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# A Pilot Study: The Use of a Survey to Assess the Food Knowledge of Nutrition Students at Various Levels of Nutrition Education

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**A Pilot Study: The Use of a Survey to Assess the Food  
Knowledge of Nutrition Students at Various Levels of  
Nutrition Education**

**By  
Chante Chambers**

**A THESIS**

Presented to the Faculty of  
The Graduate College at the University of Nebraska  
In Partial Fulfillment of Requirements  
For the Degree of Master of Science

Major: Nutrition and Health Sciences

Under the Supervision of Professor Georgia Jones  
Lincoln, Nebraska

August 2012

# **A Pilot Study: The Use of a Survey to Assess the Food Knowledge of Nutrition Students at Various Levels of Education**

Chante' Chambers, M.S.

University of Nebraska, 2012

Advisor: Georgia Jones

A working definition of a concept known as 'food literacy' encompasses using basic food preparation knowledge that has been learned, understood, and practiced to make better food decisions. To advance these skills for client service, a post-secondary nutrition program would need to include objectives that allow application of knowledge. For this reason, the purpose of this study was to determine the difference in knowledge and application among students in 100, 200 and 400 level college nutrition course(s). A survey was developed to measure the food knowledge of these college students as they prepare for careers as health care professionals. The survey emphasized the application of proper food knowledge toward the general population. Students involved with this study were currently enrolled in nutrition courses that instructed on nutrition as it relates to health, food safety and chronic disease management. Results from this study suggested that mean scores of students in 200 and 400 level nutrition courses were significantly higher than those in 100 level nutrition course. Further research could expand the survey's scope, depth and consistency of information.

**DEDICATED TO:**

**My family**

**And to those who come after me....**

**ACKNOWLEDGEMENTS:**

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the following people....

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Dr. Kaye Stanek-Krogstrand, Committee Member

Faculty and Staff of the Department of Nutrition and Health Sciences,  
University of Nebraska, Lincoln, NE

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## CHAPTER ONE

### INTRODUCTION

Diet is important in promoting and maintaining health. Nutrition plays a vital role in the onset of chronic diseases. Risk factors, impacted by diet, elevate chances for such illnesses as heart disease, cancer, diabetes, and osteoarthritis. The long term consequences of these diseases, however, are costly resulting in disability, high healthcare expenses, and possible death. Healthy diets, on the other hand, involving proper nutrition can aid in disease prevention producing healthy individuals and reducing healthcare costs.

Knowing this has heightened the interest for preventative measures. How people have sustained their health through economic and socio-demographic changes has promoted measures to assess knowledge, attitudes, behaviors and skills that would impact the health of an individual. These efforts, according to the United States Department of Agriculture (USDA), have been continued due to affects that changing roles and limiting resources (within economic and socio-demographic statuses) have on health.

The rise in convenience (or commercial) food consumption has been coupled with the change in the social dynamics among American households. Data reveals that although most believe in healthy eating and are aware of the benefits; knowledge does not reflect actual behavior or intent. As a result food preparation skills have declined, diminishing an individual's opportunity to become involved in learning how to cook and the concepts involved in diet manipulation. A study performed on British adults suggested that deficient cooking skills inclined individuals to depend more on meals prepared outside of the home.

The USDA continues to propose that consumption of calories from processed foods will not meet the recommended nutrient requirements and that a lifestyle of healthy eating must include nutrient recommendations. Healthy dietary practices developed over time, require individuals to monitor nutrient and caloric intake. In the 2010 Part A: Executive Summary, the Dietary Guidelines Advisory Committee (DGAC) of the USDA and the US Department of Health and Human Services (HHS) acknowledged the need for change in order to support the general public meeting dietary recommendations. To do this, DGAC suggested and approved strategies that focused on knowledge, attitude and behavior(s) to promote a healthy lifestyle among the general public.

However, there has been insufficient amount of research that has addressed the concept of food knowledge among professionals to assist the public in changing their dietary habits. With an increased dependency on fast food restaurants and consumption of processed meals, the public's application of healthy food knowledge appears to have decreased significantly. To initiate and sustain healthy goals, dietitians and healthcare professionals must be food literate in order to fashion nutritional information to meet clients' needs.

## CHAPTER TWO

### LITERATURE REVIEW

From the 1900's through today, the major causes of death have only changed slightly. Before the 1900s, major causes of death were due to tuberculosis, influenza, pneumonia, diarrhea, and ulceration of the intestines (1). Comparably, the deaths in the 1950s were due to cardiovascular diseases, cancer, and stroke (1). Today, cardiovascular disease, cancer and stroke still remain the leading causes of death among Americans (1). Researchers argue that the reason diseases of the 1950s have remained because of change in diet (i.e. intake of foods higher in fat and sodium), economic (i.e. job status, income level) and socio-demographic changes (i.e. family structure) (2).

Currently, the diseases that have caused death (specifically cardiovascular diseases and stroke) are a reflection of Americans altering habits. Throughout the years, the lifestyle and diet of an average American has continued to change (3, 4, 5). Convenience foods have replaced home-cooked meals. Smaller households (fewer than 3 members) are less likely to cook (6). Among those who work more than 35 hours per week spending less time preparing foods, 'the self-prepared meal' has been deemed as an unattractive concept to pursue.

Income, employment and demographic changes have fostered an atmosphere and desire for convenience foods and inactivity (2, 7, 8). The popularity of dining out has increased the consumption of meals away from home (3, 9). A 5% rise was noticed (in 2000) when 41% of Americans reported incorporating more than three commercial meals into their diet per week (5, 10). Compared to foods prepared at home, meals prepared away from home are deemed higher in sodium, saturated fat, and lower in fiber and

calcium, lowering the nutritional quality of American diets (11, 12). Due to these trends, studies are warning of the negative impact that restaurants and fast-food consumption could have on health (3, 5, 13).

Using basic food preparation knowledge that has been learned, understood, and practiced to make better food decisions, has been defined as food literacy (14). Few studies have investigated the connection between food preparation skills and eating behaviors, attitudes and knowledge. Some researchers state that knowing how to cook raises the ability to prepare healthy meals thus increasing the consumption of healthier foods (15, 16). Kolindinsky et al. (2007), supports this claim by showing that cooking improved eating patterns (17). Others, however, suggest that to raise the likelihood of cooking, cooking knowledge and skills have to improve and address level(s) of understanding, inclinations, confidence, interests and expenses (18, 19).

The USDA has suggested that a shift in food consumption is expected to occur as education and income grow (20). It projects that by 2020, the number of high school and college graduates will increase 3% (from 2000). With the exception of potatoes, meat and egg products, higher levels of education are anticipated to increase the consumption of fruits and vegetables (20).

### *The Role of the Dietitian*

Although nutrition is an element in many prevention strategies, it is often difficult to assess. Researchers are promoting dietitians to assist in the development and implementation of tools that would monitor an individual's diet. Consequently allowing dietitians to better assist individuals in combating existing nutritional problems, improve health and prevent diseases (21).

With this in mind, the role of the dietetic profession becomes essential in managing the health of patients and clients. As research increases to connect and define clients' health status, the demand to provide quality health care rises as well. Knowledge has expanded beyond the recognition of common diseases that are pathogenic or toxic, to including diseases that involve nutrient deficiencies, imbalances and metabolic impairments. As a result, diseases and disorders (i.e. obesity, type 2 diabetes and immunologic disorders) that are linked to diet have increased over time becoming burdensome to society (21).

### *Professional Development for Dietitians*

Additional opportunities for dietitians have transitioned to include educating about food preparation and safety among at-risk populations. As health professionals, dietitians are relied upon for information regarding specific food preparations and safety awareness. Studies (22, 23) have reported difficulties of health care professionals to explain food preparation and safety. Clients have reported below satisfactory responses to practitioners advising on sickness due to food contamination and improper cooking. As a result, studies have been conducted to improve the education among health care professionals in providing food preparation and safety to clients. Accordingly, Wong et al. (24) have indicated that when well-educated in food and food safety, health care professionals provide safe, appropriate and satisfactory recommendations to patients.

Moreover, with a high degree of food illnesses occurring and 20% of the US population being at-risk (25, 26), the need for professionals to provide food safety education has escalated (25, 27, 28). Other factors (such as food-related diseases, outbreaks, and supply changes) have also required the need for education in order to minimize the consumption of foods that can result in illnesses and complications (24, 29,

30). To do this, researchers (31) have suggested that to change food related behaviors among the public (especially those at-risk) professionals must be able to educate about foods and food preparation practices (32,33,34).

Byrd-Bredbenner et al. (2007) exemplified this by conducting a study to observe the actual precautions young adults take when handling food. The study had 154 participants (both men and women) prepare two recipes in a laboratory to identify food handling practices. The outcome of the study indicated that young adults practiced unsafe food handling techniques, acknowledging education to be an essential opportunity for improving such skills (35).

As it relates to dietitians' responsibilities, approximately 54% of entry-level registered dietitians are involved with support groups or community organizations (36, 37,38). According to Rogers and Fish (2006), specific responsibilities include advocating, developing menus, recipes and monitoring/evaluating health and food quality (38). Therefore, food literacy may become a useful and essential intervention tool for dietitians who are seeking food knowledge for their specialized field of study.

With the home becoming the focal point of health promotion efforts among the general public, healthcare trends have suggested a greater need for health professionals to be competent and accountable in preventative care. Professionals providing food literacy guidance continue to saturate the food market as nutritionists (even though no education in didactic curriculum is evident), increasing public scrutiny and competition among professions (39).

Solin and Dalton (1997) assessed the level of food knowledge in the profession and curriculum of dietetics. The participants were members and non members of American Dietetic Association (ADA) who worked in the food industry. The survey

consisted of 20 questions and measured food identification and preparation. Performance questions were used to estimate the need for food skills. With a score of 70% considered passing, 40% of those who participated did not pass. Although findings were lower than expected, the majority of registered dietitians (who participated) felt their food knowledge was adequate for their scope of practice (40).

### *The Market Shift*

Bower's (2000) describes cooking in the early 1900s as a full-time job which consisted of preparing meals, cleaning and household chores. Food preparation was wide-ranging until the 1890s when processed foods (i.e. dry cereals, canned foods, etc.) were introduced. By the 1930's more people (particularly women) were employed and new technologies (i.e. electric washing machines, refrigerators, electric and gas ranges) lessened the amount of time spent preparing meals (41).

While there has been a reduction in preparation time in cooking meals at home, the nostalgia of home cooked meals is still pursued. Even as characteristics of the family unit changes to include the decline of older children and adolescent eating family dinners (42), to the increase of snacking and dining out (43), women (particularly mothers) continue to remain the most reliable source of information on cooking techniques (44, 45).

Though seen as a way to bring families together, home cooked meals have been modified. Since the introduction of fast-foods in the 1930s, only 45% of Americans prepare entrees from scratch, leaving opportunity for food companies to mass produce conveniently commercialized foods to make cooking at home easier. Although Bower (2000) explains that lowering fat intake with home-prepared foods is easy, food industry

analysts have observed that the general population believes nutrient dense foods are more time consuming to prepare due to fluctuating personal interests and resources (46).

To test the notion that home-cooked meals require more time, Beck (2007) examined the time invested in family meal preparation. Sixty-four meals among 32 families were recorded and investigated. Results indicated that the total preparation time of meals cooked at home took approximately 54 minutes. Using commercial foods did not reduce actual cooking time. Compared to the use of raw ingredients, commercial foods contributed to the reduction of 'hands-on' time, cooking skills required and time spent shopping to prepare more difficult dishes (47).

Consequently, the acceptance of commercial foods has redefined the term 'cooking'. As evident by instructions on packages and recipes, the introduction of such products has lowered the standard of cooking, thereby, eliminating the desire for training, development and practice of cooking skills. This has shifted the population into three types of cooks: "sophisticates", "in-betweens" and the "don't-want-to-cooks" (48).

As the groups' names are indicative of the individuals that comprise them, each is pursued by food companies based on the group's characteristics. For example, the sophisticates include young adults that view their cooking experience(s) as rewarding and intimate. The don't-want-to-cooks are characterized as those who express an extreme dislike towards cooking and deem cooking as a laborious task. Individuals in the former category are pursued through expensively stylish high-technology kitchen appliances and the quality of food ingredients used in entrees to enhance identity through food. Individuals in the latter category are pursued through food products that conveniently remove barriers associated with cooking while not exploiting their apathy towards cooking. The in-betweens category, on the other hand, attempts to balance time and quality. Given that this group eventually tends to move either towards the don't-want-to-

cook or sophisticates group, marketers pursue this group with skepticism and sensitivity, acknowledging the fluidity of the group (48).

To further differentiate the behavior shift among young adults, Lake et al. (2006) conducted a longitudinal study that focused on the household arrangement patterns of food shopping and preparation. Results from a sample of 198 adults confirmed claims of women to be the main individuals to hold the responsibility of shopping and preparing meals within the household (49). However, the Harnack et al. (1998) study, which collected and analyzed the US Department of Agriculture's 1994 Continuing Survey of Food Intakes among 1,204 households, showed men to also be engaged in meal planning, shopping and preparation. This was especially the case in situations where the individual was either young, at (or below) poverty level, had a smaller household size or was a full-time working woman who claimed to be head of the household (50).

### *Benefits of Teaching and Developing Food Knowledge*

A cross-sectional analysis conducted by Larson et al. (2006) concluded that young adults should be taught how to prepare fast and healthy meals to improve their nutritional outcomes. The study described the association among food preparation behaviors, cooking skills, food resources, and the diet quality to young adults as beneficial when appropriate practices and techniques are asserted (51).

However, teaching food preparation principles to potentially increase healthy eating is not new (52, 53). Another study conducted by Larson et al. (2006) described how adolescent involvement in all aspects of food preparation impacted diet quality. In its cross-sectional design, food preparation, purchasing habits and dietary intake were assessed using frequency questionnaires. When frequency of cooking increased at home, results showed a significant increase among youth/adolescents preparing foods lower in

fat and higher in fruits, vegetables, vitamins and minerals. Food preparation also was related to lowered intakes of carbonated beverages and fried foods (54).

As recommended by this study, encouraging adolescents to help with meal preparation is beneficial. It further implies that getting adolescents more involved, entices educators to create interventions and programs that teach cooking and healthy decision making skills. This attempts to aid in the notion that the responsibility for becoming more involved in shopping or preparing meals will increase with age.

There is evidence of children being more involved in cooking at home and making specific food choices. Findings suggest that health promotion activities (i.e. Food Clubs, Cooking Clubs, etc.) are an appropriate and feasible approach to developing food preparation skills with individuals of any age (55). With this in mind, healthcare professionals (in particular dietitians) should have the proficiency to educate through initiatives and activities taught at age appropriate levels.

### *Evaluating Food Knowledge of Nutrition Students*

Many nutrition students are seeking to become either registered dietitians or other healthcare professionals (i.e. physical therapists, personal trainers, physician assistants, etc.). As a dietitian, preparing meals becomes more than a personal choice but a professional responsibility. Additional job requirements may include (but are not limited to): teaching, assessing, evaluating and developing materials, providing nutritional care (38), and educating professionals, community leaders or liaisons in order to meet expanding needs for neighborhoods with limited resources (56).

Adults are also susceptible to chronic diseases due to habits and inactivity developed while in school (57). Larson et al. (2009) reported that young adults who frequently cooked for themselves had less fast-food encounters and met nutrient

requirements over those who did not prepare their food (58). However, students have been noted to maintain the eating habits of their childhood. Haire-Joshu (2005) has explained that an environment can teach children how to be obese. This insinuates that obesity and associated habits are learned behaviors that are supported by an environment (59).

One environmental variable that influences the improvement of dietary habits is time. According to the USDA 2007 Economic Research Report, time is impacted by economic and socio-demographic differences. Household size, earnings, employment status, and head of household genders are some examples of factors that can influence time spent in food preparation (60). The report continues to suggest that as more women enter into the workforce, their time commitment is affected thus allowing the opportunity for food marketers to continually adjust in order to accommodate and appeal to projected needs (60).

Given the change in the American diet and demographic households, a need has been generated to study the link between cooking skills and intentions toward healthy eating. Levy et al. (2004) used cooking classes to improve college students' perspective on cooking. Compared to cooking demonstrations, cooking classes appeared to have a greater impact in increasing knowledge and improving healthy behaviors (53). Moreover, in the midst of epidemics resulting from childhood and adult obesity, the food knowledge to recognize opportunities for behavior modification may need to be measured among professionals.

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## **CHAPTER THREE**

### **MANUSCRIPT**

This manuscript will be submitted as a descriptive article. All forms pertaining to the study have been made available in the Appendices.

# **A Pilot Study: The Use of a Survey to Assess the Food Knowledge of Nutrition Students at Various Levels of Nutrition Education**

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## 1. Introduction

The United States Department of Agriculture (USDA) reported obesity to be a factor of physical inactivity and poor diet (1, 2). Contributing to these national statistics are Nebraska's 26.6% residents who are reportedly obese (2, 3).

Obesity, defined as a body mass index (BMI) of 30 or greater, is a major risk factor for diseases related to cancer, diabetes, osteoarthritis and the cardiovascular system to name a few (2). Evidence has suggested that diet quality, which advances the signs and symptoms for these chronic diseases, can impact obesity. When diet quality improves by including more nutrient dense foods, in many cases cholesterol and hypertension levels decrease (2). Individuals, however, must apply basic food knowledge and preparation skills to make better food choices, thus the need for food literacy. This suggests that simply knowing the need to increase fruits, vegetables, and whole grains while lowering sodium and saturated fat intake (2), no longer guarantees success for a healthy lifestyle.

The challenge for nutrition professionals is converting nutrition knowledge into strategies that can help individuals make healthier food choices. In order to accommodate a client's food preference, awareness, interest, as well as, their social and environmental barriers, professionals must take into account their own food literacy level. Food literacy encompasses using basic food preparation knowledge that has been learned, understood, and practiced to make better food decisions (4). To advance these skills for client service, a post-secondary nutrition program would need to include classes that allow application of food knowledge. However, if training and education is lacking in the area of food knowledge, future nutrition professionals will not have the capabilities or confidence to impact the public.

The goal of this project was to develop a survey to measure food knowledge among nutrition students as they progress through their course of study. It was hypothesized that the survey will measure and differentiate food knowledge among nutrition students at various levels of their education. The objective(s) of the survey include the following:

- a. To measure the food knowledge of nutrition 150, 244 and 452 students.
- b. To determine if there are differences in level of knowledge among the three classes.

## **2. Materials and Methods**

### 2.1 Survey Components

This study was approved by the University of Nebraska-Lincoln's IRB 200409003 EP as part of an amendment of a continuing study assessing the food literacy of college nutrition students. The survey (Appendix A) used in this study was modified from prior surveys administered by Meckna (2006) and Williams (2009) (4, 5). Survey components included:

- a. Foods or techniques used to alter food preparation and diet to improve overall health (Healthy Preparation)
  - i. Application of skills and knowledge set #1 – Question #: 1, 2, 4, 6, 8
  - ii. Application of skills and knowledge set #2 - Question #: 1, 6, 11, 12, 13, 14, 15
- b. Foods or techniques that impact preparation time (Preparation Time)
  - i. Application of skills and knowledge set #1 – Question #: 7
  - ii. Application of skills and knowledge set #2 – Question #:4
- c. Techniques used to prepare foods at home (Home Techniques)

- i. Application of skills and knowledge set #1 – Question #: 3
  - ii. Application of skills and knowledge set #2 – Question #: 3, 7, 8
- d. Functional properties of ingredients (Ingredients)
- i. Application of skills and knowledge set #1 – Question #: 5
  - ii. Application of skills and knowledge set #2 – Question #: 2, 5, 9, 10
- e. Food varieties, types and forms available in the marketplace  
(Identification)
- i. Skills and knowledge identification – Question #: 1

Students who participated were in 100, 200 and 400 level nutrition classes majoring in Dietetics, Culinology, and/or Nutrition, Exercise and Health Sciences. Results from the survey will provide an opportunity to further develop and measure the aspects of food literacy among nutrition students. The survey will also provide a basis for future use when modifying curriculum to meet the needs of students and clients.

## 2.2 Survey Design

Previously developed and tested food literacy surveys were used as a basis to further understand the food literacy of students enrolled in the University of Nebraska-Lincoln's NUTR 244: Scientific Principles of Food Preparation (4, 5). To prevent students from simply recalling and reiterating information presented to them, the revised survey included scenario-type questions and was sectioned into different sets to mix the types of questions asked. Application type questions required students to use problem-solving skills for practical situations.

The survey was reviewed by nutrition professionals. Based on recommendations, survey revisions were made. Students of the Fall 2009 NUTR 244: Scientific Principles of Food Preparation, from the University of Nebraska-Lincoln, was the study group for this project, while students from both of the Spring 2010 NUTR 150: Foundations in Nutrition and Health Promotion and NUTR 452: Medical Nutrition Therapy served as comparison groups.

The type and number of survey questions in the food knowledge subcategories differed according to the topic being addressed. For example, Foods/Technology Used to Alter Food Preparations and Quality of Health (Healthy Preparation) consisted of 12 multiple choice questions that focused on food and its relationship to health. Using the same multiple choice format, Food/Techniques that Impact Preparation Time (Preparation Time) had two questions that focused on procedures that affected cooking time. Techniques that May be Used to Cook Foods at Home (Home Techniques) included four questions that assessed students on home cooking methods, and Functional Properties of Ingredients (Ingredients) had five questions that focused on the function of ingredients. Food Varieties, Types and Forms Available in the Marketplace (Identification) used matching for students to identify seven foods that could possibly be found in a grocery store or market.

### 2.3 Survey Administration, Data Collection and Statistical Analysis

Administration of the survey was conducted online via Survey Monkey. All surveys were administered and completed online with instructions given by the researcher prior to survey administration. If the researcher was unavailable, the same instructions were given to the classroom instructor and times were set-up to answer any questions the instructor may have had from the students.

Responses to the survey were voluntary. Time to complete the online survey was flexible to a student's schedule. Students' answers were kept confidential and remained collected within the software database until further use.

Statistical analysis was done via ANOVA for comparisons between groups. The Tukey HSD post-hoc determined where the significant differences occurred among groups. Cronbach alpha was estimated for each sub-category to establish internal consistency. The statistical program used was the SPSS (PSAW 18) analysis.

### **3. Results**

#### 3.1 Demographics

Of 105, approximately 76 (72%) students of NUTR 244: Scientific Principles of Food Preparation completed the computerized survey during the December 2009 Fall semester. Within the comparison groups, approximately 80 out of 100 (80%) students in NUTR 150: Foundation in Nutrition and Health Promotion and in NUTR 452: Medical Nutrition Therapy approximately 149 out of 150 (99%) students completed the survey in the beginning of the spring semester of 2010. Results were compared among classes.

As it relates to gender, more females than males participated in the survey (Table 1). More specifically, students in NUTR 452 (n=149) had a total of 110 females and 39 males complete the survey. While students in NUTR 244 (n=78) had 28 males and 50 females, students in NUTR 150 (n=82) was comprised of 33 males and 49 females (Table 1). Among the nutrition courses, NUTR 452 had more females and males to complete the survey than NUTR 150 and NUTR 244.

Table 1 . Number of male and female according to nutrition courses.

Course	Male	Female	Total
NUTR 150	33 (40%)	49 (60%)	82
NUTR 244	28 (36%)	50 (64%)	78
NUTR 452	39 (26%)	110 (74%)	149

Note: Results were based on total number of responses to Demographic Question #1.

When examining the question regarding having a job as a cook, more students responded ‘no’ in NUTR 452 (n=131) than in NUTR 150 (n= 74) and NUTR 244 (n= 71) (Table 2). This was consistent even within nutrition classes. In NUTR 150, more students responded ‘no’ (n= 8) than ‘yes’ (n= 74). For NUTR 244, 71 students indicated ‘no’ with 8 students indicating ‘yes’; while in NUTR 452, 18 students responded ‘no’ and 131 responding ‘yes’.

Table 2. Number of students who have held a job as a cook.

Course	Yes	No	Total
NUTR 150	8 (10%)	74 (90%)	82
NUTR 244	8 (10%)	71 (90%)	79
NUTR 452	18 (12%)	131 (88%)	149

Note: Results were based on total number of responses to Demographic Question #2.

As it relates to academic major, there were more students in NUTR 150 (n=52; 57%) who was majoring in Dietetics than NUTR 244 (n=16; 22%) and NUTR 452 (n=23, 26%) (Table 3). Among other majors, Nutrition, Exercise and Health Sciences (NEHS) was the most leading major among students in NUTR 244 (n=52; 72%) and NUTR 452 (n=65, 73%) than NUTR 244 (n=38; 42%).

Table 3. Number of students by academic major and nutrition courses.

Course(s)	Dietetics	Family and Consumer Sciences	Nutrition, Exercise and Health Sciences (NEHS)	Culinology	Restaurant Management	Total
NUTR 150	52 (57%)	0 (0%)	38 (42%)	0 (0%)	0 (0%)	91
NUTR 244	16 (22%)	2 (3%)	52 (72%)	0 (0%)	2 (3%)	72
NUTR 452	23 (26%)	1 (1%)	65 (73%)	0 (0%)	0 (0%)	89

Note: Results were based on total number of responses to Demographic Question #3.

When examining where students lived, students in NUTR 150 predominately lived in dorms (n= 42) and apartment or house (n= 35) five out of seven days of the week (Table 4). Whereas those in higher nutrition courses NUTR 244 (n= 57) and NUTR 452 (n= 131) lived predominately in either apartments or houses. Fraternity and sorority houses being the next most lived places between courses NUTR 244 (n= 13) and NUTR 452 (n= 12).

Table 4. Number of students by where they lived five days per week and nutrition course.

Course(s)	Dorm	Apartment or House	With Parents	Fraternity or Sorority House	Other	Total
NUTR 150	42 (51%)	35 (43%)	1 (1%)	4 (5%)	0 (0%)	82
NUTR 244	6 (8%)	57 (72%)	3 (4%)	13 (17%)	0 (0%)	79
NUTR 452	2 (1%)	131 (89%)	3 (2%)	12 (8%)	0 (0%)	148

Note: Results were based on total number of responses to Demographic Question #4.

Of approximately 307 students who completed the survey, 176 (57%) indicated that they watched food shows (see demographic question #6). Each student ranked the top three food shows he/she most likely watched (Table 5). Overall response counts indicated Ace of Cakes (n=120), Rachel Ray's 30 Minute Meals (n=118) and Iron Chef America (n=114) the three top ranked shows watched. Within courses, most students in NUTR 150 (n=34, 28%) and NUTR 452 (n=58; 48%) preferred Ace of Cakes, while students in NUTR 244 preferred to watch Rachel Ray's 30 Minute Meals (n=28; 24%) and/or Ace of Cakes (n=28; 23%).

Table 5. Food shows watched by students according to nutrition course.

Course(s)	Rachel Ray's 30 Minute Meals	America's Test Kitchen	Iron Chef America	Good Eat with A. Brown	Unwrapped with M. Summers	Ace of Cakes	Other
NUTR 150	33 (28%)	10 (29%)	28 (25%)	17 (28%)	28 (44%)	34 (28%)	18 (28%)
NUTR 244	28 (24%)	7 (21%)	23 (20%)	17 (28%)	12 (19%)	28 (23%)	11 (17%)
NUTR 452	57 (48%)	17 (50%)	63 (55%)	26 (43%)	24 (38%)	58 (48%)	36 (55%)
Total(s)	118	34	114	60	64	120	65

Note: Results were based on total number of responses to Demographic Question #7.

Printed recipes were shown to have been used by 239 (78%) (see demographic question #8). Students noted the top three sources in which they obtained their recipe(s). According to responses, a family member (n=258), Internet (n=220) and/or cookbook (n=218) were sources that provide the student with a recipe. Within courses, family members were the primary source students in NUTR 150 (n=68; 26%), NUTR 244 (n=68; 26%) and NUTR 452 (n=122; 47%) (Table 6).

Table 6. Sources where students obtained recipes according to nutrition courses.

Course(s)	Family Member	Cookbook	Magazine	Cooking Show	Internet	Other
NUTR 150	68 (26%)	61 (28%)	29 (25%)	13 (28%)	52 (24%)	3 (17%)
NUTR 244	68 (26%)	53 (24%)	24 (21%)	13 (28%)	60 (27%)	5 (28%)
NUTR 452	122 (47%)	104 (48%)	63 (54%)	21 (45%)	108 (49%)	10 (56%)
Total(s)	258	218	116	47	220	18

Note: Results were based on total number of responses to Demographic Question #9.

Intended career goals of students were Dietitian (n=121), Sport Nutrition (n=96), Physical Therapy (n=94) (see demographic question #10). Students in NUTR 150 predominately where Freshman (n= 37) and Sophomore (n= 28) (Table 7). Whereas those in higher nutrition courses NUTR 244 (n= 43) and NUTR 452 (n= 98) were Junior and Seniors, respectively. Among seniors, NUTR 150 (n=4) had fewer students than NUTR 244 (n=15) and NUTR 452 (n=98) that completed the survey.

Table 7. Number of students by academic status and nutrition course.

Course(s)	Freshman	Sophomore	Junior	Senior	Fifth Year Senior	Graduate	Total
NUTR 150	37 (45%)	28 (34%)	13 (16%)	4 (5%)	0 (0%)	0 (0%)	82
NUTR 244	0 (0%)	18 (23%)	43 (54%)	15 (19%)	2 (3%)	1 (1%)	79
NUTR 452	0 (0%)	0 (0%)	14 (10%)	98 (67%)	30 (21%)	4 (3%)	146

Note: Results were based on total number of responses to Demographic Question #12.

### 3.2 Results of Subcategories

Participants who failed to respond to any items were omitted from the analyses. After omissions, the sample size considered for analyses was approximately N=307 (with some missing data points). For analysis, questions were categorized into the following categories: healthy preparation, identification, preparation time, home techniques, and ingredients.

Calculations (for all groups and categories) were based on zero and 1 (with zero equating to ‘no’ and one equating to ‘yes’) to indicate the number of questions answered correctly. From this, the average was determined using a scale from zero to 1. Questions referring to ‘frequency’, however, used number of occurrences and percentages compared to total.

Cronbach alpha scores for sub-categories ranged from 0.14 to 0.73 (Table 8). With an acceptable alpha score being above 0.70, all sub-categories (except for Identification,  $\alpha = 0.73$ ) were considered either poor (i.e. Healthy Prep,  $\alpha = 0.53$ ) or unacceptable (i.e. Prep Time,  $\alpha = 0.14$ ; Home Tech,  $\alpha = 0.28$ ; Ingreds,  $\alpha = 0.25$ ). A higher

mean was noted between a lower alpha score sub-category (i.e. Ingred,  $\alpha= 0.25$ ,  $M= 0.93$ ), than a higher alpha score subcategory with a lower mean (i.e. Identification,  $\alpha= 0.73$ ,  $M= 0.76$ ).

In comparing questions and cumulative scores, higher means were noted in subcategories Functional Properties of Ingredients (Ingreds) ( $M=0.93$ ), Foods/Techniques Used to Alter Food Preparation & Quality of Health (Healthy Prep) ( $M=0.79$ ), and Food Varieties, Types, & Forms Available in the Marketplace (Identification) ( $M=0.76$ ) for all students (Table 8) as the top three scoring categories.

Table 8. Cumulative Descriptive (Mean  $\pm$ SD) for all groups combined according to Food Knowledge subcategories, set number(s), question number(s) and Cronbach alpha of survey questions for internal consistency.

Food Knowledge Subcategories	Application of Skills and Knowledge Set #1	Application of Skills and Knowledge Set #2	$\alpha$	$M \pm SD$
Foods/Techniques Used to Alter Food Preparation & Quality of Health (Healthy Prep)*	Question #: 1, 2, 4, 6, 8	Question #: 1, 6, 11, 12, 13, 14, 15	0.53	$0.79 \pm 0.30$
Foods/Techniques that Impact Preparation Time (Prep Time)*	Question #: 7	Question #: 4	0.14	$0.67 \pm 0.26$
Techniques that May be Used to Cook Foods at Home (Home Tech)*	Question #: 3	Question #: 3, 7, 8	0.28	$0.67 \pm 0.23$
Functional Properties of Ingredients (Ingreds)*	Question #: 5	Question #: 2, 5, 9	0.25	$0.93 \pm 0.15$
Food Varieties, Types, & Forms Available in the Marketplace (Identification)	Skills and Knowledge Identification Question #: 1		0.73	$0.76 \pm 0.16$

Note: Averages were determined using a scale from zero to 1. \*Healthy Prep is Healthy Preparation; Prep Time is Preparation Time; Home Tech is Home Techniques; Ingreds is Ingredients. Cronbach alpha is  $\alpha$ . No significant differences were determined.

Within subcategories, all groups scored higher in identification, but ranked lower in technique (Table 9). In comparing each group, NUTR 244 students' averaged 0.96 in the area of identification, 0.78 in the area of ingredients and 0.88 in preparation time.

NUTR 150 had significantly lower means in all categories ( $p < 0.05$ ). Although averages appear to be increasing, there were no significant differences ( $p > 0.05$ ) between NUTR 244 and NUTR 452.

A one-way ANOVA was used to test for mean differences among the three nutrition classes. Means differed significantly across the classes among all the categories: healthy preparation ( $p = 0.000$ ); preparation time ( $p = 0.000$ ); home technique ( $p = 0.000$ ); ingredients ( $p = 0.000$ ); and identification ( $p = 0.002$ ). Tukey HSD post-hoc comparisons between students in NUTR 244 group ( $M = 0.78$ , 95% CI [0.785, 0.835]) and students in NUTR 452 showed no statistical significant at  $p > 0.05$ ; however, comparisons between students in NUTR 150 and the two classes (NUTR 244, NUTR 452) were significantly different ( $p < 0.05$ ).

Table 9. Mean ( $M$ )  $\pm$  Standard Deviations (SD) of subcategories among Courses: NUTR 150 (N=62), NUTR 244 (N=64), NUTR 452 (N=125).

Course(s)	Healthy Prep* $M \pm SD$	Prep Time* $M \pm SD$	Home Tech* $M \pm SD$	Ingreds* $M \pm SD$	Identification $M \pm SD$
NUTR 150	0.65 $\pm$ 0.16 <sup>a</sup>	0.57 $\pm$ 0.37 <sup>a</sup>	0.57 $\pm$ 0.27 <sup>a</sup>	0.50 $\pm$ 0.21 <sup>a</sup>	0.87 $\pm$ 0.23 <sup>a</sup>
NUTR 244	0.77 $\pm$ 0.15 <sup>b</sup>	0.88 $\pm$ 0.21 <sup>b</sup>	0.66 $\pm$ 0.27 <sup>b</sup>	0.78 $\pm$ 0.20 <sup>b</sup>	0.96 $\pm$ 0.07 <sup>b</sup>
NUTR 452	0.82 $\pm$ 0.14 <sup>b</sup>	0.85 $\pm$ 0.25 <sup>b</sup>	0.73 $\pm$ 0.25 <sup>b</sup>	0.70 $\pm$ 0.19 <sup>b</sup>	0.94 $\pm$ 0.14 <sup>b</sup>

Note: Averages were determined using a scale from zero to 1. \*Healthy Prep is Healthy Preparation; Prep Time is Preparation Time; Home Tech is Home Techniques; Ingreds is Ingredients. Columns with different letters are significantly different ( $p < 0.05$ ).

### 3.2a Cooking Frequency

Students in NUTR 150 (n=48) had higher incidences of cooking less than two days a week than students in NUTR 244 (n=21) and NUTR 452 (n=24) (Table 10). While, students in NUTR 244 (n=32) and NUTR 452 (n=64) had higher incidences of cooking at least a portion of a meal everyday than students in NUTR 150 (n=15). Cooking increased among students with more nutrition education in these three courses than those with less nutrition education.

Table 10. Frequency of Cooking.

Course(s)	Frequency			Total
	Less than or equal to 2 days a week	3-6 days a week	Everyday	
NUTR 150	48 (59%)	18 (22%)	15 (19%)	81
NUTR 244	21 (27%)	26 (33%)	32 (41%)	79
NUTR 452	24 (16%)	59 (40%)	64 (44%)	147

Note: Results were based on number of occurrences and totals for Demographic Question #5.

### 3.2b Nutrition Classes

For nutrition classes (Table 11), number of courses taken differed significantly between groups, ( $p = 0.000$ ). Tukey HSD post-hoc comparisons indicated NUTR 244 had significantly higher ( $p = 0.000$ ) means than students in NUTR 150. But NUTR 452 students ( $M = 3.50$ , 95% CI [3.19, 3.81]) had significantly higher mean scores ( $p < 0.05$ ) than students in both NUTR 150 and NUTR 244.

Table 11. Average number of nutrition courses (Means  $\pm$  SD) taken by students.

Course(s)	N	M $\pm$ SD
NUTR 150	81	0.35 $\pm$ 0.96 <sup>a</sup>
NUTR 244	79	2.35 $\pm$ 0.89 <sup>b</sup>
NUTR 452	147	3.50 $\pm$ 1.91 <sup>c</sup>

Note:  $p < 0.05$ . N= number of students; Averages were determined using a scale from zero to 1 for Demographic Question # 11.

#### 4. Discussion

The goal of this pilot study was to develop a survey that measured food knowledge among nutrition students as they progress through their course of study. It was hypothesized that results of the survey will differentiate knowledge among students at various levels of their education. Moreover, it was anticipated that students who have had or are taking a food preparation course (NUTR 244) would have a significantly higher food knowledge average than those who have not (NUTR 150). To further investigate differences among groups, comparisons were also made among students who were not directly enrolled (NUTR 452) in a food preparation class.

These comparisons apply to the field of Nutrition and Health Sciences. Survey use (in food knowledge assessment) provides an opportunity to further define and measure the aspects of 'food literacy' among nutrition students. Comparisons can be made by instructors (as needed) to further understand the demographic of students' enrolled.

For this pilot study, the majority of students who participated in the survey were female and seniors. Most students had never held a job. The academic major primarily represented was Nutrition Exercise and Health Science (NEHS). Students lived in either an apartment or house, watched Ace of Cakes. Each used a recipe from family members

to prepare at least a portion of a meal every day intended to pursue Dietetics while completing the following courses: NUTR 244: Scientific Principles of Food Preparation, NUTR 245: Scientific Principles of Food Preparation Lab, NUTR 344: Food and Nutrition of Healthy Living and NUTR 372: Food Safety and Sanitation.

Given the subcategory results, findings showed that the mean scores of those who were currently enrolled in a food preparation class (NUTR 244) or had previously taken the course (NUTR 452) were higher than those who had not been (NUTR 150) enrolled in a food preparation class. Cumulatively, questions on ingredient functions and techniques for altering food for health benefits received the highest averages. This could be due to the ‘hands-on’ experiences that students were given during classes (i.e. NUTR 244) that allowed exposure to ingredients and the cooking techniques to improve health.

Although no significant difference was calculated, the cooking frequency of a student appeared to have increased as the course number increased. This may illustrate that the more nutrition classes a student takes (NUTR 452), the more he or she was likely to cook, scoring higher on their mean scores. It also suggests that as students progress in their education, a change in environment (i.e. from dorm to apartment) may require the student to cook more. Students in NUTR 452 having significantly higher mean scores than NUTR 150 and NUTR 244, imply that the exposure to different cooking methods, experiences and recipes promote the understanding to how methods impact cooking preparation and ultimately behaviors.

### *Healthy Preparation*

Questions within this sub-category dealt with foods or techniques used to alter food preparation and diet to improve health and were similar to the following: ‘A grocery store customer asks you about ways to tenderize and improve the flavor for tough cuts of

meats. You tell her that the best way is to...?’ Topics often covered prevention of foodborne illnesses, and cooking techniques to minimize fat or sodium. These questions were considered given the impact and understanding of the dietitian’s role. Additionally, with the need to provide food safety education escalating, professionals must be able to educate on foods and food preparation practices. This also supports the education of dietitians as health care professionals being capable of providing safe, appropriate and satisfactory food recommendations to patients.

As previously mentioned topics that covered prevention of foodborne illnesses, and cooking techniques to minimize fat or sodium were considered. Twelve questions in the subcategory of Healthy Preparation were developed. Cumulative scores of students in NUTR 244 and NUTR 452 classes, suggests that details and impact of cooking methods are possibly being addressed in these courses and other nutrition courses.

Although this is more apparent in NUTR 452 than NUTR 244, it can be implied that the subsequent increase in course number have allowed students to build on the foundation laid in previous courses (i.e. NUTR 244). This, in turn, shows that professionals are being provided food safety education (as well as other health information) on preparation practices.

However, whether or not the survey questions captured the extent of information coming solely from nutrition classes is unknown. Students have indicated that they watch food shows and have used family, the internet and cookbooks as sources of information. These sources could influence a student’s understanding of health and cooking, thus, impact the way a question was (or should) have been asked and answered. If this is the case, further research must be done to show differences among sources and questions must be asked to reflect the source of health information.

### *Preparation Time*

Questions that established knowledge in this sub-category dealt with cooking methods that minimized the time to prepare a meal, for example: ‘A vegetarian asks you if there is a quicker way to prepare beans without soaking overnight. She constantly forgets them and they end up sprouting after a week. You tell her...?’ The more an individual is exposed to what impacts the preparation time of a meal depend how often an individual cooks.

As cooking frequency is considered, familiarity with different cooking methods learned from taking classes is noted. Studies that use classes to improve college students’ cooking perspective and frequency resulted in students improving health behaviors due to the familiarity of the methods used. Consequently, it was assumed that students gained familiarity with different cooking methods from the experiences gained in nutrition classes.

While significant differences were not identified between NUTR 244 and NUTR 452, results still complement studies that use classes to improve college students’ cooking perspective and frequency, which resulted in students improving health behaviors. This gives insight that students may become more accepting toward cooking the more classes they take. It also suggests that with more classes, the more he/she cooks, ultimately becoming more open and inclined to improving their health.

In theory, as a student progress in course number the exposure to methods (as it relates to time) becomes understood, thus, allowing students to be more efficient and effective in cooking. This is necessary to influence any perception that cooking is time consuming, deterring individuals from investing in their health. As it has been noted, students maintain the eating habits of their childhood. However, the trend of students’ progressing into cooking more is evident in all subcategory results.

### *Home Techniques*

Questions for cooking techniques, dealt with equivalences and measurements often used in preparing meals, for example: ‘ \_\_\_\_\_ ounces is to one pound while \_\_\_\_\_ pint is to two cups’. Knowing an individual’s cooking techniques may provide a perspective toward an individual’s eating behavior. Studies have suggested a connection between an obese individual’s behavior and his/her environment. Assuming the environment encourages unhealthy eating behaviors, indicates an individual is more likely to make eating decisions made by poor cooking techniques. This appears to be in agreement with other research that has illustrated that knowing proper cooking techniques can raise the ability to prepare healthy meals.

### *Ingredients*

Questions involving ingredients concentrated on functional properties of ingredients and how they react with other ingredients to produce a product, for example: ‘If a client makes a cake with an alternative sugar (i.e. Equal) instead of sucrose, it would most impact its \_\_\_\_\_’. Scores were anticipated to be lower, among students in NUTR 150, due to the fact that most of these students have not taken a food course. Coursework for NUTR 244 students, on the other hand, is more in depth and incorporates the instruction(s) and objective(s) of understanding the role of ingredients within recipes. Scores for students in NURT 452, were anticipated to be slightly higher, due to the exposure of information given by the number of courses taken.

Questions focused on measuring standards. With this in mind, home techniques may differ from person to person depending on race/ethnicity, resources available, literacy skills, and understanding. Questions may have neglected the opportunity to use other types of techniques to further establish trends. However, the current trend of students scoring higher as they take more classes is validated the more students cook,

which may suggest that knowing proper cooking techniques can increase the ability to prepare healthy meals.

### *Identification*

Questions involving identification were designed to match a food item to its appropriate name. Being able to identify foods could establish marketplace vocabulary; thereby, developing familiarity to connect and describe what one is looking for. It may also be the key in applying both design and analysis of recipes, recognizing reoccurrences of health problems and understanding that the use of one ingredient may not correspond to the use of another. If this is in fact the case, then identification may become another component to increasing the rate of cooking at home, thus, improving the consumption of healthier foods.

For questions involving identification and ingredients properties, scores were anticipated to be lower. Yet, they appeared to follow the same trend as previously mentioned. Being able to identify food could assist in developing students' understanding of ingredients and their roles.

It would also build familiarity with food items, lowering the anxiety to cook and creating an environment open to cooking. Given the demands of accessibility and the lack of foods in various settings and geographical areas, becoming familiar with food could aid in ingredients substitution for recipes. If this is the case, these could also be deemed vital in designing and analyzing recipes to minimize the reoccurrences of health problems, increase the rate of cooking at home, thus, improving the consumption of healthier foods.

Within certain circumstances, however, food knowledge appears lower for students in NUTR 452 when compared to students in NUTR 244. This occurs more

specifically in all subcategories (except for Healthy Preparation and Home Technique), which may indicate the shift in the use of knowledge as it pertains to the students' career choice. Given that the majority of students who participated in the survey were female seniors, majoring in NEHS who never held a job as a cook, may suggest that cooking (or food) techniques may not be sustainable in the life of the individual. Research indicates that changes within an individual's life may alter the frequency he/she prepares at least a portion of a meal. Responses to living in either an apartment or house, suggest changes in a student's lifestyle as he/she transitions into another aspect of his/her life (i.e. household type and size, earnings, employment status, professional interests, etc.). Transitions, in turn, may cause a decrease in the frequency of cooking which may either diminish or support cooking skills.

With this in mind, as cooking classes are used to improve college students' perspective and knowledge on cooking, cooking demonstrations appeared to have a greater impact in increasing knowledge and improving healthy behaviors. Again, when asked to report the frequency of preparing at least a portion of a meal, most students reported that their frequency was every day. This could imply that the student sample for this study have experience in preparing some aspect of a meal on a regular basis, which may further suggest that experience could impact students' recognition of food terminology, techniques and varieties used in the survey questions.

Considering that the top three intended career goals of students were Dietitian, Sport Nutrition, or Physical Therapy, provides other perspectives on the cooking experiences among students. Again, reasons for the differences between groups may include where the student received his or her cooking instruction (i.e. family member, Internet, cookbook, etc.), cooking interests, prior experience, and level of understanding in knowing the language associated with cooking. To better health, it becomes necessary

to have the proficiency of knowing the outcome of manipulating all aspects of preparing a meal.

## **5. Limitations**

Considering the lack of recent research surrounding the concept of food literacy and food knowledge, dietitians from the community were not used. Input was not obtained from external focus groups, interviews, surveys, or informal discussions. For example, revisions made to the survey did not include insight from currently employed registered dietitians, faculty from other food or related departments, or students. However, information used to comprise the survey was based on previously tested surveys which were used during the University of Nebraska-Lincoln NUTR 244: Scientific Principles of Food Preparation curriculum.

Overall group means showed students in NUTR 244 and NUTR 452 have the highest mean scores. This could illustrate students who are currently in (or have had) a food preparation course will be able to apply food knowledge better than those who have not taken a preparation class. However, scores were not measured against letter grades of students in their respective classes; therefore, direct correlation between consistency of performance and knowledge of material should be further investigated. Other limitations included that there were no pre/post data to reinforce the benefits or challenges of this survey. Therefore, comparisons made may not be ruled as fair given the number of students in each group and number of question in each sub-category. All surveys were taken at different times according to the availability of the student. Given that students were able to take the survey on-line, no assistance was available to guide the student if he or she had any questions regarding the content that was being asked.

Survey completion times were not recorded. Survey questions were grouped only for statistical purposes.

Given that subcategories were created for statistical purposes only, the number of questions was not pre-determined. Additionally, no clear and definitive definition was established for such terms as 'cooking', 'food knowledge' or 'food literacy'. Therefore, further research is necessary to gain a better perspective on how the definition of cooking can impact perception and how questions and subcategories are impacted.

Finally, students in the comparison groups could have acquired food principle knowledge from other classes or curriculums that were not specific to NUTR 244. Henceforth, to state that students only used principles taught from NUTR 244 to answer survey questions may be unwarranted due to the similarity of objectives from other nutrition classes.

## **6. Conclusion**

Based on findings and piloting experience, this research adds to the understanding of students' ability to apply food knowledge to modify health outcomes. This approach allowed for the targeting of different aspects of assessment and integration of scientific food principles which has been cited as important factors among different populations. Results show that students in a food preparation class have the knowledge to apply scientific principles toward the concepts of health. It also shows that as students progress in their level of education (such as from NUTR 244 to NUTR 452), they are more retaining and applying that knowledge.

Survey results appear to be congruent with studies which had suggested that to raise the likelihood of cooking, level(s) of understanding, inclinations, confidence,

interests and expenses would have had to be addressed. Although results do not show a direct association between inclination of cooking and nutrition classes taken, it is promising to note that those who took more classes and cooked more often had better results than those who took less classes and cooked less often. The information used and collected could prove valuable in conducting external and internal auditing for such areas as: curriculum improvement, intervention assessment, professional development, program planning and evaluation, research development and community involvement. It is recommended, however, that a combination of pre/post data collection, as well as, professionals from the community be used to further expand the function, scope and depth of the survey and ultimately establish a food literacy score ranking system.

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## Appendix A

### **Food Knowledge Survey for College Nutrition Students**

The goal of this project is to determine the food knowledge of college nutrition students. Information gained from this research will aid in the development of food related courses. This information will also broaden the development of extension programming in areas related to food. Answers given are confidential and will only be used for research purposes.

**NAME:** \_\_\_\_\_

**Student Demographic:**

1. Gender?      a. Male      b. Female
2. Have you ever held a job as a cook?   a. Yes      b. No
3. What is your major?
  - a. Dietetics      b. Family and Consumer Sciences      c. Nutrition, Exercise and Health Sciences (NEHS)
  - d. Culinology      e. Restaurant Management      f. Other: \_\_\_\_\_
4. During the semester, where do you live at least 5 days per week?
  - a. Dorm      b. Apartment or House      c. With Parents
  - d. Fraternity or Sorority House      e. Other
5. How often do you prepare at least a portion of a meal?
  - a. Every day      b. 5 to 6 days per week      c. 3 to 4 days per week
  - d. 1 to 2 days per week      e. Less than 1 day per week      f. Only on special occasions
  - g. Never
6. Do you watch food shows?   a. Yes      b. No.
7. If you watch food shows, please rank the top three shows you are most likely to watch.
  - a. Rachael Ray's 30 Minute Meals      b. America's Test Kitchen      c. Iron Chef America
  - d. Good Eat with A. Brown      e. Unwrapped with M. Summers
  - f. Ace of Cakes      e. Other \_\_\_\_\_
8. Do you cook with a printed recipe?   a. Yes      b. No
9. What is the source of your recipe? Please check the top three choices.
  - a. Family Member      b. Cookbook/Magazine      c. Cooking Show      d. Internet
  - e. Other
10. What is your intended career goal(s)? Pick the top three.
  - a. Dietitian
  - b. Personal trainer
  - c. Nurse
  - d. Medical doctor
  - e. Restaurant owner
  - f. Hospitality (i.e. hotel management, turf management)
  - g. Wellness/health promotion consulting
  - h. Physical therapy
  - i. Cardiac rehabilitation
  - j. Sports nutrition
  - k. Food service
  - l. Academia/Research
  - m. Other \_\_\_\_\_

11. Which of the following nutrition courses have you taken? Check all that apply.
- a. NUTR 244: Scientific Principles of Food Preparations
  - b. NUTR 245: Scientific Principles of Food Prep Lab
  - c. NUTR 344: Food and Nutrition of Healthy Living
  - d. NUTR 370: Food Production Management
  - e. NUTR 371: Applied Food Production Laboratory
  - f. NUTR 372: Food Safety and Sanitation
12. Are you a ...?
- a. Freshman
  - b. Sophomore
  - c. Junior
  - d. Senior
  - e. 5<sup>th</sup> year Senior
  - f. Graduate
  - g. Other

**Application of Skills and Knowledge Set #1:**

13. A grocery store customer asks you about ways to tenderize and improve the flavor for tough cuts of meats. You tell her that the best way is to:
- a. Marinate her meat in the refrigerator with an acid and flavoring
  - b. Marinate her meat on the counter top with vinegar
  - c. Cook over high heat without moisture
14. An article has your clients worried. It concluded that *E.coli* can grow on meat thawed under warm water. You know there is supported evidence that for food safety purposes:
- a. It is best to thaw ground beef in the refrigerator
  - b. There is no best way to thaw meat, just as long as it is thawed
  - c. The meat will be cooked so there is no need to worry
15. A woman comes to you embarrassed because she doesn't know what it means when a recipe states "1  $\frac{3}{4}$  cup sugar, divided". You tell her that:
- a. The recipe requires the sugar to be used in at least two places
  - b. It means  $\frac{3}{4}$  cup of sugar is used one time and the 1 cup another time
  - c. She needs to mix the sugar in the recipe, slowly
16. Your college roommates are making taco meat for tonight's football party. They have cooked over three pounds of meat but are not sure how to tell if it's done. As a future nutritionist, you recommend ground beef to be done when:
- a. The juice runs clear
  - b. It reaches an internal temperature of 155F for 15 seconds
  - c. It is no longer pink inside

17. At your employee food day celebration, you notice your coworkers' cakes are flatter than usual. You attribute this to them:
- Not baking long enough, therefore not allowing proper chemical bonds to form
  - Having too much baking soda or baking powder, breaking the forming bonds
  - Not creaming the shortening and sugar properly, to allow for incorporation of air
18. An obese boy was referred to you for nutrition counseling. In talking with him, he states that he is cooking his food in a small amount of fat. The method(s) he is most likely using is/are:
- Pan-Frying
  - Roasting
  - Parboiling
19. The extension coordinator has asked you to do a beef stew recipe for a food demonstration. However, time is limited. You note the drawback to this recipe would be that it requires \_\_\_\_\_ which is \_\_\_\_\_.
- Cooking in liquid over low heat; simmering
  - Cooking in liquid over high heat; frying
  - Cooking in liquid over medium heat; boiling
20. A parent has a child who is allergic to egg containing products. The parent claims that she has done her best to eliminate eggs from her recipes, but her daughter still got sick. Which food would be most responsible for her daughter's recent allergic reaction?
- Beef stew and rice
  - Mayonnaise-based potato salad (with no boiled eggs)
  - Baked chicken and glazed carrots

**(Please continue to the next page....)**

**Skills and Knowledge Identification.** Please match the lettered phrase or word to the correct numbered item below (all may not apply).

21. Ginger \_\_\_\_\_

22. Leeks \_\_\_\_\_

23. Rhubarb \_\_\_\_\_

24. Sweet potatoes \_\_\_\_\_

26. Eggs Benedict \_\_\_\_\_

27. Cucumber \_\_\_\_\_

28. Egg plant \_\_\_\_\_

29. Pumpkin \_\_\_\_\_



**Application of Skills and Knowledge Set #2:**

30. A panicked father tells you his son has gotten sick from eating a jar of home-canned green beans and is not sure what to do. The best answer would be to tell him that:

- His son must have been sick prior to eating the green beans and to give him Tylenol
- It may be the result of improper canning methods and it will pass in 24hours
- It may be the result of improper canning methods and to take him to a hospital as soon as possible.

31. If a client makes a cake with an alternative sugar (i.e. Equal) instead of sucrose, it would most impact its \_\_\_\_\_.
- Shelf-life
  - Packaging
  - Safety
32. \_\_\_\_\_ tablespoon(s) is equivalent to \_\_\_\_\_ teaspoons while \_\_\_\_\_ cup is equivalent to \_\_\_\_\_ ounces.
- 1 and 4; 1 and 16
  - 1 and 3; 1 and 8
  - 1 and 3; 1 and 16
33. A vegetarian asks you if there is a quicker way to prepare beans without leaving them soaking overnight. She constantly forgets them and they end up sprouting after a week. You tell her :
- No, overnight is the only way.
  - Yes, if she adds an acid while cooking.
  - Perhaps, with a quick soak method.
34. In reference to question #33, to make legumes a complete meal you would add a:
- A cereal
  - Potatoes
  - Lettuce and tomato salad
35. An Asian-American lactose intolerant male is ABLE to eat, which of the following?
- Ice cream
  - Milk
  - Yogurt
36. \_\_\_\_\_ is to cut into narrow sticks while \_\_\_\_\_ is to cut into very small pieces.
- Slice; Mince
  - Julienne; Dice
  - Chiffonade; Chop
37. \_\_\_\_\_ ounces is to one pound while \_\_\_\_\_ pint is to two cups.
- 32;1
  - 1/16; 1/2
  - 16;1

38. Read the list of ingredients below.

1/2 cup margarine

3 Tbsp. dry vegetable soup mix

1-1/2 cups crushed saltine crackers

8 chicken drumsticks

A client tells you that the above ingredients are all he has until next payday. He wants to prepare a meal for tonight's dinner but is not sure what to do with what he has. You tell him:

- a. Make a coating to dip the chicken and bake
- b. He needs to incorporate more fruits and vegetables either in the recipe or as a side dish
- c. Give him another recipe that may be more suitable

Read the list of ingredients below.

2 cups flour

1 tsp baking powder

1 cup sugar

1 tsp baking soda

4 Tbsp unsweetened cocoa powder

1 cup mayonnaise

1 tsp vanilla extract

39. You have handed the above recipe out at a food demonstration. A participant asks you, "Where are the eggs and milk?" You tell them:

- a. None of the below answers
- b. The recipe already includes what is necessary
- c. The recipe is designed to minimize time allowing room for improvisation

40. A woman with high cholesterol comes to you asking if there are preparation methods she can use to lower the fat content in chicken. You tell her:

- a. Pan-frying
- b. Sautéing
- c. Broiling

41. A homemade \_\_\_\_\_ recipe could be used for \_\_\_\_\_, to minimize \_\_\_\_\_ content.

- a. Stock; soups; sodium
- b. Roux; gravies; fat
- c. Sauce; pastas; carbohydrate

For questions 42-44 refer to the frozen Chicken & Noodles nutrition label below.

### **Chicken & Noodles**

<b>Nutrition Facts</b>	
Serving Size: 1 Meal	
<b>Amount/Serving</b>	
Calories: 610	Calories from Fat: 310
<b>% Daily Value*</b>	
Fat (34g)	52%
Saturated Fat (14g)	70%
Polyunsaturated Fat (0g)	--
Monounsaturated Fat (0g)	--
Trans Fat (.5g)	--
Cholesterol (100mg)	33%
Sodium (1500mg)	62%
Potassium (0mg)	--
Carbohydrates (52g)	17%
Total Dietary Fiber (5g)	20%
Sugars (6g)	15%
Protein (24g)	48%
Vitamin A 45%	Vitamin C 0%
Calcium 10%	Iron 10%

Percent daily values are based on a 2,000 calorie diet. Your daily values may higher or lower depending on your

42. A client comes asking you to assess the above package. Based on a 2000 caloric diet, you quickly note that it is high in:

- a. Saturated fat and sodium
- b. Sodium and carbohydrate
- c. Carbohydrate and fat

43. The client likes this meal and has no desire to change products. To reduce the contents (in question #42), an initial strategy would be for her:

- a. To make a home-made Chicken and Noodles entrée with nutrient dense resources
- b. To reduce the serving size and add a lettuce salad
- c. To change to a similar brand or meal

44. After a week, the same client comes back (to you) revealing she has high blood pressure and wants to try something new. For her to gain more dietary control, you recommend her:

- a. To make a home-made Chicken and Noodles entrée with nutrient dense resources
- b. To reduce the serving size and add a lettuce salad
- c. To change to a similar brand or meal