students to participate in the sessions.

7. **Email Communications:** If you would like one or two of your team members (in addition to the PI) to be copied on all email communications, please list these individuals in the box below.

Name:	E-mail:
Name:	E-mail:

8. **Study Purpose:** In non-technical terms, provide a brief description of the purpose of the study. Upon conclusion of the study, how will you share your results (e.g., academic publication, evaluation report to funder, conference presentation)?

Description: Evaluate an applied nutrition demonstration model for a nutrition topic (alternate proteins) with culinary arts students. By administering pre and post surveys at the time of the demonstration session as well as 10 weeks later we will learn more about the level of knowledge and confidence in menu planning for vegetarian meals among culinary arts students.

9. **Anticipated Dates of Research:**

Anticipated start date (may not be prior to IRB approval; may be "upon IRB approval"): October 1, 2011.

Anticipated completion date (Please include time needed for analysis of individually identifiable data): December 31, 2012.

10. **Funding Source:** Please check all that apply.

☐ Submitted for internal funding
☐ Internally funded
☐ Submitted for external funding
 Funding source, if applicable (Do not use initials): _____
 Proposal number (PPN) for the Office of Sponsored Programs: _____
 Name of PI on Funding Proposal: _____
☐ Externally funded
 Funding source, if applicable (Do not use initials): _____
 Proposal number (PPN) for the Office of Sponsored Programs: _____
 Name of PI on Funding Proposal: _____

- ☐ Intend to seek funding From whom? _____
☒ Not funded

11. Support provided by Creative Inquiry Initiative: ☐ Yes ☒ No

12. Other IRB Approvals:

Has this research study been presented to any other IRB? ☐ Yes ☒ No

Where? _____ When? _____

If yes, what was their decision? ☐ Approved ☐ Disapproved ☐ Pending

Please attach a copy of any submissions, approvals, or disapprovals from other IRBs.

13. **Exempt Review Checklist:** To determine whether this study meets the federal requirements for exemption [45 CFR 46.101], please complete the following checklist. This will indicate if your study can be exempted from IRB continuing review.

The Federal Code [45 CFR 46.101] permits research activities in the following six categories to be exempted. Please check the relevant exemption category / categories.

Categories of Research Activities Exempt from Continuing Review	
<input checked="" type="checkbox"/>	<p>B1. Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as:</p> <ul style="list-style-type: none"> a. research on regular and special education instructional strategies, OR b. research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods. <p>NOTE: Survey and interview procedures with minors are exemptible if the activities fall within this category.</p>
<input type="checkbox"/>	<p>B2. Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, UNLESS:</p> <ul style="list-style-type: none"> a. the information obtained is recorded in such a manner that human participants can be identified, directly or through identifiers linked to the participants; AND b. any disclosure of the human participants' responses outside the research could reasonably place the participants at risk of criminal or civil liability or be damaging to the participants' financial standing, employability, or reputation. <p>NOTE: Survey and interview techniques which include minors are not exempt. Observation of the public behavior of minors, if the researcher is not a participant, is exempt.</p>

<input type="checkbox"/>	<p>B3. Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior that is not exempt under Category B2, if:</p> <p>a. the human participants are elected or appointed public officials or candidates for public office, or</p> <p>b. federal statute(s) require(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.</p>
<input type="checkbox"/>	<p>B4. Research, involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that participants cannot be identified directly or through identifiers linked to the participants.</p>
<input type="checkbox"/>	<p>B5. NOTE: Please contact the IRB office before selecting this category since use of this exemption must be initiated by the agency head of the federal funder.</p> <p>Research and demonstration projects which are conducted by or subject to the approval of appropriate Federal Department or Agency heads, and which are designed to study, evaluate, or otherwise examine:</p> <p>a. public benefit or service programs; or</p> <p>b. procedures for obtaining benefits or services under those programs; or</p> <p>c. possible changes in or alternatives to those programs or procedures; or</p> <p>d. possible changes in methods or levels of payment for benefits or services under those programs.</p>
<input type="checkbox"/>	<p>B6. Taste and food quality evaluation and consumer acceptance studies,</p> <p>a. if wholesome foods without additives are consumed, OR</p> <p>b. if a food is consumed that contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the Food and Drug Administration or approved by the Environmental Protection Agency or the Food Safety and Inspection Service of the U.S. Department of Agriculture.</p>

14. Based on the Exemption Category you checked above, please answer the corresponding questions below:

Exemption Category B1: Complete questions a and b.

- a. Is the research conducted exclusively in established or commonly accepted educational settings?
Yes ☒ No ☐
- b. Does the research exclusively involve normal educational practices?
Yes ☒ No ☐

Exemption Category B2 or B3: Complete questions c through g.

- c. Does the research involving human subjects exclusively involve the use of educational tests, survey procedures, interview procedures or observation of public behavior?
Yes ☐ No ☐
- d. Is the information obtained recorded in such a manner that you could identify the human participants, directly or through codes or demographic information linked to the participants?
Yes ☐ No ☐

- e. Could any disclosure of the human participants' responses outside the research reasonably place the participants at risk of criminal or civil liability or be damaging to the participants' financial standing, employability, or reputation?
Yes ☐ No ☐
- f. If survey or interview techniques are employed, will all participants be 18 years of age or older?
Yes ☐ No ☐ Does not apply ☐
- g. If observations of the public behavior of minors are employed, will a researcher participate in the activities being observed?
Yes ☐ No ☐ Does not apply ☐

Exemption Category B4: Complete questions h through n.

- h. What are the types of data or specimens? _____
- i. What is the source of the data or specimens? _____
- j. Are the data or specimens publicly available? (That is, can the general public obtain the data or specimens? Data are not considered publicly available if access is limited to researchers.)
Yes ☐ No ☐
If yes, please contact the IRB staff for consultation. You may not be conducting research involving human subjects as defined in the federal regulations governing research involving human subjects (45 CFR 46.102).
- k. If the data or specimens are not publicly available, are you required to obtain permission to access these? If the answer is "Yes," attach a copy of the correspondence granting you permission.
Yes ☐ No ☐
- l. If the data or specimens are not publicly available, how are these identified when they are made available to you?
1) ☐ Direct Identifier (e.g., subject name, address, or social security number).
2) ☐ Indirect Identifier (e.g., an assigned code that could be used by the investigator or the source providing the data or specimens to identify a subject, such as a pathology tracking number or a tracking code used by the source).
If you will receive data with indirect identifiers only, please contact the IRB staff for consultation. You may not be conducting research involving human subjects as defined in the federal regulations governing research involving human subjects (45 CFR 46.102).
3) ☐ No Identifier (i.e., neither the researcher nor the source providing the data or specimens can identify a subject based upon information provided with the data or specimens).
If it will be impossible for anyone to identify subjects based upon information provided with the data or specimens, you will not be conducting research involving human subjects as defined in the federal regulations governing research involving human subjects (45 CFR 46). Please contact the IRB staff for confirmation.
- m. If (1) is checked above, will you record any direct identifiers that are available to you?
Yes* ☐ No ☐
- n. Will any data or specimens be collected from participants after the submission of this application? (Data or specimens are considered to "exist" if ALL the data or specimens to be used for the research have been collected prior to the submission of this application.)
Yes* ☐ No ☐

*Your research does not qualify for exemption from IRB review under Exemption Category B4.

PLEASE NOTE: If you are applying for exemption only under Exemption Category B4, you have now completed this application. Please submit your application following the instructions at the end of the form.

Exemption Category B5: Please contact the IRB office if use of this exemption for your protocol has been initiated by the agency head of the federal funder.

Exemption Category B6: Complete questions o through q.

- o. Are only wholesome foods without additives consumed?
Yes ☐ No ☐
- p. Does the food consumed contain only food ingredients at or below the level and for a use found to be safe by the FDA or approved by the EPA or the Food Safety and Inspection Service of the USDA?
Yes ☐ No ☐
- q. Does the food consumed contain agricultural chemicals or environmental contaminants at or below the level found to be safe by the FDA or approved by the EPA or the Food Safety and Inspection Service of the USDA?
Yes ☐ No ☐

15. Study Sample: (Groups specifically targeted for study)

Describe the participants you plan to recruit and the criteria used in the selection process. Indicate if there are any special inclusion or exclusion criteria.

NOTE: If individuals who are incarcerated will be participants, your research is not exemptible. Please complete the Expedited / Full Review Application.

Description: Culinary Arts students from local community college programs (Greenville Tech, Trident Tech, Johnson & Wales).

Age range of participants: 19-35 Projected number of participants: 150

- | | | |
|---|---|---|
| <input type="checkbox"/> Employees | <input checked="" type="checkbox"/> Students | <input type="checkbox"/> Minors (under 18) * |
| <input type="checkbox"/> Pregnant women * | <input type="checkbox"/> Fetuses / neonates * | <input type="checkbox"/> Educationally / economically disadvantaged * |
| <input type="checkbox"/> Minors who are wards of the state, or any other agency, institution, or entity * | <input type="checkbox"/> Individuals who are incarcerated * | <input type="checkbox"/> Persons incompetent to give valid consent * |
| <input type="checkbox"/> Other-specify: _____ | <input type="checkbox"/> Military personnel | |

*State necessity for using this type of participant: _____

16. Study Locations:

- | | |
|---|--|
| <input type="checkbox"/> Clemson University
<u>Tech, Johnson & Wales</u> | <input checked="" type="checkbox"/> Other University / College <u>Greenville Tech, Trident</u> |
| <input type="checkbox"/> School System / Individual Schools _____ | <input type="checkbox"/> Other - specify _____ |

You may need to obtain permission if participants will be recruited or data will be obtained through schools, employers, or community organizations. Are you required to obtain permission to gain access to people or to access data that are not publicly available? If yes, provide a research site letter from a person authorized to give you access to the participants or to the data. Guidance regarding Research Site Letters is available [here](#).

- ☒ Research Site Letter(s) not required.
☐ Research Site Letter(s) attached.
☐ Research Site Letter(s) pending and will be provided when obtained.

17. Recruitment Method:

Describe how research participants will be recruited in the study. How will you identify potential participants? How will you contact them? **Attach a copy of any material you will use to recruit participants (e.g., advertisements, flyers, telephone scripts, verbal recruitment, cover letters, or follow-up reminders).**

Description: The participants will come from an intact class of students at the participating colleges through collaboration with the instructor of the course(s). The PI will coordinate with the instructor for the time slot and location in which to present the culinary nutrition session to the class. A copy of the description of the session which will be shared with the instructor who will read it to the class the week prior to our session is attached (verbal recruitment script attachment).

18. Participant Incentives:

- a. Will you pay participants? ☐ Yes ☒ No
Amount: \$_____ When will money be paid?: _____
- b. Will you give participants incentives / gifts / reimbursements? ☐ Yes ☒ No
Describe incentives / gifts / reimbursements: _____
Value of incentives / gifts / reimbursements: \$_____
- When will incentives / gifts / reimbursements be given?: _____
- c. Will participants receive course credit? ☐ Yes ☒ No
- d. Will participants receive extra credit? ☐ Yes ☒ No
If yes, an equivalent alternative to research participation must be provided and described in your informed consent document(s).

19. Informed Consent:

- a. Attach a copy of the informational letter or consent script you plan to provide to your participants (and their parents or guardians, if applicable). [Consent Document Templates](#)
- b. Will you use concealment (incomplete disclosure) or deception in this study? ☐ Yes ☒ No
If yes, please see guidance regarding Research Involving Deception or Concealment [here](#), submit a copy of the Additional Pertinent Information / Permission for Use of Data Collected in a Research Study form you will use, and provide a justification in the following space for this use of concealment or deception. _____

20. Procedures:

- a. What data will you collect? a 14 item pre and post survey; a 6 item demographic form
- b. Please describe in detail the process each participant will experience and how you will obtain the data. We will administer the demographic and pre survey at the beginning of the 90 minute session. We will present a power point, and cooking demonstration for the group of culinary arts students in a classroom at the tech college location. Following the session we will administer the post survey (same copy as the pre survey).
- c. If data collection tools will be used, how much time will it take for each participant to complete these tools? It will take approximately 5 minutes to complete the demographic form and 14 minutes to complete the pre and post surveys.
- d. How many data collection sessions will be required for each participant? Will this include follow-up sessions? one
- e. How will you collect data?

<input checked="" type="checkbox"/> in-person contact	<input type="checkbox"/> telephone
<input type="checkbox"/> snail mail	<input type="checkbox"/> email
<input type="checkbox"/> website	<input type="checkbox"/> other, describe _____

Please include copies of surveys, interview questions, data collection tools and debriefing statements. If survey or interview questions have not been fully developed, provide information on the types of questions to be asked, or a description of the parameters of the survey / interview. Please note: finalized survey or interview instruments will need to be reviewed and approved by amendment, before implementation.

- f. Will you audio record participants? ☐ Yes ☒ No
- g. Will you video record participants? ☐ Yes ☒ No
- h. Will you photograph participants? ☐ Yes ☒ No

If you will audio or video record or take identifiable photographs of participants, please consult the IRB's Guidance on the Use of Audio / Video Recording and Photography [here](#). Please include all the information addressed by this guidance document in the application and, where appropriate, in the consent document(s).

- 21. Protection of Confidentiality:** Describe the security measures you will take to protect the confidentiality of the information obtained. Will participants be identifiable either by name or through demographic data? If yes, how will you protect the identity of the participants and their responses? Where will the data be stored and how will it be secured? Who will have access to the data? How will identifiers be maintained or destroyed after the study is completed?

Description: Surveys will contain random identification system and these forms will be kept in a locked cabinet in the PI office for 5 years.

22. PI Signature:

I have reviewed this research protocol and the informed consent document(s), if applicable. I request approval of this research study by the IRB of Clemson University.

Signature of Principal Investigator Maynard O'Grady Date Sept 2011
(hard-copy signature only needed if application will not be submitted via PI's email account)

Submission Instructions: Exempt applications are processed as received. There is no deadline for submitting exempt applications for review. Please allow seven to ten business days for processing.

Please submit this application and all associated documents from the Principal Investigator's (PI's) email address to the IRB staff. Receipt of the application electronically from the PI will qualify the application as a signed electronic submission. Alternatively, the signed, hard-copy application may be mailed or delivered to the Office of Research Compliance, 223 Brackett Hall, Clemson, SC 29634-5704.

Appendix K

Institutional Review Board (IRB) Request for Amendment-Pilot Study I

Request for Amendment
Clemson University Institutional Review Board (IRB) (Version 10.28.2011)
Clemson University IRB Website

Office use only	
<u>For Expedited and Full Protocols</u>	<u>For Exempt Protocols</u>
<input type="checkbox"/> Approved <input type="checkbox"/> Disapproved	<input type="checkbox"/> Validated as continuing to meet the criteria for Exempt status <input type="checkbox"/> Not validated as continuing to meet the criteria for Exempt status
Signature of IRB Chair / Designee _____	Date _____

Protocol Number:	2011288
Research Title:	Culinary Nutrition application with culinary students
Principal Investigator:	Margaret Condasky

1. **Type of Amendment Request:** Check all that apply. Be sure to attach any new or revised documents, with changes highlighted or electronically shaded.

- | | |
|---|--|
| <input type="checkbox"/> Protocol Change or Amendment | <input checked="" type="checkbox"/> Change to Data Collection Tools or Procedure |
| <input type="checkbox"/> Change to Subject Selection Criteria | <input type="checkbox"/> Consent Form Changes |
| <input type="checkbox"/> Subject Recruitment Methods | <input type="checkbox"/> Editorial/Administrative/Personnel Changes |
| <input type="checkbox"/> Other (please specify): _____ | |

2. **Summary:** Provide a brief description of changes and rationale.

Description: In spring semester we plan to once again visit culinary students at Greenville Tech, Trident Tech and Johnson Wales and provide a culinary nutrition session with a questionnaire administered before and after the session to learn more about nutrition knowledge. This session will be on ways to reduce sodium in cooking.

☒ I am the principal investigator. I am submitting this form electronically and this submission constitutes my signature.

Principal investigator signature: Margaret Condasky Date: 1.27.12

Appendix L

Institutional Review Board (IRB) Exempt Review Application for Pilot Study II

Exempt Review Application
Clemson University (CU) Institutional Review Board (IRB) (Version 10.28.2011)
Clemson University IRB Website

Office use only	Protocol Number: <u>IRB 2012-101</u>
<input type="checkbox"/> Approved Exemption Category _____	<u>3/21/2012</u>
Signature of IRB Chair / Designee _____	Date _____

1. **Developmental Approval:** If you already have developmental approval for this research study, please give the IRB protocol number assigned to the study. More information available [here](#).

2. Research Title:	Applied Nutrition Survey for Culinary Arts Students
If different, title used on consent document(s)	
If class project, include course number and title	

3. Principal Investigator (PI): The PI must be a member of the Clemson faculty or staff. You cannot be the PI if this is your thesis or dissertation. The PI must have completed IRB-approved human research protections training. Training will be verified by IRB staff before approval is granted. Training instructions available here . CITI training site available here .	
Name: Margaret D. Condrasky	<input checked="" type="checkbox"/> Faculty <input type="checkbox"/> Staff
Department: Food Nutrition and Packaging Sciences	E-mail: mcondra@clemson.edu
Campus address: 216 Poole Ag Center	Phone: 656-6554 Fax: 656-0331

4. Co-Investigator(s): Co-Investigators must have completed IRB-approved human research protections training. Training will be verified by IRB staff before approval is granted. Training instructions available here . CITI training site available here .		
Name:	E-mail:	
Department:	Phone:	
<input type="checkbox"/> Faculty	<input type="checkbox"/> Graduate student	<input type="checkbox"/> Other. Please specify.
<input type="checkbox"/> Staff	<input type="checkbox"/> Undergraduate student	
Name:	E-mail:	
Department:	Phone:	
<input type="checkbox"/> Faculty	<input type="checkbox"/> Graduate student	<input type="checkbox"/> Other. Please specify.
<input type="checkbox"/> Staff	<input type="checkbox"/> Undergraduate student	

5.	Additional Research Team Members: All research team members must have completed IRB-approved human research protections training. Training will be verified by IRB staff before approval is granted. Training instructions available here . CITI training site available here .
	<input type="checkbox"/> List of additional research team members included. Form available here .

6. **Research Team Roles:** Describe the role of each member of the research team (everyone included in Items 3, 4 and 5), indicating which research activities will be carried out by each particular member. Team members may be grouped into categories.

Description: Dr. Margaret Condasky will conduct all research activities.

7. **Email Communications:** If you would like one or two of your team members (in addition to the PI) to be copied on all email communications, please list these individuals in the box below.

Name:	E-mail:
Name:	E-mail:

8. **Study Purpose:** In non-technical terms, provide a brief description of the purpose of the study. Upon conclusion of the study, how will you share your results (e.g., academic publication, evaluation report to funder, conference presentation)?

Description: The goal of conducting this survey of culinary arts students is to determine their knowledge and perceptions of nutrition concepts. It is anticipated that the students will have taken a nutrition course within their curriculum. This study will review the participant aptitude to apply these concepts i.e. reducing sodium in a recipe, or enhancing fiber content of a dish measured at a point later in their studies. Upon conclusion of the study it is anticipated that this information will be shared with the culinary educators as well as provide baseline information for future design of creative culinary nutrition educational models.

9. **Anticipated Dates of Research:**

Anticipated start date (may not be prior to IRB approval; may be "upon IRB approval"): April 15, 2012

Anticipated completion date (Please include time needed for analysis of individually identifiable data): December 15, 2012

10. **Funding Source:** Please check all that apply.

- ☐ Submitted for internal funding
- ☐ Internally funded
- ☐ Submitted for external funding
- Funding source, if applicable (Do not use initials): _____
- Proposal number (PPN) for the Office of Sponsored Programs: _____
- Name of PI on Funding Proposal: _____
- ☐ Externally funded
- Funding source, if applicable (Do not use initials): _____
- Proposal number (PPN) for the Office of Sponsored Programs: _____
- Name of PI on Funding Proposal: _____
- ☐ Intend to seek funding From whom? _____
- ☒ Not funded

11. Support provided by Creative Inquiry Initiative: ☐ Yes ☒ No

If yes, all Creative Inquiry students will be members of the research team, please see item # 5.

12. Other IRB Approvals:

Has this research study been presented to any other IRB? ☐ Yes ☒ No

Where? _____ When? _____

If yes, what was their decision? ☐ Approved ☐ Disapproved ☐ Pending

Please attach a copy of any submissions, approvals, or disapprovals from other IRBs.

13. Exempt Review Checklist: To determine whether this study meets the federal requirements for exemption [45 CFR 46.101], please complete the following checklist. This will indicate if your study can be exempted from IRB continuing review.

The Federal Code [45 CFR 46.101] permits research activities in the following six categories to be exempted. Please check the relevant exemption category / categories.

The Federal Office of Human Research Protections has made Decision Charts available [here](#) to help in determining whether a particular study falls within a particular Exemption Category.

Categories of Research Activities Exempt from Continuing Review	
<input type="checkbox"/>	<p>B1. Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as:</p> <ul style="list-style-type: none">a. research on regular and special education instructional strategies, ORb. research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods. <p>NOTE: Survey and interview procedures with minors are exemptible if the activities fall within this category.</p>
<input checked="" type="checkbox"/>	<p>B2. Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, UNLESS:</p> <ul style="list-style-type: none">a. the information obtained is recorded in such a manner that human participants can be identified, directly or through identifiers linked to the participants; ANDb. any disclosure of the human participants' responses outside the research could reasonably place the participants at risk of criminal or civil liability or be damaging to the participants' financial standing, employability, or reputation. <p>NOTE: Survey and interview techniques which include minors are not exempt. Observation of the public behavior of minors, if the researcher is not a participant, is exempt.</p>

<input type="checkbox"/>	B3. Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior that is not exempt under Category B2 , if: <ol style="list-style-type: none"> the human participants are elected or appointed public officials or candidates for public office, or federal statute(s) require(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.
<input type="checkbox"/>	B4. Research, involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that participants cannot be identified directly or through identifiers linked to the participants.
<input type="checkbox"/>	B5. NOTE: Please contact the IRB office before selecting this category since use of this exemption must be initiated by the agency head of the federal funder. Research and demonstration projects which are conducted by or subject to the approval of appropriate Federal Department or Agency heads, and which are designed to study, evaluate, or otherwise examine: <ol style="list-style-type: none"> public benefit or service programs; or procedures for obtaining benefits or services under those programs; or possible changes in or alternatives to those programs or procedures; or possible changes in methods or levels of payment for benefits or services under those programs.
<input type="checkbox"/>	B6. Taste and food quality evaluation and consumer acceptance studies, <ol style="list-style-type: none"> if wholesome foods without additives are consumed, OR if a food is consumed that contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the Food and Drug Administration or approved by the Environmental Protection Agency or the Food Safety and Inspection Service of the U.S. Department of Agriculture.

14. If you selected Exemption Category B4, please complete questions a through h below:

- What are the types of data or specimens? _____
- What is the source of the data or specimens? _____
- Are the data or specimens publicly available? (That is, can the general public obtain the data or specimens? Data are not considered publicly available if access is limited to researchers.)
 Yes ☐ No ☐
If yes, please contact the IRB staff for consultation. You may not be conducting research involving human subjects as defined in the federal regulations governing research involving human subjects (45 CFR 46.102).
- If the data or specimens are not publicly available, how are you obtaining permission to access these or to use them for research purposes? _____
Please attach a copy of the correspondence or agreement granting you permission.
- How will the data be made available to you (e.g., electronic file, access to hard copy records at record-holder's institution)? _____
- How are the data or specimens identified when they are made available to you?

- 1) ☐ Direct Identifier (e.g., subject name, address, or social security number).
- 2) ☐ Indirect Identifier (e.g., an assigned code that could be used by the investigator or the source providing the data or specimens to identify a subject, such as a pathology tracking number or a tracking code used by the source).
If you will receive data with indirect identifiers only, please contact the IRB staff for consultation. You may not be conducting research involving human subjects as defined in the federal regulations governing research involving human subjects (45 CFR 46.102).
- 3) ☐ No Identifier (i.e., neither the researcher nor the source providing the data or specimens can identify a subject based upon information provided with the data or specimens).
If it will be impossible for anyone to identify subjects based upon information provided with the data or specimens, you will not be conducting research involving human subjects as defined in the federal regulations governing research involving human subjects (45 CFR 46). Please contact the IRB staff for confirmation.

g. If (1) is checked above, will you record any direct identifiers that are available to you?
 Yes* ☐ No ☐

h. Will any data or specimens be collected from participants after the submission of this application? (Data or specimens are considered to "exist" if ALL the data or specimens to be used for the research have been collected prior to the submission of this application.)
 Yes* ☐ No ☐

*Your research does not qualify for exemption from IRB review under Exemption Category B4.

PLEASE NOTE: *If you are applying for exemption only under Exemption Category B4, you have now completed this application. Please submit your application following the instructions at the end of the form.*

15. Study Sample: (Groups specifically targeted for study)

Describe the participants you plan to recruit and the criteria used in the selection process. Indicate if there are any special inclusion or exclusion criteria.

NOTE: If individuals who are incarcerated will be participants, your research is not exemptible. Please complete the Expedited / Full Review Application.

Description: Second year culinary arts students from schools in the US.

Age range of participants: 19-55 Projected number of participants: 300

- | | | |
|---|---|---|
| <input type="checkbox"/> Employees | <input checked="" type="checkbox"/> Students | <input type="checkbox"/> Minors (under 18) * |
| <input type="checkbox"/> Pregnant women * | <input type="checkbox"/> Fetuses / neonates * | <input type="checkbox"/> Educationally / economically disadvantaged * |
| <input type="checkbox"/> Minors who are wards of the state, or any other agency, institution, or entity * | <input type="checkbox"/> Individuals who are incarcerated * | <input type="checkbox"/> Persons incompetent to give valid consent * |
| <input type="checkbox"/> Other—specify: _____ | <input type="checkbox"/> Military personnel | |

*State necessity for using this type of participant: _____

16. Study Locations:

☐ Clemson University ☒ Other University / College i.e Greenville Technical College, Trident Technical College, Johnson & Wales, and other two year institutions offering culinary arts

☐ School System / Individual Schools _____ ☐ Other – specify _____

You may need to obtain permission if participants will be recruited or data will be obtained through schools, employers, or community organizations. Are you required to obtain permission to gain access to people or to access data that are not publicly available? If yes, provide a research site letter from a person authorized to give you access to the participants or to the data. Guidance regarding Research Site Letters is available [here](#).

- ☐ Research Site Letter(s) not required.
☐ Research Site Letter(s) attached.
☐ Research Site Letter(s) pending and will be provided when obtained.

17. Recruitment Method:

Describe how research participants will be recruited in the study. How will you identify potential participants? How will you contact them? **Attach a copy of any material you will use to recruit participants (e.g., advertisements, flyers, telephone scripts, verbal recruitment, cover letters, or follow-up reminders).**

Description: SE contacts; and culinary directors in ACF

18. Participant Incentives:

- a. Will you pay participants? ☐ Yes ☒ No
Amount: \$_____ When will money be paid?: _____
- b. Will you give participants incentives / gifts / reimbursements? ☐ Yes ☒ No
Describe incentives / gifts / reimbursements: _____
Value of incentives / gifts / reimbursements: \$_____
- c. Will participants receive course credit? ☐ Yes ☒ No
- d. Will participants receive extra credit? ☐ Yes ☒ No

If yes, an equivalent alternative to research participation must be provided and described in your informed consent document(s).

19. Informed Consent:

- a. Attach a copy of the informational letter or consent script you plan to provide to your participants (and their parents or guardians, if applicable). [Consent Document Templates](#)
- b. Will you use concealment (incomplete disclosure) or deception in this study? ☐ Yes ☒ No
If yes, please see guidance regarding Research Involving Deception or Concealment [here](#), submit a copy of the Additional Pertinent Information / Permission for Use of Data Collected in a Research

Study form you will use, and provide a justification in the following space for this use of concealment or deception. _____

20. Procedures:

- a. What data will you collect? Demographic information (age, gender, region of country, ethnic, time involvement in foodservice industry, time in a culinary program); Questions on nutrition knowledge; as well as questions on perceptions regarding culinary nutrition principles.
- b. Please describe in detail the process each participant will experience and how you will obtain the data. The participating culinary arts student will receive an invitation (either through the program coordinator at their school or directly from the PI who will visit the school) to take the 37 item survey on-line or paper pencil (on-site).
- c. How many participation sessions and how much time will be required for each participant, including follow up sessions? one
- d. How will you collect data?

<input checked="" type="checkbox"/> in-person contact	<input type="checkbox"/> telephone
<input type="checkbox"/> snail mail	<input type="checkbox"/> email
<input checked="" type="checkbox"/> website	<input type="checkbox"/> other, describe _____

Please include copies of surveys, interview questions, data collection tools and debriefing statements. If survey or interview questions have not been fully developed, provide information on the types of questions to be asked, or a description of the parameters of the survey / interview. Please note: finalized survey or interview instruments will need to be reviewed and approved by amendment, before implementation.

- e. Will you audio record participants? ☐ Yes ☒ No
- f. Will you video record participants? ☐ Yes ☒ No
- g. Will you photograph participants? ☐ Yes ☒ No

If you will audio or video record or take identifiable photographs of participants, please consult the IRB's Guidance on the Use of Audio / Video Recording and Photography [here](#). Please include all the information addressed by this guidance document in the application and, where appropriate, in the consent document(s).

- 21. Protection of Confidentiality:** Describe the security measures you will take to protect the confidentiality of the information obtained. Will participants be identifiable either by name or through demographic data? If yes, how will you protect the identity of the participants and their responses? Where will the data be stored and how will it be secured? Who will have access to the data? How will identifiers be maintained or destroyed after the study is completed?

Description: The survey instrument and procedures provide for the participant to remain anonymous either through the administration of the survey on survey monkey site or at the school location (no identifier on survey copy).

22. PI Signature:

I have reviewed this research protocol and the informed consent document(s), if applicable. I request approval of this research study by the IRB of Clemson University.

Conflict of Interest Statement:

Could the results of the study provide an actual or potential financial gain to you, a member of your family, or any of the co-investigators, or give the appearance of a potential conflict of interest?

☒ No.

☐ Yes. I agree to disclose any actual or potential conflict of interest prior to IRB action on this study.

Margaret Cordrasky
Signature of Principal Investigator

3/21/2012
Date

(hard-copy signature only needed if application will not be submitted via PI's email account)

Submission Instructions: Exempt applications are processed as received. There is no deadline for submitting exempt applications for review. Please allow seven to ten business days for processing.

Please submit this application and all associated documents from the Principal Investigator's (PI's) email address to the IRB staff. Receipt of the application electronically from the PI will qualify the application as a signed electronic submission. Alternatively, the signed, hard-copy application may be mailed or delivered to the Office of Research Compliance, 223 Brackett Hall, Clemson, SC 29634-5704.

Appendix M

Consent Form (Sodium, Main Study)

You are invited to participate in a research study in which an applied nutrition demonstration model will be provided. Different delivery methods will be used in the applied nutrition demonstration model (face-to-face delivery presentation or/and an online presentation). The goal of this study was to determine if there is a change in knowledge, perceptions and practices as a result of using different delivery methods to teach nutrition concepts. In addition, the study will assess your satisfaction with the delivery methods. The survey includes a brief demographic section followed by questions that are divided into nutrition knowledge, perception and practices, and satisfaction with the delivery methods.

Prior to participating in the culinary nutrition lesson you will be asked to complete a demographic form and a survey, which will take approximately 15 minutes to complete. Following this you will participate in applied culinary nutrition lesson. The lesson will include a power point, a cooking demonstration and sample tasting. Following the lesson you will be asked to complete a second survey. Additional surveys will be sent to you after six weeks and six months.

Please complete the survey on your own. Your answers will not be scored and the only purpose of the questionnaire will be to assist in developing teaching materials. All data will be maintained anonymously. There are no known risks of participating in this study and your participation is voluntary. You do not have to be in this study. You may choose not to take part and you may choose to stop taking part at any time. You will not be punished in any way if you decide not to be in the study or to stop taking part in the study. If you decide not to take part or to stop taking part in this study, it will not affect your grade in any way.

By completing the following survey, you consent to participate in this research. The Office of Research Compliance at Clemson University has reviewed this study for the protection of the right of human participants in research studies, in keeping with federal and state regulation and can be reached at (864) 656-6460. You may keep this form for your record. If you have questions or concerns about this study, please contact Nisreen Abdulsalam PhD candidate: nmma3@yahoo.com.

Thank You!

Appendix N

Demographic Form (Sodium, Main Study)

- 1. What is your age as of February 5, 2013?**
 - a. Under 18
 - b. 19-29
 - c. 30-39
 - d. 40-49
 - e. 50 and over
- 2. What is your gender?**
 - a. Male
 - b. Female
- 3. How do you describe yourself?**
 - a. Black, not of Hispanic origin
 - b. White, not of Hispanic origin
 - c. Hispanic/Latino
 - d. Asian or Pacific Islander
 - e. American Indian/Alaskan Native
 - f. Other
- 4. How many years have you worked in the food service industry?**
 - a. No industry experience
 - b. Less than 1
 - c. 1 to 5
 - d. 6 to 10
 - e. 11-15
 - f. 16 or more
- 5. What is your primary position where you currently work?**
 - a. Not currently working
 - b. No industry experience/ Culinary Student
 - c. Cook / Line Cook /Sous Chef
 - d. Bakery/ Pastry
 - e. Kitchen helper
 - f. Other _____
- 6. How would you characterize the establishment where you work?**
 - a. Not currently working
 - b. Casual/Family Restaurant
 - c. Fine Dining
 - d. Quick Service/fast food
 - e. Catering
 - f. On-Site / Contract feeding
 - g. Culinary School
 - h. Health Care
 - i. Other _____

Appendix O

Pre-Intervention Survey for all groups (questions 1-30), Post-Intervention Survey for OP (questions 1- 34), Post-Intervention Survey for DP (questions 1- 30, and 35-37), Post-Intervention Survey for OP+DP (questions 1- 37), Follow-up Intervention Survey for OP, and OP+DP (questions 1- 45).

Culinary Nutrition Application Survey for Culinary Arts Students

Instruction:

- Please read each question or statement CAREFULLY.
- Please answer ALL the questions and DO NOT skip any question.
- Please answer each question or statement as HONESTLY AS POSSIBLE.

Note: Questions 1-10 have a best answer and seek information on your knowledge. Choose the best answer.

1. The 2010 Dietary Guidelines recommends reducing the upper limit for sodium intake from 2,300 mg/day to _____ mg/day.
 - a. 2,000
 - b. 1,750
 - c. 1,500
 - d. 1,200
2. Which of the following ingredients would **NOT** add to the sodium content of a dish?
 - a. Olives
 - b. Citrus
 - c. Soy sauce
 - d. All of the above
 - e. None of the above
3. Whole foods (i.e., raw vegetables and meats) contain sodium.
 - a. True
 - b. False
4. What percentage of sodium exists in table salt?
 - a. 40%
 - b. 60%
 - c. 80%
 - d. 100%
5. Which of the following is the best alternative to table salt to reduce sodium?
 - a. Sea salt
 - b. Kosher salt
 - c. Non-iodized salt
 - d. All of the above
 - e. None of the above
6. The major source of sodium in American diet is
 - a. Added during cooking
 - b. Naturally occurring
 - c. Added at the table
 - d. Processed food
7. There is **NO** difference in the sodium content between canned tomato and fresh whole tomato
 - a. True
 - b. False

8. Which of the following best represents that daily recommendation for sodium?
- $\frac{3}{4}$ teaspoon of table salt
 - 16 slices of bacon
 - 12 tablespoons of ketchup
 - 2 cup grated Parmesan cheese
 - All of the above
 - None of the above
9. Which of the following food items do you think is the largest sodium contributor in our diet?
- Bread and rolls
 - Poultry
 - Soups
 - Cheese
 - Savory snacks
10. What would you estimate would be the sodium content of a single serving (two cups of cooked pasta in salted water with $\frac{1}{2}$ cup of sauce with no added salt during the cooking process)?
- 500 mg
 - 700 mg
 - 900 mg
 - 1100 mg

Note: Questions 11-30 do not have a best answer but are designed to determine your perceptions and practices about nutrition and healthy cooking.

11. When preparing a pasta dish with meat sauce, approximately how many times would you add salt from start to finish?
- 1 time
 - 2 times
 - 3 times
 - 4 times
 - 5 times or more
12. What do you think is the maximum percentage of sodium reduction in high sodium dishes before customers would notice?
- 10%
 - 25%
 - 45%
 - 55%

Rank the ease of making the following changes in order to produce reduced-sodium. (Circle your response from very difficult to very easy).

13. Use fresh tomatoes instead of canned.	Very Difficult	Difficult	Neither Easy Nor Difficult	Easy	Very Easy
14. Adding flavoring agents and salt free seasonings instead adding salt	Very Difficult	Difficult	Neither Easy Nor Difficult	Easy	Very Easy
15. Use less condiments and garnishes	Very Difficult	Difficult	Neither Easy Nor Difficult	Easy	Very Easy
16. Adopting new menu strategies such as reducing the portion size to scale back the sodium	Very Difficult	Difficult	Neither Easy Nor Difficult	Easy	Very Easy
17. Using less salt in recipes.	Very Difficult	Difficult	Neither Easy Nor Difficult	Easy	Very Easy
18. Cook more foods from scratch	Very Difficult	Difficult	Neither Easy Nor Difficult	Easy	Very Easy
19. Use less of higher sodium ingredients such as use less deli meat on sandwiches or reduce the Amount of sauce used in dishes.	Very Difficult	Difficult	Neither Easy Nor Difficult	Easy	Very Easy

Indicate your agreement with the effectiveness of the following strategies in reducing sodium. (Circle your response from strongly disagree to strongly agree).

20. Choose products that have no added sodium or reduced sodium.	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
21. Using more fresh produce	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
22. Drain, rinse and dilute when using canned items	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
23. Taste food before you salt.	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
24. Use the proper cooking technique to bring out the natural flavors of food	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree

Indicate your agreement with the following statements. (Circle your response from strongly disagree to strongly agree).

25. A reduced-sodium menu will lead to complaints from your guests.	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
26. Sodium reduction will not be a major challenge to chefs in terms of flavor if they use their creativity in cooking.	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
27. Sodium reduction is a public health issue that if implemented would benefit everyone.	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
28. Simple flavor additions can enhance dishes containing reduced sodium.	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
29. Food service establishments should promote lower sodium versions of their menu items to guests.	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
30. Consumers prefer salty food and will resist change.	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree

Note: Questions 31-37 do not have a best answer but are designed to determine your satisfaction with the delivery method/s.

[For the purposes of this survey, online presentation is defined as a “computer mediated audio and video lesson presentation”]

Please indicate your agreement with your experience with the online delivery presentation. (Select your response from strongly agree to strongly disagree).

Post Online presentation satisfaction questions (from question # 31 to 34)					
31. The amount of time required for watching the online presentations in this lesson was appropriate.	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
32. Using the online presentation kept me engaged in the subject.	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
33. I found the online presentation to be effective in understanding the lesson.	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
34. I would recommend that this lesson continue using online presentations.	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree

Please indicate your agreement with your experience with the face-to-face delivery presentation.
(Please select your response from strongly agree to strongly disagree).

Post face-to-face presentation satisfaction questions (from question # 35 to 37)					
35. An applied nutrition presentation with a live cooking demonstration kept me engaged in the subject.	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
36. I found that the applied nutrition presentation with live cooking demonstration to be effective in understanding the lesson.	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
37. I would recommend that this lesson continue using face-to-face applied nutrition presentation with a live cooking demonstration.	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree

Please indicate your agreement with your experience with the online delivery presentation. (Please select your response from strongly agree to strongly disagree).

For Online presentation satisfaction questions (from question # 38 to 45)					
38. The delivery of content using online presentation is as effective as traditional "face-to-face" content delivery.	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
39. The instructions that I received was sufficient to access the online presentations.	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree

40. I was able to view the online presentation # 1 (Lesson 1: Sources of sodium).

- a. Yes
- b. No

If no, please explain why?

41. I was able to view the online presentation # 2 (Lesson 2: Strategies for reducing sodium).

- a. Yes
- b. No

If no, please explain why?

42. How many times did you watch the online presentation # 1 (Lesson 1: Sources of sodium)?

- a. 0
- b. 1-2 times
- c. 3-4 times
- d. 5 or more

43. How many times did you watch the online presentation # 2 (Lesson 1: Strategies for reducing sodium)?

- a. 0
- b. 1-2 times
- c. 3-4 times
- d. 5 or more

44. Are there any comments or recommendations about the online presentations that you would like to share?

45. Are there any comments or recommendations about the face-to-face presentation that you would like to share?

Appendix P

Handout Instruction to access the online presentation (Mediasite)

- ✓ Please press on the following links Lesson #1 and #2 to watch the online presentations, or copy the links and paste it to your browser. The online presentation (Mediasite) links will generate a window if a Silverlight player needs to be installed on the computer to view the lessons follow directions when prompted.
- ✓ In case you prompted to register or to enter a passcode. Please write your first and last name, your email, and then enter the passcode: **chef**. It is case sensitive.
 - **Link # 1- Sodium: Cut the Salt, Keep the Flavor - Lesson 1:** <http://dle-mediasite-hehd.clemson.edu/Mediasite/Play/fb9029ca440b4055a1f6ebb3c87cb0601d>
 - **Link # 2- Sodium: Cut the Salt, Keep the Flavor - Lesson 2:** <http://dle-mediasite-hehd.clemson.edu/Mediasite/Play/b7ee55ea4fa2406f99261a67743437d11d>

How to access the online presentation (Mediasite)

Using a Password to Register for a Mediasite Presentation

When you click on the link to the Mediasite presentation, you will see a screen like the one shown below:

Please register to access the requested Mediasite content.

First Name
Last Name
Email Address
Passcode

Register

Already registered?

Email Address
Passcode

Sign In

Here are the steps to register for a Mediasite presentation

- ✓ The first time users access the presentation, they need to register to access it.
 1. Fill in the requested fields in the **Please register to access the requested Mediasite content box**.
 - a) First Name
 - b) Last Name
 - c) Email Address
 - d) Passcode
 2. Click on the **Register** button.
- ✓ After a successful registration:
 1. Fill in the fields under the **already registered?** box.
 - a) Email Address
 - b) Passcode
 2. Click on the **Sign In** button.

Note: The passcode that is assigned is **chef**. It is case sensitive

For computers and mobile devices requirements

- ✓ PCs/laptops requirements: need to install Silverlight - <http://www.microsoft.com/silverlight/>.
- ✓ iPhones / iPads/ iPods requirements: do not need to install Silverlight. You need to install the Mediasite Mobile App. The Mediasite Mobile App is available for free via the iTunes App Store at the following link: <http://itunes.apple.com/us/app/mediasite-mobile-app/id483259660>.
- ✓ Android requirements: running Android™ 4.0 or later with Android browser and a Wi-Fi or cellular data connection (3G or higher)
- ✓ Blackberry devices: running Blackberry OS 7.0 or later Playbooks devices running QNX with Blackberry browser and a Wi-Fi or cellular data connection (3G or higher)
- ✓ For more information, please visit the following link:
<http://www.sonicfoundry.com/mediasite/player/mobile>

Some technical solutions you may need

- ✓ Because Mediasite is wholly web-based, difficulties with your web browser can lead to difficulties with playback. If you encounter issues with playback, see the links below:
- ✓ A larger number of quirks and issues can be tied to browser cache. To clear your browser's cache, head to: <http://www.wikihow.com/Clear-Your-Browser's-Cache> for instructions.
- ✓ If you're using Internet Explorer, you may also need to add the Mediasite server to your "Trusted sites" list: <http://windows.microsoft.com/en-us/windows-vista/Security-zones-adding-or-removing-websites>
NOTE: For step 4, use the "Trusted sites" link.
- ✓ If you are using a pop-up blocker or popup manager, you will need to grant access to the page or temporarily disable popup blocking before you attempt to view the lessons.
- ✓ If the viewer opens, but does not begin play
 1. Open Window Media player from your Start Menu.
 2. In the player go to the Tools menu, and click on Options.
 3. Under the "Player" tab, make sure that the "Connect to the Internet" box is checked.
 4. Under the "Performance" tab, choose a reasonable connection speed to match your current network connection, or make sure that the "Detect connection speed" option is selected.
 5. Under the "Network" tab, make sure that the three connection types at the top are all checked.
 6. Under the "Streaming Proxy Settings" heading, click the "Configure" button, and make sure that no proxy is currently listed.
- ✓ For more information, please visit the following link:
 - <http://www.sonicfoundry.com/mediasite/player/mobile>
 - <http://www.wakeahec.org/coursecatalog/Brochures/Mediasite%20System%20Requirements.pdf>
 - <https://support.sonicfoundry.com/Knowledge/Article/000003315>
 - http://delta.ncsu.edu/docs/lms_services/mediasite_playback_checklist.pdf

Appendix Q

Institutional Review Board (IRB) Exempt Review Application

Exempt Review Application
Clemson University (CU) Institutional Review Board (IRB) (Version 4.19.2011)
[Clemson University IRB Website](#)

Office use only <input type="checkbox"/> Approved Exemption Category _____ Signature of IRB Chair / Designee _____	Protocol Number: _____ Date <u>Sept 2011</u>
---	---

1.	Developmental Approval: If you already have developmental approval for this research study, please give the IRB protocol number assigned to the study. More information available here .
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2.	Research Title:	Culinary Nutrition applied with Culinary Students
	If different, title used on consent document(s)	
	If class project, include course number and title	

3.	Principal Investigator (PI): The PI must be a member of the Clemson faculty or staff. You cannot be the PI if this is your thesis or dissertation. The PI must have completed IRB-approved human research protections training. Training will be verified by IRB staff before approval is granted. Training instructions available here . CITI training site available here .		
	Name: Margaret Condasky	<input checked="" type="checkbox"/> Faculty <input type="checkbox"/> Staff	
	Department: Food, Nutrition and Packaging Sciences	E-mail: mcondra@clemson.edu	
	Campus address: 216 P & A	Phone: 656-6554 Fax: 656-0331	

4.	Co-Investigator(s): Co-Investigators must have completed IRB-approved human research protections training. Training will be verified by IRB staff before approval is granted. Training instructions available here . CITI training site available here .		
	Name: Nisreen Abdulsalam	E-mail:	
	Department: FNPS	Phone:	
	<input type="checkbox"/> Faculty <input checked="" type="checkbox"/> Graduate student <input type="checkbox"/> Other. Please specify. <input type="checkbox"/> Staff <input type="checkbox"/> Undergraduate student		
	Name:	E-mail:	
	Department:	Phone:	
	<input type="checkbox"/> Faculty <input type="checkbox"/> Graduate student <input type="checkbox"/> Other. Please specify. <input type="checkbox"/> Staff <input type="checkbox"/> Undergraduate student		

5.	Additional Research Team Members: All research team members must have completed IRB-approved human research protections training. Training will be verified by IRB staff before approval is granted. Training instructions available here . CITI training site available here . <input type="checkbox"/> List of additional research team members included. Form available here .
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6. **Research Team Roles:** Describe the role of each member of the research team (everyone included in Items 3, 4 and 5), indicating which research activities will be carried out by each particular member. Team members may be grouped into categories.

Description: Graduate student will work through the data collection (pre and post survey as well as post post survey); and assist the PI with the design and set up of the culinary nutrition session for the culinary arts students. PI Condrysaky will manage the communication with the instructors at the site and recruit the students to participate in the sessions.

7. **Email Communications:** If you would like one or two of your team members (in addition to the PI) to be copied on all email communications, please list these individuals in the box below.

Name:	E-mail:
Name:	E-mail:

8. **Study Purpose:** In non-technical terms, provide a brief description of the purpose of the study. Upon conclusion of the study, how will you share your results (e.g., academic publication, evaluation report to funder, conference presentation)?

Description: Evaluate an applied nutrition demonstration model for a nutrition topic (alternate proteins) with culinary arts students. By administering pre and post surveys at the time of the demonstration session as well as 10 weeks later we will learn more about the level of knowledge and confidence in menu planning for vegetarian meals among culinary arts students.

9. **Anticipated Dates of Research:**

Anticipated start date (may not be prior to IRB approval; may be "upon IRB approval"): October 1, 2011.

Anticipated completion date (Please include time needed for analysis of individually identifiable data): December 31, 2012.

10. **Funding Source:** Please check all that apply.

☐ Submitted for internal funding
☐ Internally funded
☐ Submitted for external funding
 Funding source, if applicable (Do not use initials): _____
 Proposal number (PPN) for the Office of Sponsored Programs: _____
 Name of PI on Funding Proposal: _____
☐ Externally funded
 Funding source, if applicable (Do not use initials): _____
 Proposal number (PPN) for the Office of Sponsored Programs: _____
 Name of PI on Funding Proposal: _____

- ☐ Intend to seek funding From whom? _____
☒ Not funded

11. Support provided by Creative Inquiry Initiative: ☐ Yes ☒ No

12. Other IRB Approvals:

Has this research study been presented to any other IRB? ☐ Yes ☒ No

Where? _____ When? _____

If yes, what was their decision? ☐ Approved ☐ Disapproved ☐ Pending

Please attach a copy of any submissions, approvals, or disapprovals from other IRBs.

13. Exempt Review Checklist: To determine whether this study meets the federal requirements for exemption [45 CFR 46.101], please complete the following checklist. This will indicate if your study can be exempted from IRB continuing review.

The Federal Code [45 CFR 46.101] permits research activities in the following six categories to be exempted. Please check the relevant exemption category / categories.

Categories of Research Activities Exempt from Continuing Review	
<input checked="" type="checkbox"/>	<p>B1. Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as:</p> <ul style="list-style-type: none"> a. research on regular and special education instructional strategies, OR b. research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods. <p>NOTE: Survey and interview procedures with minors are exemptible if the activities fall within this category.</p>
<input type="checkbox"/>	<p>B2. Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, UNLESS:</p> <ul style="list-style-type: none"> a. the information obtained is recorded in such a manner that human participants can be identified, directly or through identifiers linked to the participants; AND b. any disclosure of the human participants' responses outside the research could reasonably place the participants at risk of criminal or civil liability or be damaging to the participants' financial standing, employability, or reputation. <p>NOTE: Survey and interview techniques which include minors are not exempt. Observation of the public behavior of minors, if the researcher is not a participant, is exempt.</p>

<input type="checkbox"/>	B3. Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior that is not exempt under Category B2 , if: <ol style="list-style-type: none"> the human participants are elected or appointed public officials or candidates for public office, or federal statute(s) require(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.
<input type="checkbox"/>	B4. Research, involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that participants cannot be identified directly or through identifiers linked to the participants.
<input type="checkbox"/>	B5. NOTE: Please contact the IRB office before selecting this category since use of this exemption must be initiated by the agency head of the federal funder. Research and demonstration projects which are conducted by or subject to the approval of appropriate Federal Department or Agency heads, and which are designed to study, evaluate, or otherwise examine: <ol style="list-style-type: none"> public benefit or service programs; or procedures for obtaining benefits or services under those programs; or possible changes in or alternatives to those programs or procedures; or possible changes in methods or levels of payment for benefits or services under those programs.
<input type="checkbox"/>	B6. Taste and food quality evaluation and consumer acceptance studies, <ol style="list-style-type: none"> if wholesome foods without additives are consumed, OR if a food is consumed that contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the Food and Drug Administration or approved by the Environmental Protection Agency or the Food Safety and Inspection Service of the U.S. Department of Agriculture.

14. Based on the Exemption Category you checked above, please answer the corresponding questions below:

Exemption Category B1: Complete questions a and b.

- Is the research conducted exclusively in established or commonly accepted educational settings?
Yes ☒ No ☐
- Does the research exclusively involve normal educational practices?
Yes ☒ No ☐

Exemption Category B2 or B3: Complete questions c through g.

- Does the research involving human subjects exclusively involve the use of educational tests, survey procedures, interview procedures or observation of public behavior?
Yes ☐ No ☐
- Is the information obtained recorded in such a manner that you could identify the human participants, directly or through codes or demographic information linked to the participants?
Yes ☐ No ☐

- e. Could any disclosure of the human participants' responses outside the research reasonably place the participants at risk of criminal or civil liability or be damaging to the participants' financial standing, employability, or reputation?
Yes ☐ No ☐
- f. If survey or interview techniques are employed, will all participants be 18 years of age or older?
Yes ☐ No ☐ Does not apply ☐
- g. If observations of the public behavior of minors are employed, will a researcher participate in the activities being observed?
Yes ☐ No ☐ Does not apply ☐

Exemption Category B4: Complete questions h through n.

- h. What are the types of data or specimens? _____
- i. What is the source of the data or specimens? _____
- j. Are the data or specimens publicly available? (That is, can the general public obtain the data or specimens? Data are not considered publicly available if access is limited to researchers.)
Yes ☐ No ☐
If yes, please contact the IRB staff for consultation. You may not be conducting research involving human subjects as defined in the federal regulations governing research involving human subjects (45 CFR 46.102).
- k. If the data or specimens are not publicly available, are you required to obtain permission to access these? If the answer is "Yes," attach a copy of the correspondence granting you permission.
Yes ☐ No ☐
- l. If the data or specimens are not publicly available, how are these identified when they are made available to you?
1) ☐ Direct Identifier (e.g., subject name, address, or social security number).
2) ☐ Indirect Identifier (e.g., an assigned code that could be used by the investigator or the source providing the data or specimens to identify a subject, such as a pathology tracking number or a tracking code used by the source).
If you will receive data with indirect identifiers only, please contact the IRB staff for consultation. You may not be conducting research involving human subjects as defined in the federal regulations governing research involving human subjects (45 CFR 46.102).
3) ☐ No Identifier (i.e., neither the researcher nor the source providing the data or specimens can identify a subject based upon information provided with the data or specimens).
If it will be impossible for anyone to identify subjects based upon information provided with the data or specimens, you will not be conducting research involving human subjects as defined in the federal regulations governing research involving human subjects (45 CFR 46). Please contact the IRB staff for confirmation.
- m. If (1) is checked above, will you record any direct identifiers that are available to you?
Yes* ☐ No ☐
- n. Will any data or specimens be collected from participants after the submission of this application? (Data or specimens are considered to "exist" if ALL the data or specimens to be used for the research have been collected prior to the submission of this application.)
Yes* ☐ No ☐

*Your research does not qualify for exemption from IRB review under Exemption Category B4.

PLEASE NOTE: If you are applying for exemption only under Exemption Category B4, you have now completed this application. Please submit your application following the instructions at the end of the form.

Exemption Category B5: Please contact the IRB office if use of this exemption for your protocol has been initiated by the agency head of the federal funder.

Exemption Category B6: Complete questions o through q.

- o. Are only wholesome foods without additives consumed?
Yes ☐ No ☐
- p. Does the food consumed contain only food ingredients at or below the level and for a use found to be safe by the FDA or approved by the EPA or the Food Safety and Inspection Service of the USDA?
Yes ☐ No ☐
- q. Does the food consumed contain agricultural chemicals or environmental contaminants at or below the level found to be safe by the FDA or approved by the EPA or the Food Safety and Inspection Service of the USDA?
Yes ☐ No ☐

15. Study Sample: (Groups specifically targeted for study)

Describe the participants you plan to recruit and the criteria used in the selection process. Indicate if there are any special inclusion or exclusion criteria.

NOTE: If individuals who are incarcerated will be participants, your research is not exemptible. Please complete the Expedited / Full Review Application.

Description: Culinary Arts students from local community college programs (Greenville Tech, Trident Tech, Johnson & Wales).

Age range of participants: 19-35 Projected number of participants: 150

- | | | |
|---|---|---|
| <input type="checkbox"/> Employees | <input checked="" type="checkbox"/> Students | <input type="checkbox"/> Minors (under 18) * |
| <input type="checkbox"/> Pregnant women * | <input type="checkbox"/> Fetuses / neonates * | <input type="checkbox"/> Educationally / economically disadvantaged * |
| <input type="checkbox"/> Minors who are wards of the state, or any other agency, institution, or entity * | <input type="checkbox"/> Individuals who are incarcerated * | <input type="checkbox"/> Persons incompetent to give valid consent * |
| <input type="checkbox"/> Other—specify: _____ | <input type="checkbox"/> Military personnel | |

*State necessity for using this type of participant: _____

16. Study Locations:

- | | |
|---|--|
| <input type="checkbox"/> Clemson University | <input checked="" type="checkbox"/> Other University / College <u>Greenville Tech, Trident Tech, Johnson & Wales</u> |
| <input type="checkbox"/> School System / Individual Schools _____ | <input type="checkbox"/> Other – specify _____ |

You may need to obtain permission if participants will be recruited or data will be obtained through schools, employers, or community organizations. Are you required to obtain permission to gain access to people or to access data that are not publicly available? If yes, provide a research site letter from a person authorized to give you access to the participants or to the data. Guidance regarding Research Site Letters is available [here](#).

- ☒ Research Site Letter(s) not required.
☐ Research Site Letter(s) attached.
☐ Research Site Letter(s) pending and will be provided when obtained.

17. Recruitment Method:

Describe how research participants will be recruited in the study. How will you identify potential participants? How will you contact them? **Attach a copy of any material you will use to recruit participants (e.g., advertisements, flyers, telephone scripts, verbal recruitment, cover letters, or follow-up reminders).**

Description: The participants will come from an intact class of students at the participating colleges through collaboration with the instructor of the course(s). The PI will coordinate with the instructor for the time slot and location in which to present the culinary nutrition session to the class. A copy of the description of the session which will be shared with the instructor who will read it to the class the week prior to our session is attached (verbal recruitment script attachment).

18. Participant Incentives:

- a. Will you pay participants? ☐ Yes ☒ No
Amount: \$_____ When will money be paid?: _____
- b. Will you give participants incentives / gifts / reimbursements? ☐ Yes ☒ No
Describe incentives / gifts / reimbursements: _____
Value of incentives / gifts / reimbursements: \$_____
- When will incentives / gifts / reimbursements be given?: _____
- c. Will participants receive course credit? ☐ Yes ☒ No
- d. Will participants receive extra credit? ☐ Yes ☒ No
If yes, an equivalent alternative to research participation must be provided and described in your informed consent document(s).

19. Informed Consent:

- a. Attach a copy of the informational letter or consent script you plan to provide to your participants (and their parents or guardians, if applicable). [Consent Document Templates](#)
- b. Will you use concealment (incomplete disclosure) or deception in this study? ☐ Yes ☒ No
If yes, please see guidance regarding Research Involving Deception or Concealment [here](#), submit a copy of the Additional Pertinent Information / Permission for Use of Data Collected in a Research Study form you will use, and provide a justification in the following space for this use of concealment or deception. _____

20. Procedures:

- a. What data will you collect? a 14 item pre and post survey; a 6 item demographic form
- b. Please describe in detail the process each participant will experience and how you will obtain the data. We will administer the demographic and pre survey at the beginning of the 90 minute session. We will present a power point, and cooking demonstration for the group of culinary arts students in a classroom at the tech college location. Following the session we will administer the post survey (same copy as the pre survey).
- c. If data collection tools will be used, how much time will it take for each participant to complete these tools? It will take approximately 5 minutes to complete the demographic form and 14 minutes to complete the pre and post surveys.
- d. How many data collection sessions will be required for each participant? Will this include follow-up sessions? one
- e. How will you collect data?
- | | |
|---|--|
| <input checked="" type="checkbox"/> in-person contact | <input type="checkbox"/> telephone |
| <input type="checkbox"/> snail mail | <input type="checkbox"/> email |
| <input type="checkbox"/> website | <input type="checkbox"/> other, describe _____ |

Please include copies of surveys, interview questions, data collection tools and debriefing statements. If survey or interview questions have not been fully developed, provide information on the types of questions to be asked, or a description of the parameters of the survey / interview. Please note: finalized survey or interview instruments will need to be reviewed and approved by amendment, before implementation.

- f. Will you audio record participants? ☐ Yes ☒ No
- g. Will you video record participants? ☐ Yes ☒ No
- h. Will you photograph participants? ☐ Yes ☒ No

If you will audio or video record or take identifiable photographs of participants, please consult the IRB's Guidance on the Use of Audio / Video Recording and Photography [here](#). Please include all the information addressed by this guidance document in the application and, where appropriate, in the consent document(s).

- 21. Protection of Confidentiality:** Describe the security measures you will take to protect the confidentiality of the information obtained. Will participants be identifiable either by name or through demographic data? If yes, how will you protect the identity of the participants and their responses? Where will the data be stored and how will it be secured? Who will have access to the data? How will identifiers be maintained or destroyed after the study is completed?

Description: Surveys will contain random identification system and these forms will be kept in a locked cabinet in the PI office for 5 years.

22. PI Signature:

I have reviewed this research protocol and the informed consent document(s), if applicable. I request approval of this research study by the IRB of Clemson University.

Margaret O'Grady Sept 2011
Signature of Principal Investigator Date
(hard-copy signature only needed if application will not be submitted via PI's email account)

Submission Instructions: Exempt applications are processed as received. There is no deadline for submitting exempt applications for review. Please allow seven to ten business days for processing.

Please submit this application and all associated documents from the Principal Investigator's (PI's) email address to the IRB staff. Receipt of the application electronically from the PI will qualify the application as a signed electronic submission. Alternatively, the signed, hard-copy application may be mailed or delivered to the Office of Research Compliance, 223 Brackett Hall, Clemson, SC 29634-5704.

Appendix R

Institutional Review Board (IRB) Request for Amendment

Request for Amendment
Clemson University Institutional Review Board (IRB) (Version 10.28.2011)
Clemson University IRB Website

Office use only	
<u>For Expedited and Full Protocols</u>	<u>For Exempt Protocols</u>
<input type="checkbox"/> Approved <input type="checkbox"/> Disapproved	<input type="checkbox"/> Validated as continuing to meet the criteria for Exempt status <input type="checkbox"/> Not validated as continuing to meet the criteria for Exempt status
Signature of IRB Chair / Designee _____	Date _____

Protocol Number:	2011288
Research Title:	Culinary Nutrition application with culinary students
Principal Investigator:	Margaret Condrasky, Nisreen Abdulsalam

1. **Type of Amendment Request:** Check all that apply. Be sure to attach any new or revised documents, with changes highlighted or electronically shaded.

- | | |
|---|--|
| <input type="checkbox"/> Protocol Change or Amendment | <input checked="" type="checkbox"/> Change to Data Collection Tools or Procedure |
| <input type="checkbox"/> Change to Subject Selection Criteria | <input type="checkbox"/> Consent Form Changes |
| <input type="checkbox"/> Subject Recruitment Methods | <input type="checkbox"/> Editorial/Administrative/Personnel Changes |
| <input type="checkbox"/> Other (please specify): _____ | |

2. **Summary:** Provide a brief description of changes and rationale.

Description: In spring semester we plan to once again visit culinary students. This year we will visit TriDent technical college and Guilford Technical Community College. The research will include dividing the participants into four groups (control, demo and Media-Site, face-to face demo, and Media-site. The goal is to measure participant change in knowledge perceptions and practices, and satisfaction level with the delivery methods. We will administer a questionnaire (attached) prior to our research and again 6 weeks later and finally 4 months later to learn more about nutrition knowledge. This session will be on ways to reduce sodium in cooking.

☒ I am the principal investigator. I am submitting this form electronically and this submission constitutes my signature.

Principal investigator signature: Margaret Condrasky Date: 1.08.13