QUALITY ATTRIBUTES OF FOOD PREPARED IN QUANTITY: AN EXAMINATION OF ITS EMPHASIS IN THE FOODSERVICE COURSES AS PERCEIVED BY STUDENTS

By

GRETCHEN E. BLACKWELL

Bachelor of Science
University of Wisconsin-Stout
Menomonie, Wisconsin
1976

Master of Science
University of Wisconsin-Stout
Menomonie, Wisconsin
1978

Submitted to the Faculty of the Graduate College
of the Oklahoma State University
in partial fulfillment of the requirements
for the Degree of
DOCTOR OF PHILOSOPHY
December, 1985

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Thesis Approved:

Thesis Adviser

Dean of the Graduate College

ACKNOWLEDGMENTS

The author wishes to express appreciation to all who made this research possible. She is particularly grateful to Dr. Lea L. Ebro for the generous amount of enthusiasm, encouragement, and direction that was extended. Gratitude is also expressed to the members of my doctoral committee: Dr. William Warde, especially for evaluating instrument construction and for guidance in data analysis; Dr. Marguerite Scruggs, for her graciously given interest and strong guidance; Dr. G. Baker Bokorney, for encouragement and a warm attitude; and to Dr. Esther A. Winterfeldt, for evaluation and approval of the various research materials.

Thanks are also extended to my typist Barbara Caldwell, for her professional work as well as patience, encouragement, and interest in my endeavors. A special thank you to my parents Ernest and Eloise Furstenau for their continual love and support. I am especially grateful to David S. Blackwell, my husband for his loyal support, help, and assessment of my work.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Our society today is experiencing a gradual awakening to food consciousness: a concern for its quality (Moyer, 1977). The measurement of quality requires a knowledge base upon which to assess the quality of food products. This knowledge base has been identified as essential for beginning foodservice managers in a study by Mariampolski, Spears, and Vaden (1980) entitled: "What a Restaurant Manager Needs to Know: The Consensus." Respondents to the study, who were all foodservice professionals and members of the National Restaurant Association (NRA), indicated that a beginning foodservice manager will maintain quality and quality control through routine monitoring of food items produced and served.

To achieve quality, foodservice managers need to be knowledgeable about the appropriate measures for judging food quality. Students of foodservice are the future foodservice managers. Frequently omitted in foodservice courses are student experiences with quality product standards.

> Lack of this information could result in fewer people with the ability to recognize the characteristics of a good quality product, fewer food service personnel who can recognize the causes of a substandard product in order to correct it and make it a standard product, and also a reduction in the total quality of institutionally prepared foods. (Cotner, 1974, p. 129).

Various experts have contributed definitions of the term, quality, to the industry. Gorsuch (1978) says that quality is a measurement of the degree to which a product meets the expectations of the consumer. Slater (1980) defines quality in terms of the wholesomeness of ingredients, in conjunction with a price the consumer is willing to pay. The American Dietetics Association (ADA) (1974, page 665) has developed as its definition of quality food:

> Food which has been selected, prepared, and served in such a manner as to retain or enhance natural flavor and identity; to conserve nutrients, and to be acceptable, attractive, and microbiologically and chemically safe.

The United States Department of Agriculture (USDA), (1951) believes that quality is the combination of attributes or characteristics of a product that determine its degree of acceptability as a product. It is apparent that much diversity of ideas exists, in regard to definitions ofquality.

The term, quality, without being defined in terms of some standard has very little meaning (Gould, 1977). In order to meet any quality standard, there must be a further distinction made between the terms: quality assurance and quality control. Both terms represent ways to organize food quality departments. Quality control is: the regulating process through which we measure actual quality performance, compare it with standards and then act on the difference. On the other hand, quality assurance is providing to all concerned, evidence to establish confidence that the quality function is being adequately performed. Frequently, this is done through a quality audit team (Bolton, 1980).

Statement of the Problem

The control of quality is a management function. According to Kramer and Twigg (1970):

> From the management standpoint, quality control may be considered as a management tool for delegating authority and responsibility for product quality. While relieving itself of the burdensome detail, management still retains the means of assuring satisfactory results (p. 3).

Controlling food quality requires managerial attention to a broad spectrum of activities. The management, effective practice, and operation of the food control function requires managerial skill and ability, especially in dealing with people and organizing activities (Blanchfield, 1979).

Achieving quality food in foodservice systems requires criteria to measure the achievement of acceptable quality. Only limited meaningful information is available regarding the quality of meals in foodservice systems (Bobeng and David, 1978a). Quality is an elusive term; quality continues to be intangible. Standards by which specific quality can be measured need to be described (David, 1979).

Purpose and Objectives of the Research

The intent of this research was to determine quality attributes for food prepared in quantity. A further purpose of the research was to discover the perceptions of four types of students: Dietetic Intern, Plan IV, Coordinated Undergraduate Program (CUP), and Council of Hotel, Restaurant, and Institutional Education (CHRIE) regarding the knowledge attained and the importance placed on the food quality attributes.

The specific objectives for this research were:

1. Determine the quality attributes of food prepared in quantity.
2. Compare the perceptions of four types of students: Dietetic Intern, Plan IV, CUP, and CHRIE regarding the degree of importance of food quality relative to each of the attributes of food quality.

3. Compare the perceptions of four types of students: Dietetic Intern, Plan IV, CUP, and CHRIE regarding the degree of knowledge attained relative to each of the attributes of food quality.

4. Develop a conceptual model of food quality.

Hypotheses

The hypotheses postulated for this study were:

Ho_1 There will be no significant differences in the importance scores of the quality attributes for each of the four types of students: Dietetic Intern, Plan IV, Coordinated Undergraduate Program (CUP), and Hotel, Restaurant, and Institution (CHRIE) based on each of the following demographic variables:

a. Age

b. Sex

c. Classification

d. Declared major

e. Number of credits

f. Number of years work experience in foodservice

g. Geographic area

Ho_2 There will be no significant differences in the knowledge scores of the quality attributes for each of the four types of students: Dietetic Intern, Plan IV, CUP, and CHRIE based on the demographic variables as in Ho_1.

Assumptions and Limitations

1. The students surveyed have an adequate understanding of quality in food prepared in quantity to objectively respond to the questionnaire.

2. Only students under program directors listed in the American Dietetic Association (ADA) Directory of Dietetic Programs (1985) and the Directory of Hotel, Restaurant, and Institutional Schools (1982) published by the Council of Hotel, Restaurant, and Institutional Education (CHRIE) will be surveyed.

3. Only students selected by faculty members were used as survey respondents.

4. Only students currently enrolled in or who have already completed Quantity Food Production Management were asked to complete the survey.

Definitions

The following definitions were used to enhance the understandability of this study:

American Dietetic Association, The (ADA): A professional organization responsible for establishing educational and supervised clinical experience requirements and standarads of practice in dietetics (American Dietetic Association Reports, p. 66, 1981).

Coordinated Undergraduate Dietetic Program (CUP): (established in 1962): The coordinated undergraduate dietetic program is a formalized baccalaureate educational program in dietetics sponsored by an accredited college or university and accredited by The American Dietetic Association. The curriculum is designed to coordinate didactic and supervised clinical experiences to meet the qualifications for practice in the profession of dietetics (American Dietetic Association Reports, p. 66, 1981).

Dietetic Intern: An individual who performs supervised duties in planning and directing food service programs for specified length of time to gain practical experience immediately following graduation from a university, as an additional qualification for employment as a DIETITIAN (United States Department of Labor, p. 61, 1977).

Plan IV, Minimum Academic Requirements for A.D.A. Membership: Approved as a pilot program in 1970 and officially became effective July 1, 1972. Academic requirements for Plan IV are expressed in terms of knowledge areas and basic competencies rather than mandating specific courses and semester hours of credit. The intent of this plan is to provide a conceptual framework which permits freedom and flexibility for the development of curricula and courses by individual institutions (Chambers, p. 598, 1978).

Council on Hotel, Restaurant, and Institutional Education (CHRIE): The Council on Hotel, Restaurant, and Institutional Education is the society for hospitality education professionals. The membership includes faculty and two and four year hospitality education programs in the United States and abroad (CHRIE, 1985).

CHAPTER II

REVIEW OF LITERATURE

Quality is a many faceted concept. Due to the complexity of most foodservice systems, successful management of food quality is difficult. There are substantial gaps in our knowledge that make it extremely challenging to predict quality changes during procedures used in foodservice operations (Lund, 1982). According to West, Wood, Harger, and Shugart (1977, p. 79): "An understanding of these attributes of food that together make up measurable quality is the first step toward producing quality food."

This chapter encompasses a comprehensive coverage of concepts and processes which contribute to the elucidation of the term quality and to the delineation of food quality attributes applied to foodservice systems. The chapter includes five sections: quality, quality control, and quality assurance; perceptions and attitudes as measures of quality; food quality attributes; organization of foodservice systems for food quality; and ongoing quality and quality control programs.

Quality, Quality Control, Quality Assurance

The word quality is a nebulous term and has a diversity of meanings within the food industry. It is difficult to define quality within the parameters of a tangible definition, hence, quality needs to have a standardized meaning. Many foodservice industry operations are without

such standardized meanings and within the foodservice industry, standards are not always established and/or followed.

> Our failure to quality control in our operations is a major source of customer dissatisfaction. The lack of total quality control systems also prevents us from improving productivity and profitability in the foodservice industry (King 1982, p. 111).

For effective food quality control, the functions of both quality control and quality assurance need to be established. Quality assurance oversees and evaluates quality control, just as quality control oversees and evaluates production. Therefore, a good analogy is: quality assurance is to quality control as auditing is to bookkeeping (Lushbough 1978). The distinction can also be made that quality assurance is a system, whereas quality control is a procedure within that system (Spencer, 1980).

The utilization of a complete systems approach is necessary for a quality assurance program to meet success. There are two phases to the approach: a quality control cycle and a production cycle (Kramer, 1971). The quality control cycle is the first cycle. Customer specifications are established. Procedures for measuring the quality attributes as accurately and precisely as possible are decided. Results of samples are posted on control charts. The production cycle is concerned mainly with the establishment of sample stations. This process begins with receipt or rejection of raw materials, grading of materials, and testing of materials preceding processing. The goal of the production cycle is to decide how to handle materials until customer specifications are met.

Quality control has varying parameters, as criteria, that are important in evaluation. This is because in any given situation, some

particular levels of quality may be important, whereas others may not. It is important therefore, to identify the areas that constitute categories for quality analysis. According to Kramer (1966) there are three categories of quality analysis: quantitative, hidden, and sensory. These three variables are all interdependent. Their relationship to one another depends on the consumer preference composite of the three categories.

Quantitative attributes determine the price the consumer will pay for the product: quantity, weight, and packaging of ingredients. The second category, hidden attributes, includes the factors that affect the salability of the product from the standpoint of health. The nutritive value of food as well as its microbiological and chemical safety are considerations for this component. The third category is sensory. This area involves consumer preference and acceptability of the product. It includes appearance, kinesthetics, and flavor. Appearance is measured by the human eye. Kinesthetics includes the texture, consistency, and viscosity of the product. Flavor evaluation characteristics are taste and smell.

Quality connotes an operational definition. It is reflective of an ongoing system whose endpoint is customer satisfaction as a result of the process. In a sense then, quality is found when a customer's satisfaction is met. Customer satisfaction begins the process. The flow process which designates a quality control cycle is as follows: 1) customer specifications for each quality factor; 2) testing methods; 3) control stations; 4) reporting control charts; 5) action needed; 6) repeat the cycle (Kramer and Twigg, 1970). As a result of the process, both the customer and the quality control system are satisfied.

Individuals make the system work with deliberate success. Without the input of customers (consumers), the individuals managing and working within the system, at all levels, cannot meet the quality requirements necessary for satisfactory results. Customer satisfaction leads to dollars earned, hence, the most pressing problem faced by foodservice practitioners today is to maintain customer satisfaction and the feeling that value is given for every dollar spent (King, 1982).

Achieving customer goodwill is the result of the proper management of people in the quality control system. A sizable portion of the quality control effort is spent in dealing with the problems resulting from human error. Production personnel, therefore, need to be motivated toward viewing preventive quality control as an integral part of their job, and not merely as the sole responsibility of a quality control department (Beem, 1966).

The individuals that comprise the quality control system will determine its overall value. Barring the high technology component of the trade, it is still humans that operate the quality control process. The quality of the people in the organization is the variable for success.

> Quality people providing value-added services in a spirit of partnership with their customers will inevitably generate success both for themselves as well as the organization of which they are a part. (Capoor, 1981, p. 156).

The elements of quality control need to be built into the system so that quality does not become an add on component (Briskey, 1978). If quality control is not built into the various employee jobs, then individuals may tend to become apathetic about their work. These individuals then leave quality control to someone else hoping the mistakes will be fixed later. Superior performance depends on the

integrity, ability, and commitment of each individual in the quality control system. Also, the high quality of the finished product depends directly on the ability, commitment, and integrity of every production worker (Lushbough, 1978).

The best way to construct a quality control program begins with consideration of the fact that everyone is involved. The Sixfold Path of Quality represents a program with involvement by all employees. The six parts of the program are: 1) thoroughly familiarize employees; 2) clearly define the expectations; 3) promote full understanding by the employee; 4) utilize effective communication means; 5) encourage plant teamwork; and 6) develop a comprehensive operating manual (Beem, 1966).

The Sixfold Path of Quality Program is based on the idea that, in order for the employee to fully appreciate the job, that employee must thoroughly understand the job. Also incorporated within the program is the idea that high performance can be achieved only if the employee fully understands what is expected.

Additional considerations take into account quality control regulations. The employee must be given the background as to why the regulations are necessary. Then too, in order to develop the quality control program, effective communication with the employee is necessary. This will facilitate input from the employees regarding the make-up of the program. The final consideration should be the creation of a comprehensive operating manual for referral and use by supervisors.

A complete quality control system includes three areas: raw material control, process control, and finished product inspection (Hawthorn, 1967). In contrast, quality assurance takes into account 11

requirements: 1) general, 2) sanitation, 3) uniformity of specifications, 4) procedures, 5) label compliance, 6) process control, 7) technical service, 8) training, 9) education, 10) feedback, and, 11) analysis (Briskey, 1978).

An explanation of the process which follows the 11 requirements begins with development of the product, taking into account product standard formulation, specifications, as well as label and sanitation adherence. The second phase includes production processing. Another consideration is technical in nature involving coordination of management and regulatory agencies in order to meet food regulations. Other components are ongoing training and education of the management. Feedback of the system to management is also essential.

Perceptions and Attitudes of Quality

Ideas about food quality vary because people have different standards for quality food. McCune (1962) feels that there are several criteria for judging quality food. Quality food begins with high grade ingredients. Additional food quality factors are that the food has good texture, taste, and appearance. If all of the aforementioned criteria are met, then individual perceptions of quality are high. The age of the individual also influences one's perception of food because any particular age group is accustomed to their own typical foods.

Geographical, racial, and socioeconomic background also affects the individual opinion of quality food. Past experiences play a leading role in judging quality in food. Emotions evoke responses that affect the perceptions of quality in food. Lastly, education provides the most significant judgment on food quality.

The perception of quality food has varying interpretations amongst consumer, technologist, and manager (Thorner and Manning, 1983). The consumer associates quality with personal preferences. These preferences are based on factors such as habit, locality, ethnic characteristics, advertising, promotions, and price. The analyst or technologist, however, refers to quality as an index or measurement by classification of a product's chemical and physical properties. Management relates quality to profits: cost of product, profits generated, and consumer acceptance.

Another perspective with which to form a perception of food quality may be taken from quality control. Total quality control in food production requires the use of one particular attribute: integrity. Integrity in a human being is synonymous with the high quality of a product. The definition of integrity as: wholesomeness, honesty, and fulfilling a fine expectation, suggests quality (Wolf, 1972).

The concept that quality food is superior food with a top degree of excellence is an easily constructed definition, but is uneasily attained. Miller (1964) feels that attainment of top quality becomes a responsibility that trained and experienced foodservice personnel must accept in three ways: quality product, quality people, and quality management. Obtaining a quality product requires a systematic production plan and attention to details. This production plan takes into account: buying, recipes, forecasting, and workload. Food presentation must be accounted for with continuity and accuracy for every guest. The attention to details means that employees are continually made aware of the fact that quality food does not just happen; work and procedures of employees must be checked for this reason.

Miller (1964) goes on to say that quality people are obtained through training: teaching, meetings, personal contacts, coaching, and counseling. The last of the three responsibilities is quality management. Quality management is the result of management that stresses working together through teamwork.

The relationship of quality and standards is one of commitment and challenge. Since 1917, dietitians have been striving to maintain quality and standards related to food production. Cooper (1938, p. 751) said that "...the art of preparing and serving food tastily and attractively should always be foremost." Denman (1931) described the preparation of quality food as the most important activity in the institution kitchen. Over the passage of time, changes in the philosophy of, approach to, and preparation of food are forcing us to use new ideas to maintain quality and standards, yet meet the needs of society (Carpenter, 1967).

The commitment to monitor quality requires continual research and application toward that cause. Furthermore, periodic and systematic evaluation to make changes in standards, resources, methods, and objectives are required. As a consequence, the changing social, scientific, and economic conditions of society are met. David (1979, p. 412) stated that "Dietitians must operate at a professional level but use technical knowledge for quantity food production without loss of quality."

Food Quality Attributes

A food quality attribute is a characteristic which relates to the quality of the product. The following discussion is a synopsis of the literature depicting the various food quality attributes.

Customer satisfaction is an important measure of quality control. In foodservice operations, customers are free to go elsewhere, if the quality of the food establishment is not what is expected. A report by the National Restaurant Association titled "How Consumers Make the Decision to Eat Out" (National Restaurant Association, 1982) disclosed that quality food was rated as the most important attribute of a restaurant. This was true of all types of restaurants and in all categories of respondents.

Providing quality for the customer is the same applied to the least and most expensive operations.

> Quality is measured strictly in terms of the user or consumer of products. In the end, quality standards are set by customers, not management. Management achieves customer satisfaction when customer expectations are accurately gauged and met (Snyder, 1983, p. 61).

Snyder goes on to say that the industry today is finding that it costs five times more to create a new customer than to provide satisfaction to an old customer. Reliability in meeting customer satisfaction is a function of employees' knowledge of what to do and how to do it. Further, in order to create customer satisfaction, management must provide a system which eliminates error.

The most effective method of maintaining quality at an expectation level acceptable to the consumer is through successful evaluation of customer complaints. Thorner and Manning (1983) have separated complaints into three categories: psychological, physiological, and pressure or business competitive patterns. Psychological complaints surface as a result of the sensory effects of the product. Physiological complaints arise from the physical condition or health of the customer. Food or beverage consumed under these conditions may have an unusual

taste and thus result in unmerited complaints. Pressure or business competition complaints are annoying because they indicate problems that cannot be rationally traced or solved. These are an outgrowth of unethical business practices for the purpose of creating a beneficial sales atmosphere. Agents are sent to establishments in an effort to sabotage business. Foodservice operations must first understand complaints and then judge their value in order to satisfy the customer.

Holding temperatures of food products affect the retention of their food quality. Hot holding or warm holding of food is accomplished through the use of a stationary steam table or a movable cart. Though prepared with careful choice of raw materials, and of processing and storage, hot holding of food production destroys the sensory quality of food products (Bengtsson and Dagersbog, 1978).

Temperature fluctuations as a consequence of holding food at the steam table are observable. Less temperature fluctuation was apparent in items held in deep containers with a small surface area; items held in a large piece or carved to order; or items that were in compact consistency and/or covered with sauce or gravy. Food brought to the steam table at 160^{o} F or above had a gradual temperature drop in an extended (45 minutes or longer) time period. Products brought to the steam table at 150^{o} F or below, showed a continued temperature rise during holding. If food was brought to the steam table at 160^{o} F, a 140^{o} F temperature could be maintained for an hour or longer (Blaker and Ramsey, 1961).

Some sensory attributes suffer more than others during hot holding; the degree of loss depends on the type of food (Karlstrom and Jonsson, 1977). Hill, Baron, Kent, and Glew (1977) reported that potatoes are

most affected by hot holding, followed by fish and meat. Meat may be held at least three hours without major decreases in quality (Paulus, Nowak, Zacharios, and Bognav, 1978). Hot holding is destructive to vegetable quality. Vegetables should therefore be used within 40 minutes of cooking (Hill et al., 1977).

The loss of sensory quality can be reduced by proper control of the environment and temperature. The most effective measure is to keep the time between preparation and serving to a practical minimum (Bengtsson and Dagersbog, 1978). Other measures established to control the environment and temperature include: choice of proper cooking method; and regulation of time, temperature, and air humidity (Karlstrom and Jonsson, 1977).

The temperature of food is recognized as being a major factor in the sensory acceptance of food (Dahl, 1982). It is a challenge for foodservice personnel to serve hot foods hot and cold foods cold. Part of the challenge is that serving temperatures preferred by consumers vary according to the food and beverage consumed (Klein, Matthews, and Setser, 1984). The following temperature ranges were preferred for four classes of foods served hot: soup 145-150^{o} F, potatoes and vegetables 140-145^{o} F, entrees 140-145^{o} F, and beverages 145-150^{o} F (Blaker, Newcomer, and Ramsey, 1961).

Many recipes currently in use, if produced as written, would result in products which would not be recognizable or served. Reliable recipes are basic tools and important determinants of production and cost control (Miller and Goodenow, 1962). Items must be selected and scheduled for standardization, formulated for testing and developing, standardized by yield, and then constructed as a final recipe. The result of the

system is consistent product of top quality food. Control of the production system is achieved through standardized recipes and supervision of employees.

Correct use of portion control means care and consistency in handling foods. Blackburne (1963) believes that portion control is: 1) giving a definite quantity of food; 2) establishing a definite price for the food; and 3) resulting in a definite percentage of the profits. In order to maintain control, employees participating in the production of foods are to be carefully trained and supervised. Employees are best taught to perform their duties in a very exacting manner. Foods are portioned prior to cooking. Products are weighed before and after cooking. Cooking time is adhered to so that the standard size of product is obtained consistently.

Establishment of a program to assure portion control is suggested. This program includes use of proper ladles, dishers, and spoons for service; appropriate service dish size; and proper set-up for service prior to dishing. Before service, workers are assembled. The manager then checks the serving equipment and the preset portions. By observation of customer eating habits, based on leftovers and total consumption, the fitting portion size is checked intermittently by management.

Because of the utilization of food systems other than the conventional, the foodservice industry is also represented by commissary, ready-prepared, and assembly systems. These systems utilize cook/chill and cook/freeze. As a result of using cook/chill and cook/freeze systems, entrees and vegetables for example may receive two heat treatments. The first heat treatment occurs when the food is initially

prepared and the second immediately before service (Klein, Matthews, and Setser, 1984). Rethermalizing food is necessary and this makes quality retention difficult.

The equipment used is also a major component of the reheating process. The decision to designate the appropriate equipment for a desired cooking purpose is important. Each type of equipment for reheating food has its own particular time and temperature capabilities (Klein, Matthews, and Setser, 1984).

Forced-air convention ovens reheat precooked foods in bulk or single portion. The reheating time varies depending on the heating power balanced with the oven load (Bengtsson, 1979).

Microwave ovens are also applicable to reheating foods. The ovens have three positive features relative to reheating. These features are: increasing the food temperature; losing only 10 percent of the moisture; and lowering the microbial population (Dahl and Matthews, 1980 a,b). Results depend upon type, shape, size, and arrangement of food; power input and output of the oven; type of container; length of heating cycle; and location of food within the oven (Dahl, 1982).

Steam-jacketed kettles work effectively for food reheating. They are especially appropriate for stews, soups, gravies, and spaghetti sauce. Problems associated with the unit are: stirring required to prevent burning, uneven temperature distribution, and stirring required to quicken heating.

A reheat cart is useful to carry food, keep chilled food cold and reheat frozen food. Individual food items were reheated according to programmed heating codes. Two problems with the system are its failure

to heat all foods correctly and its uneven heating (Shaw, Darsch, and Tuomi, 1979).

Evaluation of food for sensory quality involves the examination of attributes, such as appearance, flavor, and texture. Extensive research exists on the sensory qualities of foods prepared on a small scale, but not in results functional for application in foodservice systems.

The sensory quality of foods does not consist of a single well defined attribute. This was discovered during the era of 1920-1930. Sensory quality entails a composite of several properties which are perceived individually, then integrated into the brain for a total impression. The United States Department of Agriculture (USDA) was responsible for the development of grades and standards of quality for various food products. (USDA-CMS).

Every attibute of food quality is not entirely independent. Attributes may overlap and be influenced by other attributes. Because of the overlap, drawing borderlines between attributes is an arbitrary decision (Kramer, 1968).

The most desirable outcome of food production is palatibility. Palatibility directly influences sensory factors. Most particularly affected sensory factors are the appearance of the food and its flavor. A chief factor in the appearance of food relates to its color. Additionally, the consistency of the product is recognized as a significant contribution to the appearance of the food. The size of the portion and the shape or form of the food determines another part of the appearance made by individual food items. Arrangement of the food items on the plate or platter adds to the quality of its appearance.

The above factors all lead to a total appearance or image made by the food. Eye appeal is gained through formulation of interesting combinations of food. The foods may differ in type, color, and form as well as plate arrangement. A contrasting set of food combinations also gains eye appeal for the consumer. Foods properly prepared and attractively served stimulate the appetite. The appearance of the food items influences the acceptability of the food to the consumer; it affects the enjoyment of the food as well (West, et al., 1977).

Correct judgment of odor and taste in foods plays a highly important and almost indispensable role in the foodservice industry.

> Those who have mastered the culinary arts have done so because they have also mastered the art of precise identification of odors and tastes and have applied this knowledge to their craft (Thorner and Manning, 1983, p. 12).

Proper handling of foods requires a full understanding of smell and taste. Application of these senses will maintain uniformity of product and forestall customers complaints.

Sounds may be important for the eating quality of foods. The identification of sound related to various foods is described as the crushing it makes as a result of biting and chewing. The correct identification of foods from their sounds determines its recognizability. Foods differ in their recognizability. No one group of foods is more recognizable than any other. Though no comparable studies support the idea, it appears that the identification of foods is related to the senses. The senses particularly utilized are visual, olfactory, and taste or tactile sensations. Acoustical input may, therefore, contribute as much as the other senses to the eating quality of food (Vickers, 1980).

Color is a sensory factor linked to the appearance of food. There is a definite art to color in food:

> Color is forever a part of food, a visual element to which human eyes, minds, emotions, and palates are very sensitive. ...man has come to build up strong and intuitive associations between what he sees and what he eats. A good meal to say the least, is always a beautiful sight to behold (Birron, 1963, p. 45).

People react strongly to color. The world we live in is full of color. Food is expected to be an anticipated, established and appropriate color. The first impression given by food is its color. A study by Hall (1958) established and demonstrated the idea that a food appearance affects our perceptions of its odor, taste, temperature, and texture.

The increased appeal of foods which are attractively colored translates into increased consumption. Our society is moving toward increased consumption of colors with higher nutrient density as lower per capita consumption is stressed (Institute of Food Technologists, 1980).

The factors decided as a result of the IFT study follow. First, color outweighs flavor in the impression it makes on the consumer. This is true even when the flavors are pleasant and when the food is popular. Color powerfully influences the consumer's ability to identify the flavor as well as to estimate its strength and quality. There is a relationship between color and other sensory factors.

A strong association between color and appetite exists. Generally speaking, bright and warm colors stimulate man; soft and cool colors the opposite. While colors involve personal and emotional interpretations, none the less, these general color ideas apply to most individuals (Birren, 1963).

Birren (1963) also reported that different situations affect color. Proper illumination of food is imperative. In foodservice, warm

lighting is appropriate. Several different colors inspire individuals. Buying can be stimulated when the eye sees different colors. For example different colors of salad dressing will impress the consumer to try the different dressings. For food display, cool blues are used successfully for background. White trays suggest cleanliness. Foodservice research has shown the value of bright coral color for wall areas. White, warm red, and cool blue are used for accents. Turquoise blue is liked as a tile background to steam tables; peach has been designated as most appetizing in a cafeteria study.

Color of plateware is important for food sales. A school cafeteria doubled its sales by putting salads on green plates. White, pink, aqua, pastel green, and yellow, by public confirmation, surpass other colors as most desirable in foodservice.

Texture is one of the attributes affecting consumer preference. Texture is identified with the structural elements of the food and the way these register with the physiological senses. This encompasses the concepts of texture, body, and consistency defined by others (Szczesniak, 1963). Texture was defined as how hard or soft as well as how large or small the kernels in the mass of food are (Hall and Fryer, 1953). Body was described as a combination of the size and texture of solid units; the viscosity of the fluid; and the proportions of solids to fluid (Smith, 1947). Consistency is often termed body (Davis, 1937). Under the term body are firmness (viscosity and modulus), springiness (elasticity), and smoothness (homogeneity).

In a study conducted by Szczesniak and Kleyn (1963) subjects were given a word association test to depict words that elicit textural description due to their sensory nature. The test showed the degree of

texture consciousness of the subjects. Results indicated that texture is a discernible characteristic that is more evident in some foods than others. Foods which elicited the highest number of texture responses were either bland in flavor or possessed the characteristics of crunchiness or crispness. The data showed that the group studied had a high awareness of texture characteristics of foods. The indication was that texture is an important characteristic influencing a consumer's image of food.

Further, another study by Szczesniak and Kahn (1971) showed that there is a relationship between the time of day and the texture preference. Soft textures connoted satiation and were associated with relaxation and children. Crisp foods are stimulating and appropriate only to active situations and adults. Bland, mild, and sweet flavors are seen as soothing, childish, feminine, frail, and neat; whereas sharp, spicy, sour, and tart flavors are viewed as exciting, adult, masculine, and strong. Examples of textural suitability are: creamy textures for lunch, sharp textures for a television snack, and toasty textures for breakfast. The results suggest that flavors and textures, are observed as soon as the food is taken into the mouth. The flavors and textures derive their meaning from the degree of resistance to absorption and the kind of activity required of the eater to overcome this resistence (Jellinek, 1973). These ideas have large implications for the kinds of foods that are incorporated into menus at various times and for various situations within foodservice.

As the consuming public becomes more conscious or critical of food textures, the need for better methods of measuring and controlling texture grows. The food industry, therefore, needs reliable sensory

panels to assess the importance of texture to the acceptability of a food item. The panels would assist to determine the textural characteristics that are important in that food (Abbott, 1972).

Sensory evaluation has numerous foodservice applications; it is the key to an effective quality control program. "Without a basic understanding and working knowledge of this subject, a quality control activity cannot be of value" (Thorner and Manning, 1983, p. 11).

The foodservice system utilized has a significant affect on the sensory quality of foods. Use of systems other than conventional foodservice systems in many ways detrimentally affects the sensory quality of the product. According to Matthews (1977) food items prepared in ready-prepared foodservice systems and reheated prior to service are less desirable than food prepared in conventional systems. Bobeng and David (1978b) reported that sensory scores for color of meat were vastly different for conventionally prepared beef than for beef prepared in cook/chill or cook/freeze systems; the difference was attributed to the second heat process. Taste panel scores for overall acceptability were much greater for beef loaves prepared in a conventional system as compared to cook/chill and cook/freeze systems. Mean scores were conventional, 5.3; cook/chill, 3.73; and cook/freeze, 2.78. A hedonic nine point scale was used. It should be noted however, that based on the research of Glew (1968) precooked and reheated food was just as acceptable as traditional methods involving hot holding.

The hedonic nine point scale used by Bobeng and David is documented in the scoring methods presented by Amerine, Pangborn, and Roessler (1965) in descriptive terminology as follows:

Excellent 9
Very Good 8
Good 7
Below good, above fair 6
Fair 5
Below fair, above poor 4
Poor 3
Very Poor 2
Extremely poor 1 (p. 356)

The descriptive terms accompanying the numerical scores are aids in judging. The palatibility rating scale is a variation of the hedonic scale. It was developed by Peryam and Shapiro (1955) for use in quality control.

Studies have been performed to evaluate the effect of reheat systems on the sensory quality of foods. Sawyer, Naidu, and Thompson (1983) evaluated beef loaf, mashed potatoes, and peas prepared in a cook/chill foodservice. Taste panelists showed a preference for beef reheated by convection and peas reheated by microwave. Microwave was given a higher rating for two of the three products that were heated. Ferguson (1981) however, identified flavor deficiencies of microwave cooked products. The deficiencies noted were: uncooked starch, pronounced fat and oil flavor, and low salt density.

Some reheat systems in the United States are capable of holding food at 140^{o}F. European systems often reheat food and hold it hot until service. Hot holding periods after reheat are best limited to 30 minutes in order to maintain sensory quality (Paulus, 1979).

Cremer and Chipley have performed an extensive amount of research on the sensory quality of foods in foodservice operations. The sensory evaluation scores of Cremer and Chipley utilized the same nine point hedonic scale as previously described. Spaghetti and chili were prepared and processed through a commissary system with chilling for

transportation and heating in convection ovens. Mean scores for various sensory characteristics ranged from 5.9 to 6.8 for spaghetti. Scores were based on the hedonic nine point scale (Cremer and Chipley, 1977a).

In another of their studies, hamburger patties precooked and frozen, were prepared in a commissary, chilled, and then heated in a convection oven; results were 5.4 to 6.5 (Cremer and Cremer, 1977b). In a 1979 study, Cremer and Chipley prepared meat loaf in a commissary and transported it hot. Scores for evaluation ranged from 6.2 to 7.2. Eggs and roast beef were evaluated in the final study through a ready prepared system. Products were then chilled and microwaved. Results ranged from 6.9 to 7.5 (Cremer and Chipley, 1980 a,b). All scores were based on a nine point hedonic scale.

A series of studies was conducted by Klein, Matthews, and Setser (1984). The goal was to help identify problem areas in reproducibly measuring specific menu items. The studies tested a spaghetti formulation. The color, flavor, and spice of the product were not greatly affected by post-cooking treatment. Texture properties were changed significantly; texture is more sensitive to deterioration and thus could be used as a quality indicator.

Implementation of a quality control program requires the incorporation of basic tools for testing. There tools are the equipment and apparatus required to perform practical testing that is basic and uncomplicated. As such, this quality testing leads to reliable, precise, and accurate results.

A program for quality control may be established for routine evaluations. Thorner and Manning, (1983) indicate the following list of tools as suitable and ample: 1) human senses; 2) scales; 3)

thermometers; 4) hydrometers or hand refractor; 5) stop watch and timers; 6) sieves; 7) water analysis kit; 8) portable fat analyzer; 9) triers; 10) standardized measuring containers, spoons, and scoops; 11) pH meter; 12) standardized pressure gauge; 13) electrical test meter; 14) microwave energy leak detector; 15) carbonated water pressure tester; and 16) soft drink, syrup-water ratio tester.

In order to comprehend the function of the tools described above, explanation of their inclusion in quality evaluation will follow. Scales are used for portion control, receiving, and production; they are manufactured in a variety of shapes, models, and capacities. The purpose of scales is to weigh accurately, quickly, and simply.

The mandates of culinary arts require that temperatures be known, set, and established. These provisions adhere to microbiological standards as well. The basic tool used for this purpose is the thermometer. Accuracy in thermometers is imperative in order to avoid false readings.

The refractometer (Abbe) or the hand refractometer rapidly determines the percentage of sugar in fountain syrups, maple syrups, and honey. Correct use requires utilization of appropriate tables. The refractometer is composed of two prisms between which the sample to be tested is placed, a telescope for observing the extent of the refraction, and a scale on which the refractive index is read. A hydrometer is a weighted spindle with a graduated neck that floats in a liquid at a height related to the density of the liquid. The neck of the instrument contains a numerical scale from which the measurement can be read. The scale gives the percentage of soluble solids in the liquid.

The function of stopwatches and timers is to check the timing cycle of equipment. Most equipment for fast food and for microwaving uses built in timing devices. In order to assure their accuracy, constant checking is required.

Various sized sieves are used to evaluate canned food items. Sieves determine drained weight of canned goods. An 8 inch diameter sieve for number 2 1/2 or smaller cans and a 12 diameter sieve for a number 10 can are suggested.

In order to assess water quality and its effects on food, use of water testing equipment is necessary. The most specific function of the test is to determine the hardness of the water. Tests are now available for fast and simple testing procedures. Bottles of test solutions: buffer solution, stable indicator, and titrating solution are used in conjunction with the water itself. Water is added drop by drop until a color change occurs. Hardness of water is determined by counting the number of drops required to bring about a color change (drop equals 1 ppm of hardness).

The use of a trier is employed for sampling items such as dried beans, spices, and green coffee from burlap shipping bags. Butter, dried milk products, and cheese may also be sampled. The pointed tool pierces the merchandise in the bag and the sample is removed.

Measuring containers, scoops, and spoons are used to standardize recipes, formulations, and ingredients. The degree of acidity or alkalinity for a substance is determined through use of a pH meter. A general purpose meter registers values between 0 and 14. A standardized pressure gauge checks the accuracy of pressure cookers, steamers, and carbon dioxide cylinders. An electrical test meter is a combination

meter that measures voltage, resistance, and amperage. Essentially, it checks electrical current entering equipment. The tester will help to pinpoint defects in motors; it will also trace broken wires or loose connections.

Determination of radiation leakage from microwaves is a safety evaluation measure performed in foodservice operations. The instrument necessary to detect radiation leakage from microwave ovens is the microwave energy leakage detector. Regular testing of microwave ovens is suggested.

Determination of carbonation volumes can be made by a pressure tester designed for that purpose. The syrup-water ratio of a soft drink machine is accomplished by a soft drink syrup-water ratio tester. A meter separator is inserted into the nozzle of a drink dispenser. The separator has two parts: one for syrup and one for carbonated water. A plastic graduate, calibrated in ounces, catches the syrup in the small tube and the carbonated water in the other. The ratio of syrup is compared with the volume of carbonated water.

Foods are a complex mixture of inorganic, organic, and biochemical compounds due to their complexity, shifts in heat, oxygen, and pH can affect their nutrient quality. A wide range of losses in heat labile nutrients is reported by Harris and Karmas (1975). The authors report losses are from 0 to 40 percent of vitamin A; 0 to 3 percent of the carotenes; 0 to 40 percent of vitamin D; 0 to 55 percent of tocopherols; 0 to 60 percent of biotin; 0 to 100 percent of folic acid; 0 to 50 percent of pantothenic acid; 0 to 40 percent of B_6; 0 to 80 percent of thiamin; 0 to 75 percent of riboflavin; 0 to 40 percent of lysine, and 0

to 20 percent of threonine. The greatest effect of the nutrient loss is the result of the time and temperature relationship with the food.

Nutrient retention in foodservice systems is dependent upon a variety of factors. Livingston and Chang (1979) summarize the factors as: 1) nutrient type; 2) type, quantity, and configuration of food; 3) container used; 4) heating rate; and 5) handling during heating.

Food decoration depicts food that is prepared with a high degree of skill and regard for quality (Institutions/Volume Feeding, 1972). Decorated foods impress patrons by assuring them that the foods prepared will be unique. Antonin Careme (1784-1833) established elements of decoration that are still recognized today. Careme, a former student of architecture, became a chef. This chef determined several rules of food decoration. Decoration chosen should be appropriate to the dish. Designs should enhance the food, not overpower it. It is to be remembered that: "...as a general rule no food item offered on a first class menu should be thought complete without a garnish of some sort." (Hotel and Motel Management, 1972, p. 24)

Sonnenschmidt and Nicholas (1972) have taken classical methods of food decoration and reworked them to meet modern needs. Their book is entitled The Professional Chef's Art of Garde Manger. The book offers suggestions for tableside or buffet. The authors describe 12 basic ingredients that are used effectively and economically in food decoration. Their list included: raw, cooked, and marinated vegetables; fresh, canned, and candied fruits; fresh herbs; aspic sheets; hard cooked eggs; baked items; dairy products; and fish roe.

Consideration in decoration should be given to the wide range of materials available as well as their design potential. Variety,

interest, and variance in the design and materials should be remembered. Imaginative use of materials marks the well decorated platter.

The art of garnishment is a useful ally in food preparation. To garnish is to adorn. In foodservice, a garnish should be edible, attractive, and compatible (Cooking for Profit, 1973). Color and texture are also important factors in choice of garnishment. Especially appropriate garnish colors are black, brown, neutral, red, orange, and yellow. Some of the most attractive garnishes are in the brightest colors. Texture may be obtained from such items as nuts, croutons, pastry shells, cocktail vegetables, and the like.

Garnishes may be elaborate and imaginative, or simplistic in make-up. Freshness should be evident and paramount. A garnish provides a compliment to any dish through color, texture, size, and flavor. The totality of the dish is kept in mind when selecting garnishes (Hotel and Motel Management, 1972).

There are a vast array of seasonings available in the world of spices and herbs. Utilization of spices for flavor enhancement depends upon knowledge of the methods for correct spicing. There are two basic methods for adding spices. The first method requires adding the spice directly to the food. The second method employed is adding spice to the flavoring agent. This may be in the form of stock, marinade, sauce, or dressing (Institutions, 1964).

Increased usage of spices is suggested due to the awareness of their availability and purpose. Spice companies offer consumers new seasoning formulations, new product development, and technical

consultation. Spice makers have established a bond between buyer and seller through their increased services.

Seasonings are available in several forms: whole, ground, extractive, volatile oil, dry carrier, and batch unit. Whole spices are bits of root, bark, seeds, and leaves. These whole spices are cleaned and then sold as is. Whole spices have a protective shell structure that protects the volatile, flavor bearing oils. Principally, whole spices serve to add flavor. Spices sold as a whole spice do not give up their flavor easily. Only through heat processing, time passage, and/or solvent action is the spice flavor extracted. Spices left whole provide appealing texture and appearance to food.

Ground spices are easy to measure and disperse through foods. Action of ground spices is faster than for whole spices, as they no longer have a protective covering. Different particle sizes are recommended for varying uses. Ground spices must pass through United States standard sieves ranging from numbers 20 to 60 mesh. These sizes do not allow the cell structure to be completely broken; the product therefore, retains flavor. Pulverized ground spices are used to reduce the possibility of color flecks in food products.

Ground spices are the standard from which all flavor quality is judged in spice materials. Extractives are prepared from the ground form. Extractives are essential oils; they do not contain other components which contribute to total spice performance.

Dry carriers have individual crystals that are cooled with the essential oils or oleoresins. Dry carriers disperse easily and flow freely. Batch units are premeasured seasoning packets.

Spices vary in type and grade. Prime grades have a higher oil content and are, therefore, more intensively flavorable. Storage is well maintained in a cool, dry, ventilated place (Food Engineering, 1969).

In conclusion, within most foodservice systems more emphasis is placed on acceptance of the food through use of a standard than through other forms of measurement (West et al., 1977). For this reason familiarity with and knowledge of the food attributes is necessary in order to assure acceptable performance standards for food products.

Organization of Foodservice Systems for Food Quality

Managing the quality of food in quantity foods has become a complex issue. With the increase in the number of foodservice systems and the tendency to centralize operations, the goal of quality food has become more difficult to achieve (Klein, Matthews, and Setser, 1984).

A breakdown of the types of institutional establishments is essential toward understanding the entire foodservice system structure. The National Restaurant Association (1983) divides the foodservice industry into three groups. Group I includes commercial eating and drinking establishments, food contractors, lodging places, and miscellaneous establishments. Group II is institutional eating places: schools, businesses, universities, hospitals, and other health facilities. Group III includes military feeding operations.

Within the last 20 to 25 years it has become common for foodservice establishments in these groups to centralize food production to produce high quality, nutritious foods and to minimize use of resources,

increase productivity, and decrease food and labor costs (Unklesby, Maxcy, Knickrehm, Stevenson, Cremer, and Matthews, 1977).

The four principal types of foodservice systems within the foodservice industry are: commissary, conventional, ready-prepared, and assembly-serve. Unklesby et al. (1977) have described these systems as follows. In the commissary system, the food is procured and produced at a central location. The prepared items are sent to areas for final preparation and service. Food may be frozen, chilled, or held hot.

The conventional foodservice system procures, produces, and serves its own food. The preparation is finished as close to service time as is possible. Food is then held in steam tables or other hot holding equipment. Plated food is served or transported to the patron in heat maintenance systems (Mahaffey, Mennes, and Miller, 1981).

The third system is ready-prepared foodservice. Menu items are prepared in advance and then chilled or frozen until just before service. Food may be plated before chilling or freezing. Reheating is by microwave, conventional, convention, or other heating unit.

The assembly-serve system is comprised of completely prepared or processed foods. These foods are heated at the point of assembling and serving the meal. Bulk, preportioned, or preplated prepared foods are tempered or reheated by a convention, microwave, or other heating system.

As shown by the aforementioned systems, considerable managerial competence is required to monitor food quality from procurement to consumption (Unklesby et al., 1977). Foodservice systems are difficult to assess in terms of quality control.

> Generally, quality assessment in these systems involves inspection at the point of service, a retrospective action,

> which provides little information for quality control (Bobeng and David, 1978 a, p. 524).

A preventative system which dispenses with control after the fact is needed. Action is called for throughout the system, not just after preparation is completed.

A management tool that may be used effectively is the HACCP model (Bobeng and David, 1978 a). HACCP stands for Hazard Analysis Critical Control Points. HACCP is a preventive system for quality control designed to inform management of potential dangers so that corrective action may be taken.

The concept was developed by the National Aeronautics and Space Administration, the Pillsbury Company, and the U.S. Army Natick Laboratories. The objective was to apply a zero defects concept to the production of food. Consideration was given to production of food, its ingredients, and potential consumer abuse. Bauman (1974) defined hazard analysis as the identification of sensitive ingredients, critical process points, and relevant human factors which affect product safety.

Unklesby et al. (1977) identified nine general areas in food systems that require monitoring. These areas are: 1) procurement; 2) storage; 3) packaging; 4) preprocessing; 5) heat processing; 6) storage following heat processing for heated, chilled, and frozen food; 7) heat processing of precooked menu items; 8) product distribution; and 9) serving.

In order to monitor controls of these areas, a foodservice administrator is faced with decisions that involve satisfying safety requirements while still maintaining nutritional and sensory quality (Klein et al, 1984). The HACCP model answers this purpose. A systems approach has been successfully implemented by the food processors to provide

control from the raw product through consumer evaluation (Kramer, 1971). The HACCP system is considered one of the best devised for quality control in the food processing industry (Kauffman, 1974).

Although the HACCP idea was devised to emphasize microbiological safety, it may be used successfully for overall foodservice operation. The development of HACCP in foodservice systems provides quality control for management.

HACCP models were developed for three on premise hospital foodservice systems: conventional, cook-chill, and cook/freeze. HACCP was applied to conventional, cook-chill, and cook/freeze systems in three phases as follows: identification of control points, identification of critical control points, and establishment of monitors for control (Bobeng, 1976).

Control points are process stages of entree production. Key control points for entree production include procurement, preparation, and heating. Critical control points are points in processing that reduce microbiologic hazard. Critical control points for entree production include: ingredient control and storage, equipment sanitation, personnel sanitation, and the time-temperature relationship. Monitors for control facilitate the effectiveness of control at the critical control points. Using the example of entree production, time and temperature standards are a practical monitoring method.

Utilization of the HACCP concept within food systems was developed to help prevent undesirable quality changes in food (Bauman, 1974). As such, use of the HACCP system functions to assist the manager in analyzing the steps in the food flow process to determine hazards. Identification of actual or potential hazards allows for establishment

of critical control points. The manager then takes corrective action to bring about process control (Bryan, 1981).

Bobeng and David (1978 a,b) have refined the HACCP model as applied to foodservice systems. Their use of HACCP has incorporated the idea of quality as a multidimensional characteristic of food: microbiological, nutritional, and sensory. For foodservice systems models, these authors identified four critical control points as: 1) ingredient control and storage, 2) equipment sanitation, 3) personnel sanitation, and 4) time and temperature parameters. Their system assumes that critical control points are interdependent. Loss of control at one point may have a cumulative effect on other factors. The use of HACCP is thus recommended as a quality control tool for foodservice operations.

The importance of testing the processing and control techniques in real or simulated settings cannot be overemphasized. Because of the many commercial and institutional settings and systems, as well as, the complex and interactive nature of the food product flow, interactions of food in the various systems requires increased observation and study. The result would be stronger measurement and control of food quality within the foodservice systems organizational structure.

Ongoing Quality and Quality Control Programs

Quality control techniques represent mainly product orientation as opposed to customer orientation since the methods used are taken from manufacturing systems (King, 1982). With some alterations, manufacturing control techniques are used in foodservice.

A comparison between business and industry techniques of quality control can be made. Components of an industry system are: 1) setting

product standards; 2) designing a system standard for price and efficiency; 3) testing and inspection; and 4) analyzing results. King (1982) further states that foodservice needs to use quality control for: 1) inspection of raw materials for conformance to specifications; 2) use of standardized recipes; 3) tasting and testing final product; and 4) final inspection as product leaves the preparation area.

Several methods have emerged within the foodservice industry to implement quality control. The first example represents use of quality control in a hospital environment. McLaren (1973) installed a system of checks to pinpoint the potential causes of customer dissatisfaction. This system was developed by the Commission for Administrative Service (CASH) in Hospitals. The system included three parts; the food preparation and service check sheet; the housekeeping and sanitation check sheet; and the patient food service survey.

The food preparation and service check is performed by dietary staff on a rotating basis, for one meal each day. The other two meals are checked by supervisors. The quality control checker selects ten items to evaluate before tray assembly. Five of the items are evaluated for appearance, texture, and taste; the other five are checked against established standards for actual temperatures on the serving line. The housekeeping and sanitation inspections divide the department into ten work areas: 1) cafeteria dining area; 2) cafeteria serving area; 3) storeroom and walk-in refrigerators; 4) hot food production area; 5) cold food production area; 6) tray assembly area; 7) nourishment preparation area; 8) bakery; 9) warewash area; and 10) dietary office. A staff member inspects two of these areas daily; all 10 are inspected each week. Five pieces of equipment are inspected daily for

cleanliness, orderliness, and operational condition. Within the workforce, two employees from the area are randomly selected for inspection in regard to uniforms and hygiene. The foodservice is the third area monitored. A weekly patient satisfaction survey is conducted.

More than 35 California hospitals have adopted the CASH system for their dietary staffing and quality control system. The focus of the CASH system within the California hospitals has been in two parts, a utilization index and a quality index. Both indexes are charted on a graph. The utilization index is calculated by multiplying the total sum of patient needs and cafeteria transactions by a predetermined factor This predetermined factor is then divided by the total direct labor hours. The quality control component of the system is based on two-weekly sampling periods of 30 minutes each. The sampling periods are a measure of employee work output. The objectives of the system were: 1) to index the quality level of meal preparation, service, housekeeping and sanitation, 2) to provide measurement on an ongoing basis, 3) to obtain feedback, and 4) to establish quality assurance (Edgecumbe, 1966).

The Greyhound Food Management Company (Restaurant Business, 1979) has instituted a quality standards strategy due to deteriorating food quality. The company decided to incorporate a get tough policy regarding quality assurance. The program included a new infield inspection system, new product specifications, new field testing procedures, and a new recipe system.

The new Greyhound system now utilizes field inspection of foodservice operations, accomplished through 11 full-staff personnel. The field staff: 1) checks branch operations, 2) inspects managers for

adherence to new preparation techniques, 3) provides assistance in cost analysis, and 4) instructs in the proper procedures for purchasing, receiving and storage. Another major modification involved the distribution of the new product specifications, revising all food catagories. Additionally, a new recipe system was established, covering preparation methods for over 500 items. As part of the Greyhound Company new quality control plan, a product evaluation center equipped with a fully operational kitchen and specially designed product evaluation room was purchased.

Kubu (1973) describes a quality assurance system for Burger King. He states that restaurants are more difficult to assure quality within, opposed to food plants where production is controlled. The reason is that in restaurants, preparation must be ready at any time and in any sequence. In fast food, the products are handed directly to patrons with no time for any analysis.

At Burger King, the program is based on strong management commitment. The structure of the program includes: specifications, operation standards, product descriptions, and storage procedures. These standards are all incorporated into an operating manual, distributed to managers. Specifications included are for ingredients and raw materials. Working standards for operation include equipment, maintenance, and facilities. Product descriptions are formulations for all items served, while procedures for storage include handling, preparation and service of food.

The organization of Burger King's quality control program is based on two components, quality assurance in restaurants and quality control in plant processing and delivery. The assurance program has four

aspects namely, quality audits, training of supervisors, approval and monitoring of ingredients, and inspection of packing plants.

Another example of quality control within foodservice is the procedure used by the Dunkin' Donuts of America System. Bolaffi, Tillinghast, Hoyt, and Mallary (1973) relate that their program is well defined, standardized and ongoing. They feel that the overall system begins with specifications based on consumer requirements, followed by raw materials testing procedures, which are sent to an outside laboratory. The Corporation Quality Assurance Committee then coordinates the activities of quality control efforts.

The control of quality in the food industry represents a vast area of concern. Quality assurance and quality control systems signify a scope, standardization and process which reflects the evaluation of an entire food system. Research is needed to discover if there is mutual agreement between foodservice educators and students as to what is quality of food prepared in quantity. It is the students who will eventually become the individuals' responsible for quality assurance and quality control.

Summary

There is limited research available on food quality applied to foodservice systems. There are large gaps in our knowledge; this makes it difficult to predict quality changes during the processes used in foodservice operations. Quantitative data are needed on changes in flavor, texture, and appearance of foods so that maintenance and improvement of product quality is achieveable (Lund, 1982). The same

observation can be made for data, both quantitative and qualitative, in foodservice systems.

To predict changes in food quality so that procedures in foodservice systems may be incorporated into the system, requires the addition of studies of quantitative data used to evaluate and predict food quality changes. The HACCP concept is applicable as one control measure in food quality control. Additional appropriate models are needed.

Considerable additional data are required in order to generate information on heating and holding of food products. Studies of equipment and time temperature procedures are deficient as well.

Little application has been made to real systems. The data obtained ought to be workable in actual systems as opposed to just simulated surroundings. Real usage provides for effective and efficient criteria which are operable in quality control programs. In addition to sensory, nutritional, and microbial considerations, data are needed to derive the new knowledge necessary to increase understanding of products, processes, resources, and management in foodservice.

CHAPTER III

METHOD

The purpose of this study was to develop a consensus of food quality attributes and to determine the perceptions of four types of students regarding food quality attributes for quantity prepared food. This chapter includes the research design, sample, instrumentation, data collection, and data analysis used in this study.

Research Design

The research design used for this study was the descriptive status survey. The function of the descriptive status survey is to describe a specific set of phenomena at one point in time (Fox, 1969). In this study, the current perceptions of students regarding their knowledge of and the importance of the food quality attributes were described. Descriptive research attempts to describe systematically, factually, and accurately a situation or topic of interest (Joseph and Joseph, 1979).

Survey research is explanatory or analytical in nature. In this type of survey research, inferences can be drawn from samples to the whole population regarding the prevalence, distribution, and interrelations of economic, sociological, and psychological variables. Survey research is probably most commonly used to obtain the opinions and attributes of individuals to study social structure (Kerlinger, 1964).

Population and Sample

The population for this study was the four types of students: Dietetic Intern, Plan IV, CUP, and CHRIE in all program locations for the groups throughout the United States during the Spring semester, 1985. The invited sample in this research (Table Ia) was comprised of all four types of students: Dietetic Intern, Plan IV, CUP, and CHRIE. Three of the four groups of students in this study were obtained from the American Dietetic Association (ADA) Directory of Dietetic Programs (1985). The three groups obtained from the ADA directory were: Dietetic Intern, Plan IV, and CUP. The fourth group was composed of hotel, restaurant, and institutional management students which were obtained from the Directory of Hotel, Restaurant, and Institutional Schools (1982) published by the Council of Hotel, Restaurant, and Institutional Education (CHRIE).

The surveys were sent to the four types of students through the institutions representing those programs: Dietetic Intern (N = 81), Plan IV (N = 54), CUP (N = 42), and CHRIE (N = 61). Because of the large number of Plan IV institutions, the Plan IV group included only land grant institutions. The CHRIE group included only the four year program option. Within the CUP and Dietetic Internship groups, program emphases with clinical or community nutrition were eliminated unless the programs included generalist and/or management areas as well.

TABLE Ia

POPULATION AND SAMPLE

	Population	Sample
Types of Students	No. of Programs	No. of Programs
Dietetic Intern	106	81[1]
Plan IV	272	54[2]
CUP	60	42[1]
CHRIE	146	61[3]

[1]Only programs with generalist and/or management emphasis were surveyed.
[2]Only land-grant institutions were surveyed.
[3]Only four-year institutions were surveyed.

Sources: Directory of Dietetic Programs (1985) and Directory of Hotel, Restaurant, and Institutional Schools (1982).

Development of Data Collecting Instrument

A structured group process called Nominal Group Technique (NGT), (Appendix A), was used to derive the quality attributes of food prepared in quantity. Seven faculty members and graduate students from the Food, Nutrition, and Institution Administration (FNIA) Department and the Hotel and Restaurant Administration (HRAD) School at Oklahoma State University participated in the NGT session. The voting process resulted in a listing of 40 quality attributes (Appendix B). Additional categories reported in the literature were added to the list. Similar

categories were then grouped under seven broad headings. A revised list was constructed (Appendix B).

Copies of the revised list were distributed to nine faculty and 15 graduate teaching or research assistants in the FNIA Department and HRAD School for their comments and suggestions regarding clarity and comprehensibility of the quality attributes. In addition, the faculty and graduate assistants were asked to verify cluster classifications; to change, delete, or substitute statements; and to suggest additional attributes. Suggestions and comments returned from about one half of the faculty and graduate students in the FNIA Department and the HRAD School at Oklahoma State University in February 1985 were compiled.

Instrumentation

A research questionnaire was developed, utilizing the food quality attributes listed in Appendix B; incorporating comments and suggestions from faculty and graduate students; and including other food quality attributes found in the literature.

Part I of the questionnaire focused on the general information component of the survey. The questions related to the following demographic information: declared major, student classification, sex, age group, course credits (hours), and foodservice work experience. Geographic area was determined by the postmark on the return envelope.

Part II of the instrument identified 24 food quality attributes. A Likert type rating scale was developed for both Columns B and C. Column B was the rating scale for importance. Respondents were asked to circle a number on the scale: 1 (very important) to 5 (not important) in order to describe the importance of the food quality attributes. Column C was

a scale for rating the knowledge attained by the students, relative to the 24 attributes. The scale ranged from 1 (learned a great deal) to 5 (did not learn). Additionally, following the last attribute was a place for the respondents to specify other attributes.

Graduate faculty members in the Department of FNIA, the School of HRAD, and the Department of Statistics at Oklahoma State University examined the instrument for content validity, clarity, and format. Modifications were made based on comments relative to the positioning and clarity of questions on the survey instrument.

The instrument was pilot tested in the Spring 1985 Quantity Food Production class (N = 22) and the Experimental Methods in Food and Nutrition Research class (N = 6) in the FNIA Department at Oklahoma State University. Comments and suggestions as a result of the pilot test were incorporated into the final instrument.

The final instrument was printed on both sides of one page of paper; it was color coded by the four types of programs to facilitate data tabulation (Appendix C).

Data Collection

The questionnaires were mailed on April 8, 1985 to 238 institutions. Three of the student groups: Dietetic Intern, Plan IV, and CUP were mailed to the addresses obtained from the Directory of Dietetic Programs (1985) from the American Dietetic Association (ADA). The CHRIE group addresses were obtained from the Directory of Hotel, Restaurant, and Institutional Schools (1982). Questionnaires were mailed to program directors for the various institutions.

The questionnaires were mailed with a cover letter (Appendix C) explaining the purpose of the research. Two types of cover letters were distributed. The first letter was appropriate for use in CUP or Dietetic Intern programs. The second letter was for use in Plan IV or CHRIE programs. The letter requested that only students currently enrolled in or who had completed Quantity Food Production Management complete the survey. April 30, 1985 was stated as the deadline for return of the surveys.

Surveys were mailed using cluster sampling in groups of 10 per institution. Each institution received an envelope containing a cover letter, 10 surveys, and a return envelope. All return envelopes provided paid return postage. There was no follow-up for the surveys after they were distributed due to time and money constraints.

Data Analysis

The data obtained from the survey were quantifiable. Because data were in ordered categories measurement was on an ordinal scale. These data were coded and keypunched directly into the mainframe computer (IBM 3081D) at Oklahoma State University using time sharing option (TSO).

Appropriate programs were selected to analyze the data using the Statistical Analysis System (SAS) (Helwig, 1979). Standard statistical procedures including frequency distribution and chi-square were used to analyze the data. The frequency distributions showed the occurrence of answers relative to the demographic variables and the food quality attributes. The relationship between selected demographic variables and the ranking of both the importance scores and the knowledge scores pertaining to each type of student program were determined through use

of the chi-square. The level of significance for the chi-square analysis was set at $p \leq .05$.

CHAPTER IV

RESULTS AND DISCUSSION

Data for the study were obtained via the instrument described in Chapter III, Methods. The questionnaires were mailed in clusters of 10 to 238 program directors for four types of students: Dietetic Intern, Plan IV, CUP, and CHRIE. The anticipated number of students surveyed was 2,380. Some program directors, however, photocopied additional questionnaires, hence returns varied from one to 60 responses from the individual programs and totalled 973 responses (Figure 1).

The response rate was 40 percent (N = 973). Although 973 respondents reflect 40 percent of the projected number of responses (N = 2,380), the true response rate is below 40 percent because a number of institutions returned more than the 10 surveys they were originally mailed. The researcher, however, decided to analyze the data from all responses (N = 973).

Characteristics of Survey Respondents

Age

Nine percent (N = 90) of the respondents were under age 21; 86 percent of those surveyed (N = 836) were between the ages of 21 to 30; 3.4 percent (N = 34) of the respondents were between 31 to 40 years of age; one percent (N = 10) of the students were 41 to 50 years of age or

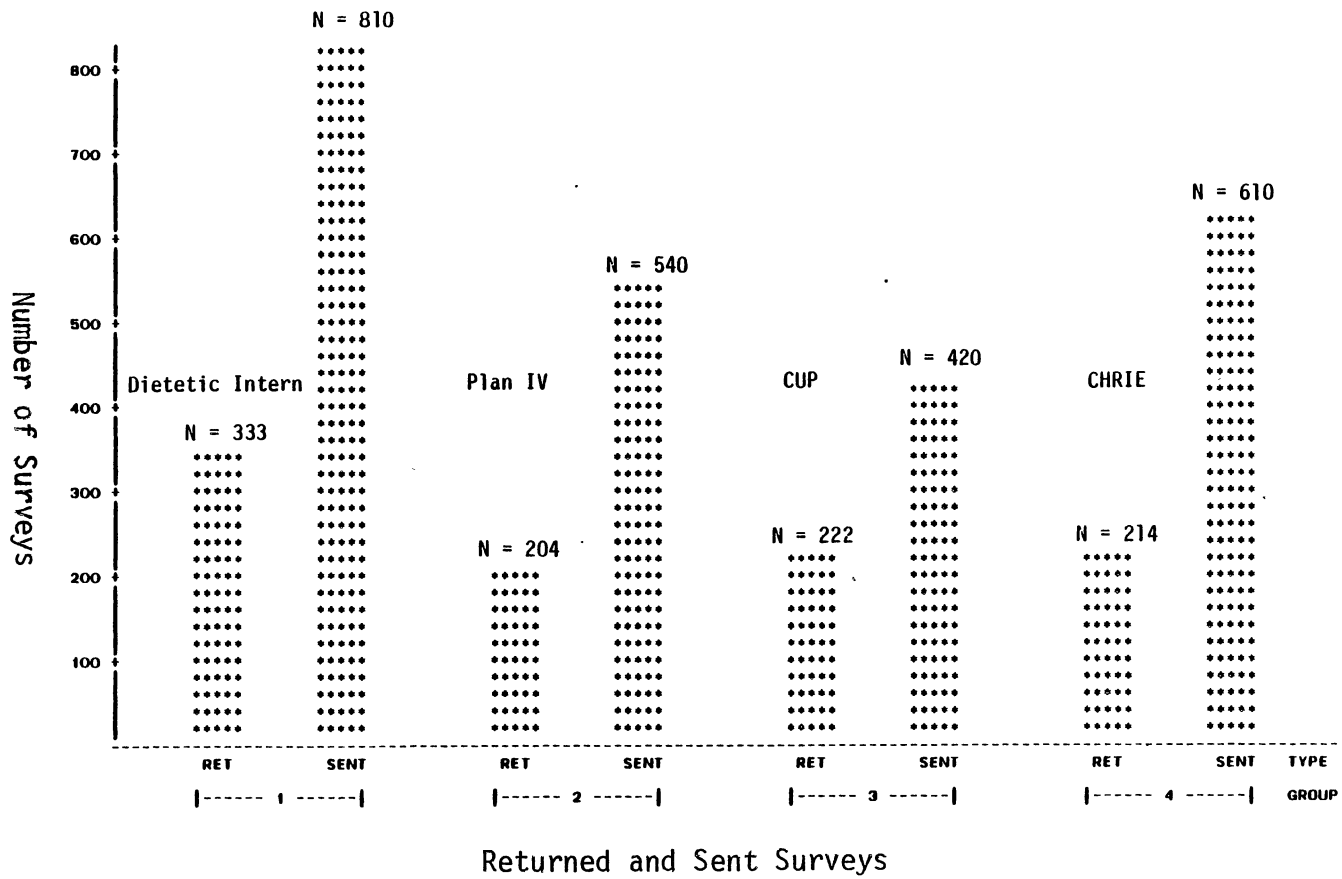


Figure 1. Sample Size and Survey Responses by Group

older; and 0.2 percent (N = 2) of the respondents were 51 years of age and older. One respondent did not indicate an age group.

Sex

Of the 973 respondents, 85.4 percent (N = 814) were female and 15 percent (N = 13) were male. Twenty respondents did not indicate their sex.

Classification

The students in the survey were classified as either one of several undergraduate student classifications or as a graduate student. Sophomores were found to be only one percent (N = 10) of the students; juniors comprised 23.6 percent (N = 230) of the respondents; seniors made up 38.2 percent (N = 372) of the students classified; and 37 percent (N = 360) were classified as graduate students.

Declared Major

The largest percentage of the students surveyed 31.8 percent (N = 309) declared dietetics (Plan IV) as their major; 13 percent (N = 126) of the respondents were foodservice management majors; hotel administration was reported as a major by 3.9 percent (N = 38) of the students; and foodservice and hotel administration was indicated by 9.5 percent (N = 93) of the respondents. Nutrition was reported as a major by 4.9 percent (N = 48) of those surveyed while home economics was selected by only .3 percent (N = 3) of the respondents. CUP, a program, rather than a major, was indicated by 15 percent (N = 146) of the students. Food science was not reported as a major. Dietetic Interns chose internship

as a major in 31.8 percent (N = 309) of those surveyed. Four respondents did not indicate a major.

Number of Credits

Designations for total number of course credits were reported in semester or quarter hours. All credits given were converted to semester hours. Incomplete answers for this question were prevalent. It appears in many cases that the students reported only their current semester of work. Number of credits ranged from 0 to 48. Many of the students also reported the number of credits only, and not the corresponding course titles. The most commonly reported courses under food preparation were basic food preparation and meal management. Under food science, courses listed were food science, food chemistry, and food microbiology, while under the category of foodservice, quantity food production, foodservice management, procurement, and equipment were indicated courses.

The average number of food preparation credits taken was six. Almost 20 percent (N = 173) of the respondents reported having taken this amount of coursework. In food science, close to 25 percent of the respondents (N = 216) reported three credits as an average. Foodservice coursework totalled six credits on the average. Seventeen and a half present (N = 155) of the respondents reported having taken or currently taking six credits of foodservice courses.

Years of Work Experience

For the amount of work experience in foodservice; 53.6 percent (N = 521) of the students answered as having completed less than one year of work experience; 24.9 percent (N = 242) of the respondents reported 1 to

2 years of experience; 13.8 percent (N = 134) of those surveyed cited 3 to 4 years; and 7.6 percent (N = 74) of the respondents declared 5 or more years of work experience. Two respondents did not answer this section.

Type of Program

Four types of programs were represented in this study: Dietetic Intern, Plan IV, CUP, and CHRIE. The largest group of students represented were the Dietetic Interns (N = 333). This was followed by the CUP group with 222 respondents. The third largest group was CHRIE with 214 students followed by 204 respondents in the Plan IV (Dietetics) group (Figure 1).

Geographic Area

The selection of United States geographic areas in this survey was based on the American Dietetic Association (ADA) membership areas (Appendix D). The largest areas represented were areas II and VI. Area II equalled 24.9 percent (N = 234) of the respondents. Area VI was 17.8 percent (N = 167) of the respondents. Results are shown in Table Ib.

TABLE Ib

GEOGRAPHIC AREA

Area	Number of Respondents	Total %
I	118	12.5
II	234	24.9
III	58	6.1
IV	118	12.5
V	150	15.9
VI	167	17.8
VII	93	9.9

Ranking of Food Quality Attributes

by Importance and Knowledge

As illustrated in Table II, the 24 attributes were ranked according to the respondents' perceptions for importance of and knowledge of the food quality attributes. As a result of the ranking, it was discovered that there is a considerable difference between how the respondents' perceived the importance of each of the attributes compared to their knowledge of the attributes. It can be noted however, that the first nine attributes were given under both the importance and knowledge rankings.

Mean Scores of Food Quality Attributes

by Importance and Knowledge

Figures 2 and 3 show the mean score responses given by the student respondents for importance and knowledge of the 24 food quality

TABLE II

RANK ORDER OF RESPONSES FOR FOOD QUALITY ATTRIBUTES BY IMPORTANCE AND KNOWLEDGE

	Importance	Knowledge
1.	Appearance	Temperature
2.	Flavor/Taste	Portion Size
3.	Customer Satisfaction	Flavor/Taste
4.	Consistency in Product Results	Appearance
5.	Temperature	Consistency in Product Results
6.	Holding Food	Nutrient Retention
7.	Color/Color Retention	Holding Food
8.	Nutrient Retention	Color/Color Retention
9.	Portion Size	Customer Satisfaction
10.	Aroma/Smell	Texture/Mouthfeel
11.	Texture/Mouthfeel	Shape (Variety)
12.	Product Identifiability	Sensory Evaluation
13.	Customer Expectation	Customer Expectation
14.	Seasoning	Aroma/Smell
15.	Sensory Evaluation	Product Identifiability
16.	Reheating Food	Reheating Food
17.	Shape (Variety)	Garnishment
18.	Complaint Analysis	Seasoning
19.	Garnishment	Food Decoration
20.	Food Decoration	Satiety
21.	Satiety	Food Evaluation Equipment
22.	Food Styling (Art)	Complaint Analysis
23.	Food Evaluation Equipment	Sound (While Eating)
24.	Sound (While Eating)	Food Styling (Art)

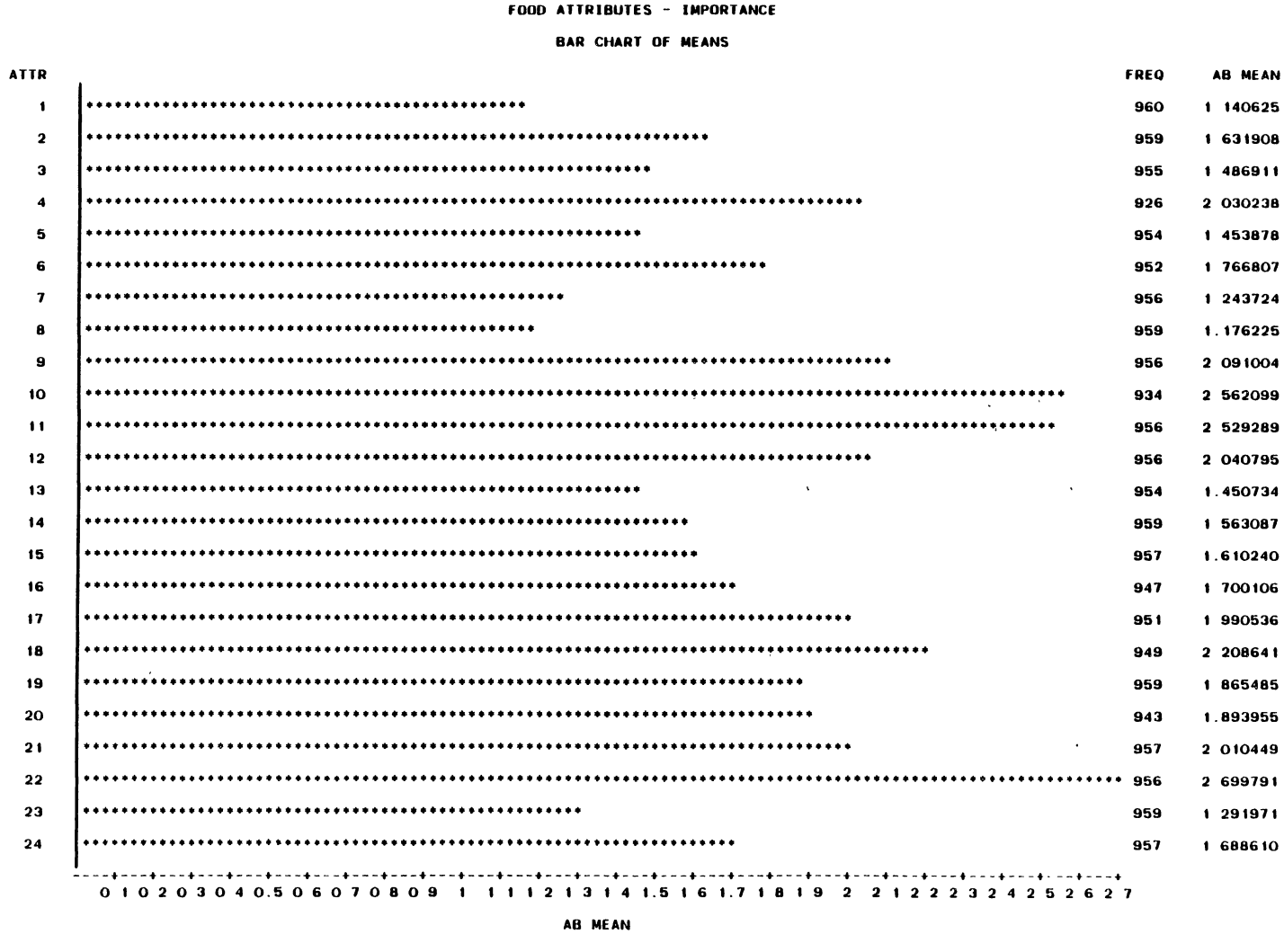


Figure 2. Mean Importance Scores of Food Attributes by Respondents

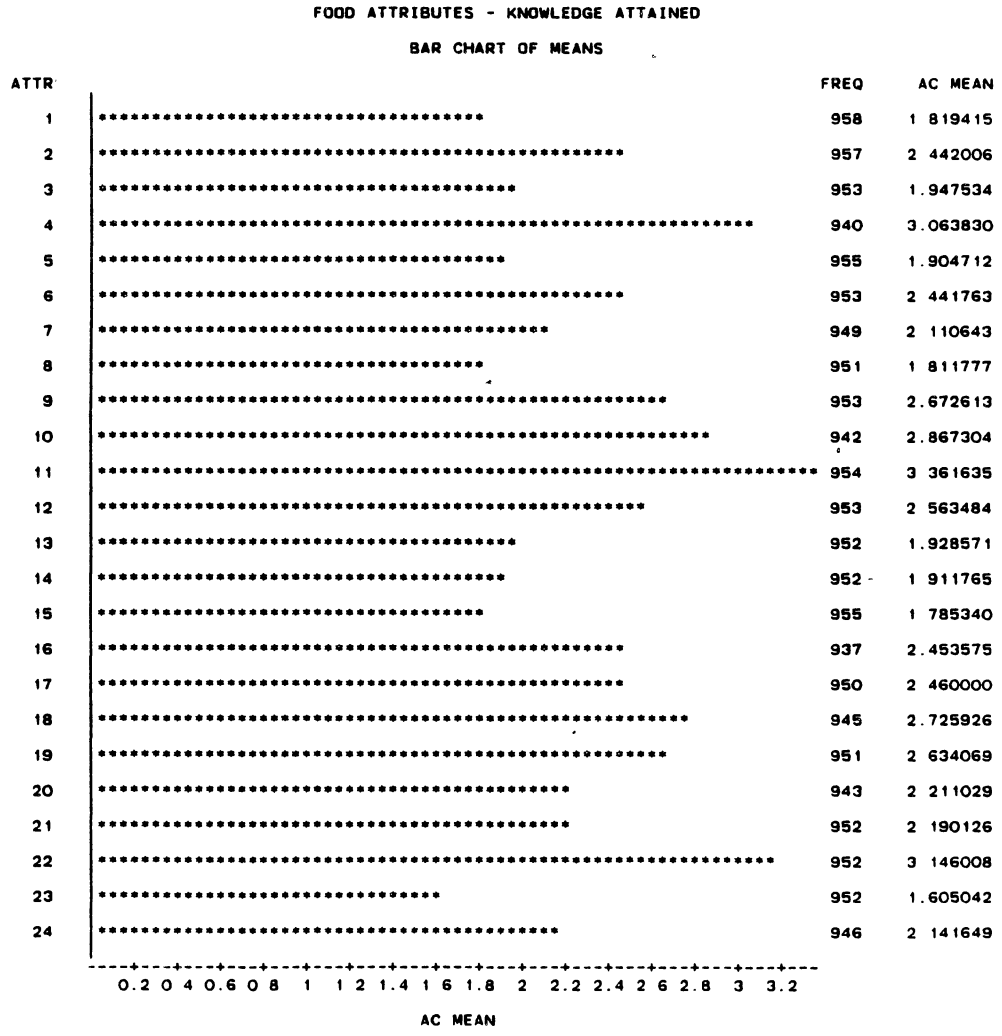


Figure 3. Mean Knowledge Scores of Food Attributes by Respondents

FOOD ATTRIBUTES - IMPORTANCE
GROUP=DIETETIC INTERN

BAR CHART OF MEANS

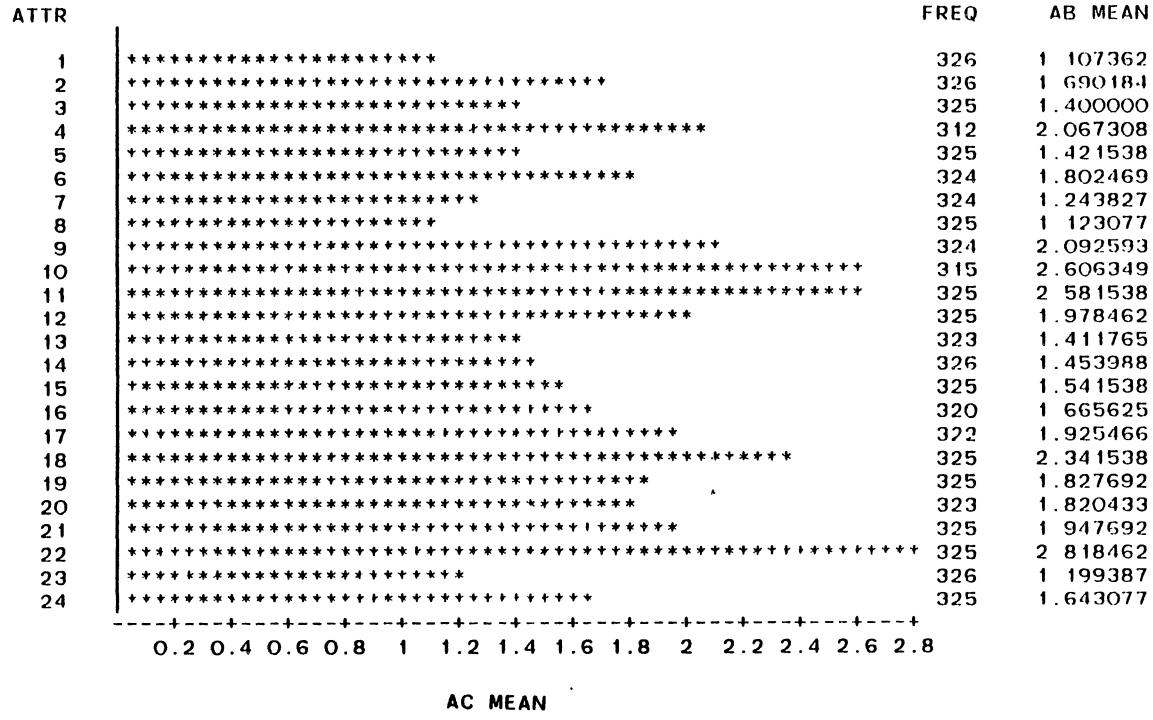


Figure 4. Mean Importance Scores of Food Attibutes by Dietetic Intern Group

FOOD ATTRIBUTES - KNOWLEDGE ATTAINED
GROUP=DIETETIC INTERN

BAR CHART OF MEANS

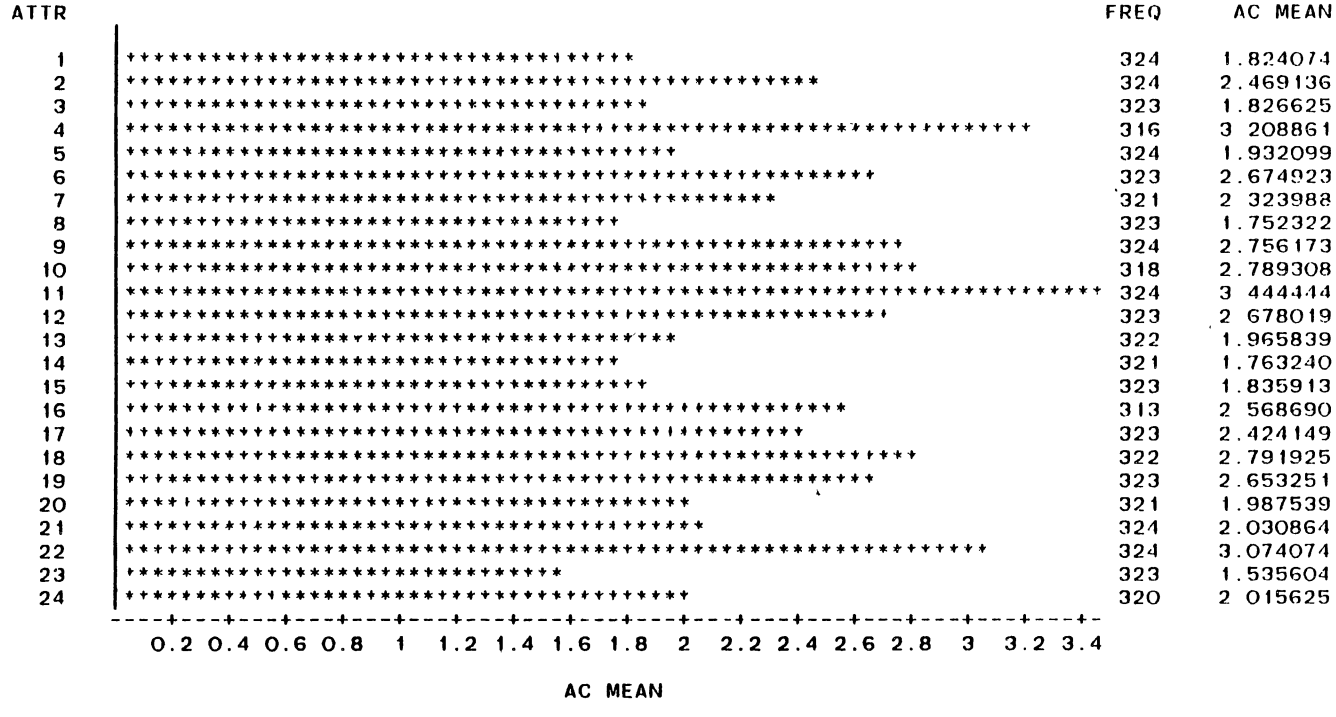


Figure 5. Mean Knowledge of Food Attributes by Dietetic Intern Group

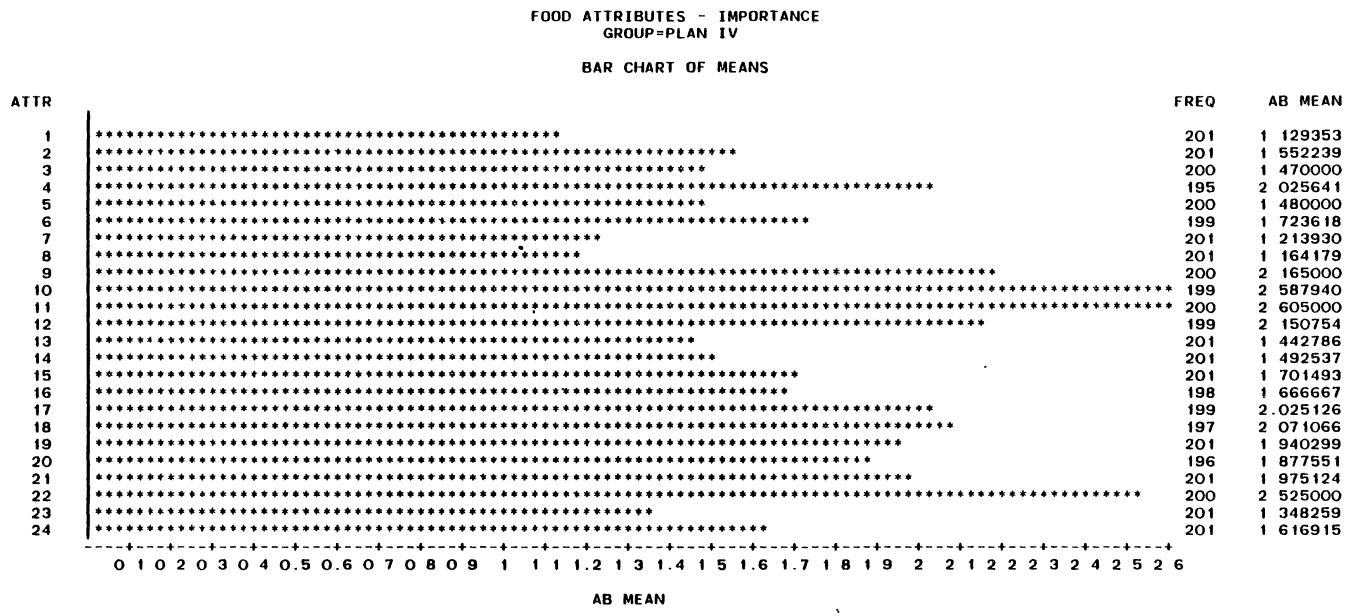


Figure 6. Mean Importance Scores of Food Attributes by Plan IV Group

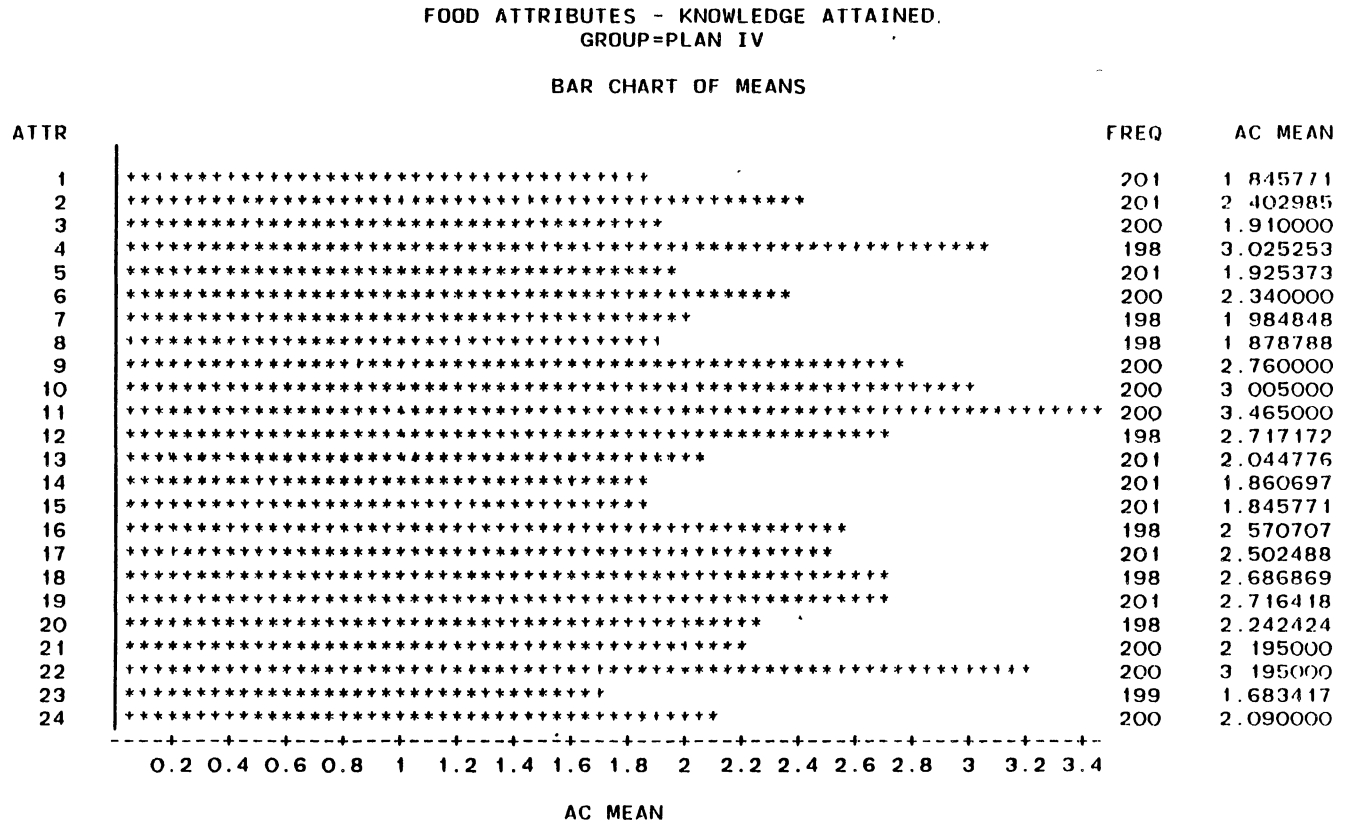


Figure 7. Mean Knowledge Scores of Food Attributes by Plan IV Group

FOOD ATTRIBUTES - IMPORTANCE
GROUP=CUP

BAR CHART OF MEANS

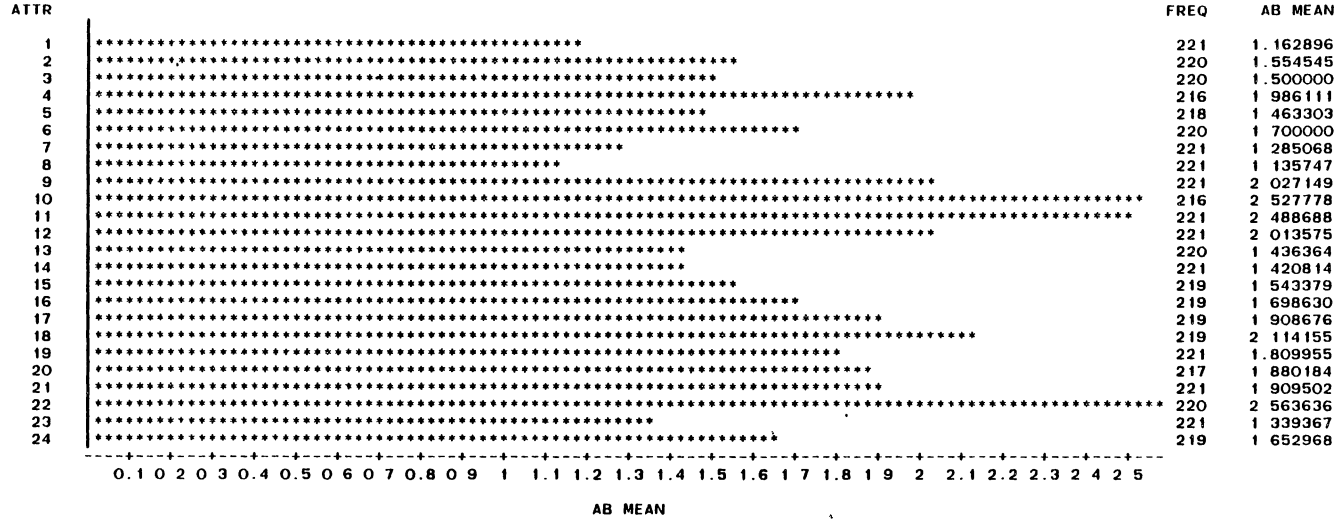


Figure 8. Mean Importance Scores of Food Attributes by CUP Group

FOOD ATTRIBUTES - KNOWLEDGE ATTAINED
GROUP=CUP

BAR CHART OF MEANS

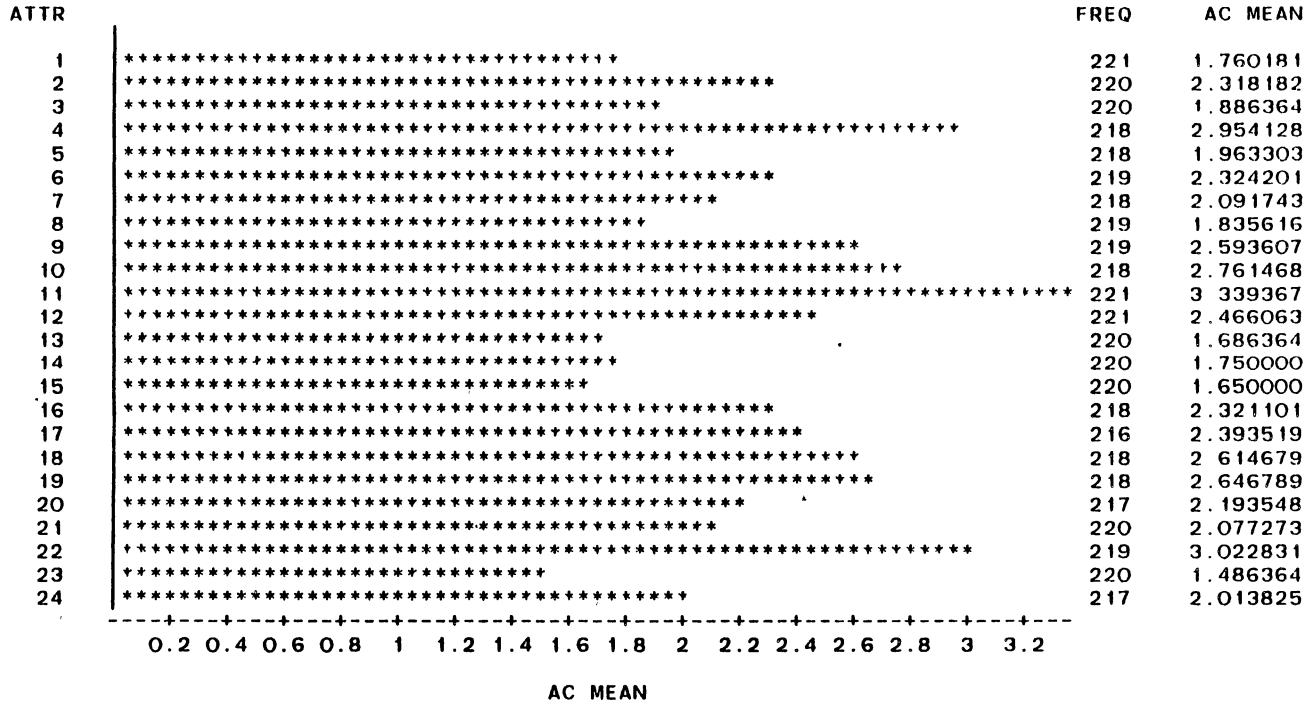


Figure 9. Mean Knowledge Scores of Food Attributes by CUP Group

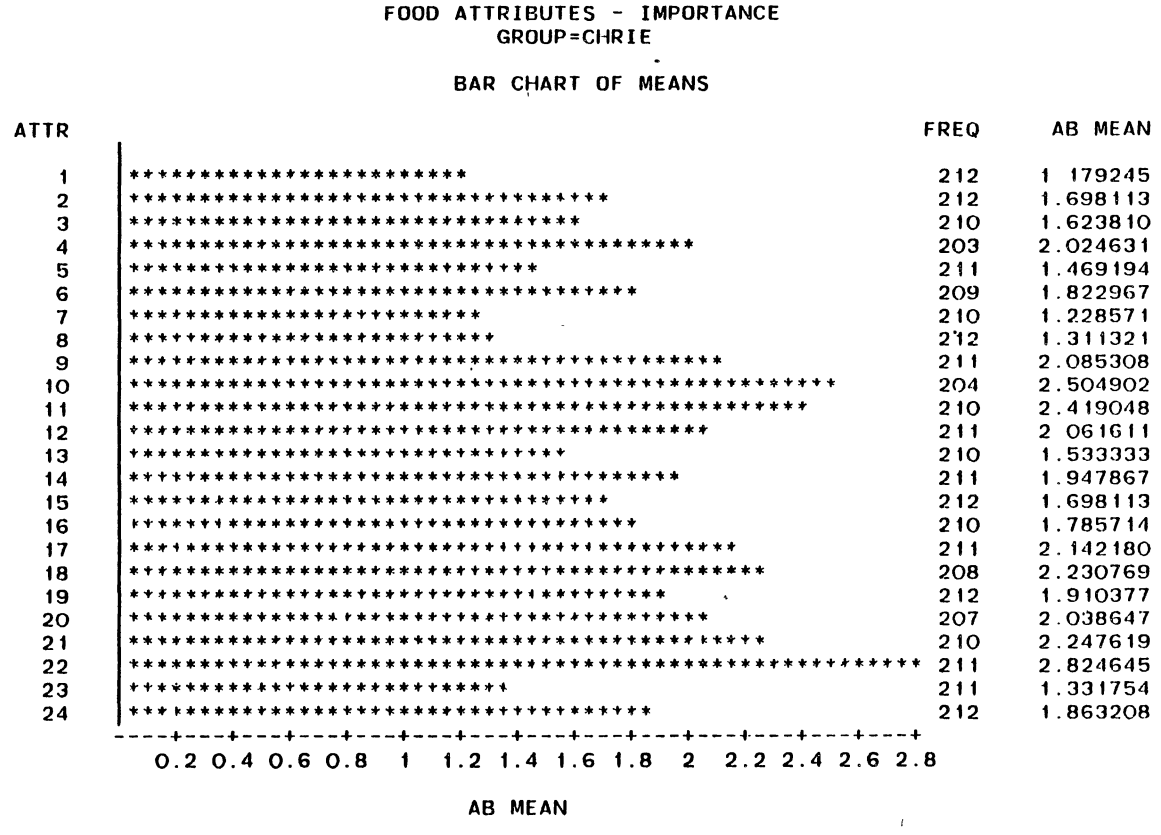


Figure 10. Mean Importance Scores of Food Attributes by CHRIE Group

FOOD ATTRIBUTES - KNOWLEDGE ATTAINED
GROUP=CHRIE

BAR CHART OF MEANS

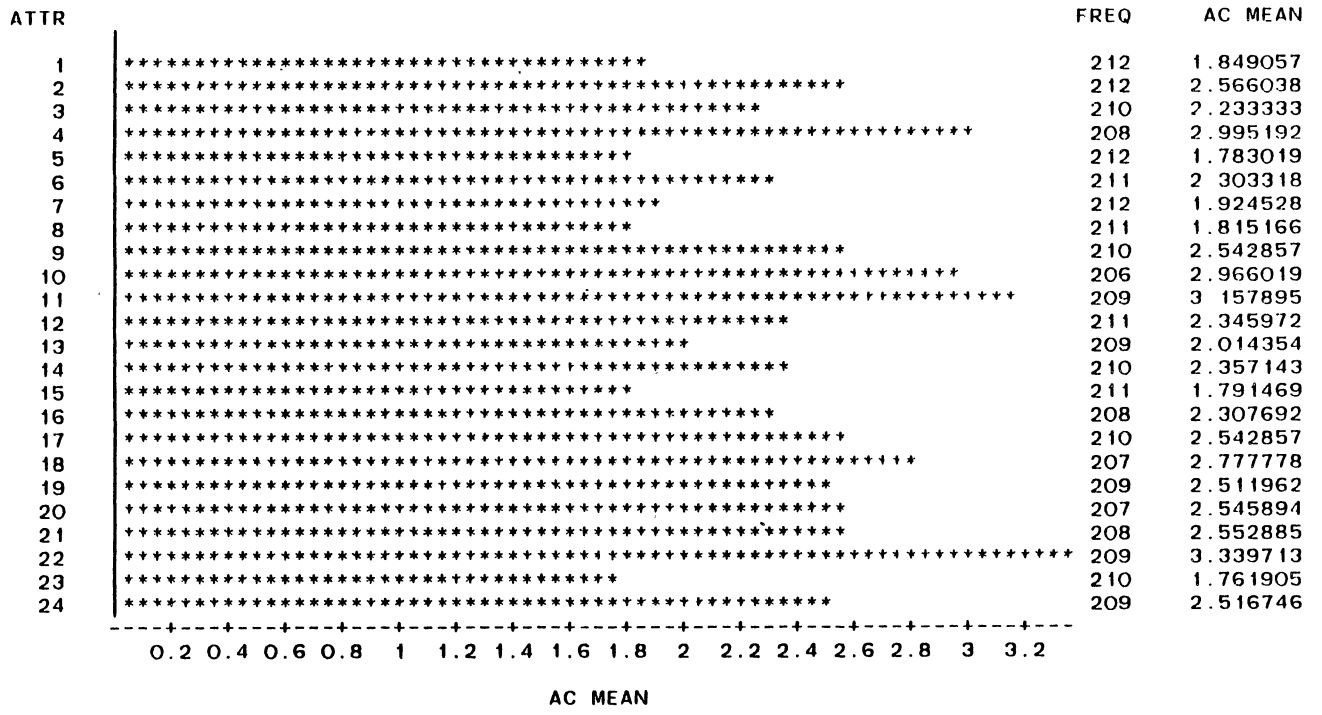


Figure 11. Mean Knowledge Scores of Food Attributes by CHRIE Group

attributes. The listing in the figures is based on the original order of the attributes in the survey questionnaire. The student mean scores are based on a Likert ranking scale of one to five. The importance scores ranged from one, very important to five, not important. The knowledge scores are from one, learned a great deal to five, did not learn.

Figure numbers 2 through 11 show the mean score responses by the respondents for importance and knowledge of the 24 food quality attributes. Mean importance scores for all respondents are located in Figure 2. The mean knowledge scores for all respondents are shown in Figure 3.

Figures 4 through 11 show the mean responses by each of the four student groups: Dietetic Intern, Plan IV, CUP, and CHRIE. Mean importance scores for Dietetic Interns are found in Figure 4. Figure 5 shows mean knowledge scores for the Dietetic Interns.

Plan IV student mean scores for the attributes are reported in Figures 6 and 7. Figure 6 shows mean importance scores. The mean knowledge scores are located in Figure 7.

Figures 8 and 9 show the mean responses for the CUP group. Figure 8 reports CUP student mean importance scores. Figure 9 shows mean knowledge scores of the food quality attributes for CUP respondents.

The CHRIE group mean scores are located in Figures 10 and 11. The mean scores for importance by the CHRIE group are shown in Figure 10. Figure 11 shows the mean knowledge scores of the CHRIE students for the quality attributes.

Interrelationship of the 24 Food Quality Attributes

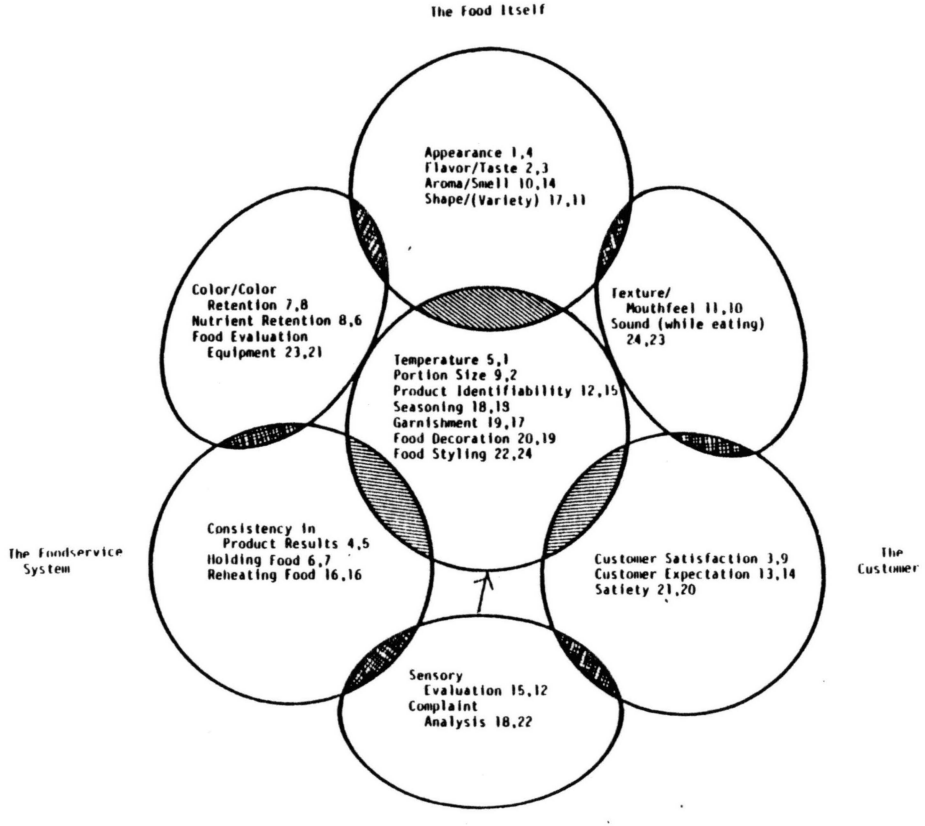
As previously stated in Chapters I and II, the term food quality is an elusive and indistinct construct. Although some researchers and the public have used unidimensional measures to capture the concept, the review of literature, as well as the NGT sessions described in Chapter III (also, in Appendix B) reflected that food quality has several dimensions.

As a result of a critical examination of the 24 attributes, at least three major dimensions in the term food quality emerged: 1) the food itself; 2) the manner in which the food is prepared or processed and served; and 3) the outcome of the preparation, as perceived by the customer or client (Figure 12).

Four of the 24 attributes were arbitrarily assigned to the dimension, the food itself, while three attributes each were found to be closely allied with the foodservice system, where the food is purchased, prepared and served; and with the customer or client dimensions. Other attributes were then assigned in-between the three major dimensions where they were closely related. Seven attributes located in the center of the diagram were related to all three dimensions.

Two numbers are attached to each of the individual attributes in the diagram. The first number represents the ranking of the attributes by importance, while the second number is the ranking of the respondents' knowledge attainment of the attribute.

Arguments can be made for or against where each attribute is placed. Since food quality has never been viewed as an interrelationship between the 24 variables, perhaps this paradigm can be seen as a



*first digit represents the ranking on importance
second digit the ranking on knowledge attained

Figure 12. Food Quality Illustrating the Interrelationship of the 24 Attributes

reflection of one attempt to model food quality and provide insights for other research to define and model food quality.

Chi-Square Analyses

Appearance: Importance and Knowledge by Demographic Variables and Types of Student

Chi-square determinations on the importance of appearance by demographic variables and types of student groups showed associations between the Dietetic Intern group and age ($p = .0001$), and between the Plan IV group and class ($p = .0002$) (Table IIIA). Two hundred and eighty-two (90 percent) of 313 of the Dietetic Intern respondents in the age group of 21-30, indicated that the food attribute appearance was a very important dimension of quality. In contrast, 100 percent of those in the age group: less than 20 ($N = 1$), 31 to 40 ($N = 8$), and 51 to 60 ($N = 1$) indicated that appearance was an important component of quality. Only 66 percent ($N = 2$) of those who were aged 41-50, however, indicated that appearance was important.

All Plan IV seniors ($N = 105$) indicated that appearance was a very important attribure. Of the graduate students, 15 out of 16 indicated that the attribute, appearance was very important. Almost all of the juniors (105 out of 106), and sophomores (four out of five) also selected very important as a response for appearance. The rest of the students indicated that appearance was only somewhat important.

On knowledge attained for the attribute appearance, associations were found between CHRIE and age ($p = .0186$) and between Plan IV and class ($p = .0017$) (Table IIIB). CHRIE group respondents ($N = 212$) gave responses to all five number rankings on the scale. Most of the

TABLE III

CHI-SQUARE ANALYSIS OF FOOD ATTRIBUTE APPEARANCE: IMPORTANCE AND KNOWLEDGE BY DEMOGRAPHIC VARIABLES

(A) Importance

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	36.106	.122	.441	4.508	9.944
	df	8	2	2	6	12
	p	.0001*	.9408	.8022	.6083	.6209
Plan IV	x^2	.552	2.494	31.592	8.546	15.578
	df	9	2	9	9	18
	p	.7838	.2874	.0002*	.4801	.6220
CUP	x^2	3.901	4.469	3.144	8.644	11.201
	df	8	2	4	6	12
	p	.8659	.1070	.5341	.1946	.5118
CHRIE	x^2	6.126	1.617	10.625	5.958	15.160
	df	9	3	9	9	18
	p	.7273	.6555	.3023	.7441	.6510

(B) Knowledge

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	6.369	7.301	.457	8.278	19.471
	df	12	3	3	9	18
	p	.8964	.0629	.9283	.5064	.3634
Plan IV	x^2	4.960	.302	26.457	12.834	18.631
	df	9	3	9	9	18
	p	.8378	.9597	.0017*	.1703	.4149
CUP	x^2	13.759	.255	6.516	6.332	18.772
	df	12	3	6	9	18
	p	.3164	.9683	.3679	.7063	.4060
CHRIE	x^2	18.380	4.993	14.386	11.893	34.045
	df	8	4	12	12	24
	p	.0186*	.2880	.2767	.4543	.0839

* Significant at $p \leq 0.05$

respondents (N = 177) were aged 21-30 and their responses were learned a great deal (N = 142), 34 selected learned moderately and only one answered did not learn for that category. Of the 30 respondents aged under 21 years, only one selected did not learn, 21 answered learned a great deal and 8 answered learned moderately.

The highest percentage of the answers given by the Plan IV group on knowledge attained for the attribute, appearance (N = 87) was 2 on the scale, indicating a great deal of learning. In this category, were sophomores, juniors, seniors and graduate students. In contrast, 2 juniors and 2 graduate students claimed no knowledge of the attribute. Seventy-four respondents chose a score of 1, the highest score for knowledge on the scale, compared to 35 scoring only moderate learning of the attribute.

Aroma/Smell: Importance and Knowledge by Demographic Variables and Types of Student

Chi-square analyses on the importance of appearance by demographic variables and types of student groups showed a significant association between the Plan IV group and sex (p = .0480) and the Plan IV group and work experience (p = .0077) (Table IVA). Of the 195 Plan IV respondents, 165 were female. Their responses were 155 for very important and 10 for moderate importance of the attribute aroma/smell. The male responses included 24 for very important and only 6 answers for not important.

Work experience attained by the Plan IV students on the average, was less than one year. This amount of experience was given by over 60 percent of the group. Of the 125 responses under the category less than

TABLE IV

CHI-SQUARE ANALYSIS OF FOOD ATTRIBUTE AROMA/SMELL: IMPORTANCE AND KNOWLEDGE BY DEMOGRAPHIC VARIABLES

(A) Importance

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	5.027	2.557	.889	7.366	14.885
	df	12	3	3	9	18
	p	.9571	.4650	.8280	.5990	.6698
Plan IV	x^2	1.904	7.907	4.248	22.401	11.911
	df	9	3	9	9	18
	p	.9929	.0480*	.8943	.0077*	.8518
CUP	x^2	9.394	1.597	2.828	3.532	17.204
	df	8	2	4	6	12
	p	.3102	.4500	.5870	.7397	.1421
CHRIE	x^2	6.814	.332	14.353	6.984	19.621
	df	9	3	9	9	18
	p	.6565	.9539	.1103	.6388	.3545

(B) Knowledge

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	6.625	5.039	1.039	9.288	22.522
	df	16	4	4	12	24
	p	.9798	.2833	.9038	.6782	.5481
Plan IV	x^2	7.043	3.857	12.297	23.984	40.826
	df	12	4	12	12	24
	p	.8548	.4257	.4221	.0204*	.0174*
CUP	x^2	20.979	4.600	4.901	4.600	29.115
	df	16	4	8	12	24
	p	.1793	.3309	.7681	.9700	.2158
CHRIE	x^2	4.723	3.302	19.687	14.382	32.330
	df	8	4	12	12	24
	p	.7868	.5087	.0732	.2770	.1190

* Significant at $p \leq 0.05$

one year of experience, most of the answers (N = 119) given were very important for the attribute aroma/smell, while only 6 in that category marked somewhat important. Those respondents with one or two years of experience (N = 35) marked very important responses and 3 respondents chose somewhat important answers for the attribute aroma/smell. Most of the students answering under the categories of 3-4 years of work experience and 5 or more years of work experience answered very important to the attribute.

Pertaining to the knowledge of the attribute aroma/smell, associations were found between the Plan IV group and work experience and the Plan IV group and geographic area (Table IVB). Respondents in the Plan IV group were mostly in the less than one year of work experience category. Within this category of student scores, 60 students marked learned a great deal, while 64 respondents claimed moderate knowledge for the aroma/smell attribute. The other work experience categories up to five or more years, also ranked a great deal of learning for the greatest percentage of the answers.

Knowledge of the attribute aroma/smell as indicated by the Plan IV group, resulted in answers that were mostly numbers two and three on the five point scale. These responses represented learned a great and moderate learning scores. Area II, the largest area, had 22 respondents marking learned a great deal, 21 respondents claiming moderate learning, and 1 respondent declaring no learning of aroma/smell.

Color/Color Retention: Importance and Knowledge by Demographic Variables and Types of Student

There were no significant results for importance of the food quality attribute color/color retention. The demographic variables did not significantly affect the scores for importance of the attribute (Table V A).

Scores for the knowledge attainment of color/color retention were found to have a significant association between the Plan IV group and class ($p = .0046$) (Table V B). Answers by Plan IV students ($N = 199$) fell mostly over learned a great deal on the scale. Seniors ($N = 105$) were the largest classification with 85 student answers on learned a great deal. Of the 73 juniors, 58 gave learned a great deal responses. Fourteen out of 16 graduate students and 2 out of 5 sophomore answers were in the learned a great deal category.

Complaint Analysis: Importance and Knowledge by Demographic Variables and Types of Student

Chi-square determinations on the importance of the attribute complaint analysis by demographic variables and types of student groups showed associations between the Dietetic Intern group and geographic area ($p = .0155$), the CUP group and class ($p = .0233$), and the CUP group and geographic area ($p = .0001$) (Table VIA). Complaint analysis as viewed by the Dietetic Interns ($N = 294$) showed that most of the answers were from Areas II and V. In Area II, 59 students gave very important responses, and 8 gave somewhat important responses to the attribute. From Area V, 53 answered with very important responses, and 18 reported somewhat important answers for the attribute complaint analysis.

TABLE V

CHI-SQUARE ANALYSIS OF FOOD ATTRIBUTE COLOR/COLOR RETENTION: IMPORTANCE AND KNOWLEDGE BY DEMOGRAPHIC VARIABLES

(A) Importance

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	5.632	2.861	.299	6.390	3.485
	df	8	2	2	6	12
	p	.6883	.2392	.8610	.3810	.9910
Plan IV	x^2	5.365	2.397	7.375	11.838	7.663
	df	6	2	6	6	12
	p	.4979	.3017	.2875	.0657	.8109
CUP	x^2	4.698	.462	4.350	6.100	16.393
	df	12	3	6	9	18
	p	.9673	.9271	.6294	.7299	.5652
CHRIE	x^2	2.159	3.425	5.220	5.019	16.324
	df	9	3	9	9	18
	p	.9887	.3307	.8148	.8327	.5699

(B) Knowledge

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	4.472	6.055	.490	17.280	17.908
	df	16	4	4	12	24
	p	.9978	.1951	.9745	.1394	.8074
Plan IV	x^2	10.174	3.794	28.539	13.130	22.087
	df	12	4	12	12	24
	p	.6007	.4347	.0046*	.3597	.5741
CUP	x^2	5.718	1.225	5.887	11.450	35.978
	df	16	4	8	12	24
	p	.9909	.8740	.6599	.4908	.0552
CHRIE	x^2	14.268	1.336	13.534	13.262	28.915
	df	8	4	12	12	24
	p	.0750	.8553	.3315	.3503	.2234

* Significant at $p \leq 0.05$

TABLE VI

CHI-SQUARE ANALYSIS OF FOOD ATTRIBUTE COMPLAINT ANALYSIS: IMPORTANCE AND KNOWLEDGE BY DEMOGRAPHIC VARIABLES

(A) Importance

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	6.050	2.394	.288	13.456	41.276
	df	16	4	4	12	24
	p	.9875	.6638	.9906	.3368	.0155*
Plan IV	x^2	9.573	3.989	15.186	10.790	24.312
	df	9	3	9	9	18
	p	.3862	.2627	.0859	.2904	.1451
CUP	x^2	18.003	3.515	17.737	11.242	72.544
	df	16	4	8	12	24
	p	.3237	.4756	.0233*	.5083	.0001*
CHRIE	x^2	13.259	3.905	15.458	9.428	34.249
	df	12	4	12	12	24
	p	.3505	.4190	.2174	.6660	.0804

(B) Knowledge

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	10.785	4.946	2.989	10.950	21.930
	df	16	4	4	12	24
	p	.8226	.2929	.5597	.5333	.5834
Plan IV	x^2	12.821	6.109	6.947	16.730	37.099
	df	12	4	12	12	24
	p	.3822	.1912	.8611	.1600	.0428*
CUP	x^2	17.660	13.037	9.081	12.042	40.488
	df	16	4	8	12	24
	p	.3442	.0111*	.3355	.4423	.0189*
CHRIE	x^2	9.421	6.744	29.021	9.241	62.890
	df	8	4	12	12	24
	p	.3080	.1501	.0039*	.6822	.0001*

* Significant at $p \leq 0.05$

CUP group responses totalled 163 for complaint analysis. Of these, 75.47 percent marked very important scores for the attribute. Most of those who chose very important as answers were upper class students. Two sophomores indicated that complaint analysis was not important.

CUP students, in general, marked point 2 on the scale of 5 most frequently for importance of complaint analysis. CHRIE respondents, also marked point 2 on the scale most frequently (50 percent, N = 102). Respondents varied by geographic area as to whether they marked very important or moderately important for the attribute complaint analysis.

Relative to knowledge attainment for the attribute complaint analysis, associations were found between the Plan IV group and geographic area ($p = .0428$), the CUP group and sex ($p = .0111$), the CUP group and geographic area ($p = .0189$), the CHRIE group and class ($p = .0039$) and CHRIE group and geographic area ($p = .0001$) (Table VI B). The Plan IV student scores for complaint analysis were mostly located at 3 (midpoint on the response scale). This showed moderate knowledge of the attribute. Area II, the largest group, followed the same trend of answering mostly scores on scale point 3 for moderate learning. Area VI had responses from 36 students, 12 of which were learned moderately and 11 were learned a great deal.

The majority of the CUP students responded with moderate learning to the question on knowledge of complaint analysis. A total of 4 males and 69 females marked that they had learned a great deal about complaint analysis. Nineteen females and three males answered that they did not learn about complaint analysis. One male declared moderate learning compared to 114 females giving the same answer.

Two hundred and three CUP students answered the complaint analysis question. Most of the respondents (N = 65) were at point 3 on the scale. Area II, the largest representation, had 33 answers for learned moderately as compared to 25 answers for learned a great deal. Area I, with 43 student responses, showed 31 scores of learned moderately, with only 8 scores of learned a great deal.

CHRIE students (N = 208) responded most frequently with answers that reflected learned a great deal and learned moderately. Most of the respondents were in the senior class. Seventy-eight of the seniors gave moderate learning answers and 51 answered learned a great deal.

Most frequently indicated CHRIE scores for knowledge of attribute complaint analysis showed that both a great deal of learning and moderate learning had occurred. Seven areas were represented with a total of 208 responses. Area VI, had 28 responses for learned a great deal and 41 responses for moderate learning of complaint analysis.

Consistency in Product Results: Importance and Knowledge by Demographic Variables and Types of Student

Associations were found for the importance of the attribute consistency in product results between the Plan IV group and sex ($p = .0415$) and the CUP group and geographic area ($p = .0382$) (Table VII A). Answers for the attribute consistency in product results by the Plan IV group, given by both male and female respondents, indicated that over 94 percent (N = 194) selected very important answers. Thirty of the responses were from male students. Moderate importance responses were selected by 11 males and females.

TABLE VII

CHI-SQUARE ANALYSIS OF FOOD ATTRIBUTE CONSISTENCY IN PRODUCT RESULTS: IMPORTANCE AND KNOWLEDGE BY DEMOGRAPHIC VARIABLES

(A) Importance

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	6.437	1.116	2.402	.420	12.714
	df	8	2	2	6	12
	p	.5984	.5723	.3009	.9987	.3902
Plan IV	x^2	13.600	8.230	6.860	7.175	24.557
	df	9	3	9	9	18
	p	.1373	.0415*	.6517	.6189	.1376
CUP	x^2	6.790	.734	5.078	3.510	21.940
	df	8	2	4	6	12
	p	.5595	.6927	.2794	.7426	.0382*
CHRIE	x^2	7.000	6.494	5.791	6.596	24.578
	df	9	3	9	9	18
	p	.6371	.0899	.7607	.6791	.1370

(B) Knowledge

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	9.077	2.474	7.370	4.571	27.192
	df	16	4	4	12	24
	p	.9102	.6492	.1176	.9708	.2956
Plan IV	x^2	8.490	2.211	9.563	10.381	38.516
	df	12	4	12	12	24
	p	.7458	.6970	.6542	.5825	.0307*
CUP	x^2	9.402	7.364	3.488	15.724	40.278
	df	16	4	8	12	24
	p	.8959	.1178	.9001	.2042	.0200*
CHRIE	x^2	5.702	4.069	9.538	11.078	21.896
	df	8	4	12	12	24
	p	.6806	.3968	.6565	.5222	.5854

* Significant at $p \leq 0.05$

All of the CUP group respondents rated consistency in product results from 1 through 3 on the scale (very important to moderately important). Most of the responses (N = 120) were the top score on the Likert scale. Within Area II, the largest proportion of respondents, selected score 1 on the scale most frequently followed by scores 2 and then 3.

Relative to knowledge attainment for the attribute consistency in product results, associations were found between the Plan IV group and geographic area (p = .0307) and the CUP group and geographic area (p = .0200) (Table VII B). Two groups showed significance for the attribute consistency in product results, Plan IV and CUP. Of the 201 Plan IV responses, 156 students (77.61 percent) claimed having learned a great deal. This was also true for Area II, from which the largest number of responses came. Area II student scores (N = 37) were answered with learned a great deal, six responses represented moderate learning scores, and one respondent marked did not learn. In contrast, CUP responses were mainly under learned a great deal, with 150 of the 203 responses on the high end of the scale. Area II students, answered mostly with learned a great deal scores.

Customer Expectation: Importance and Knowledge by Demographic Variables and Types of Student

There was one significant chi-square association for the importance of the attribute customer expectation between the Dietetic Intern group and work experience (p = .0016) (Table VIII A). Customer expectation scores by the Dietetic Intern group, disclosed that most of the

TABLE VIII

CHI-SQUARE ANALYSIS OF FOOD ATTRIBUTE CUSTOMER EXPECTATION: IMPORTANCE AND KNOWLEDGE BY DEMOGRAPHIC VARIABLES

(A) Importance

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	12.976	4.962	5.269	26.569	15.720
	df	12	3	3	9	18
	p	.3708	.1746	.1531	.0016*	.6121
Plan IV	x^2	9.040	4.172	14.178	3.689	19.002
	df	9	3	9	9	18
	p	.4336	.2435	.1161	.9307	.3917
CUP	x^2	2.788	4.359	12.156	11.871	23.461
	df	12	3	6	9	18
	p	.9969	.2252	.0586	.2207	.1735
CHRIE	x^2	20.061	1.660	9.818	7.633	23.025
	df	12	4	12	12	24
	p	.0659	.7980	.6320	.8131	.5183

(B) Knowledge

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	15.524	4.552	6.695	10.157	16.191
	df	16	4	4	12	24
	p	.4867	.3364	.1529	.6022	.8810
Plan IV	x^2	11.554	3.564	14.166	9.332	24.067
	df	12	4	12	12	24
	p	.4821	.4682	.2903	.6743	.4577
CUP	x^2	18.255	.397	5.478	19.028	33.674
	df	16	4	8	12	24
	p	.3092	.9828	.7055	.0878	.0907
CHRIE	x^2	13.211	3.448	21.551	6.318	38.764
	df	8	4	12	12	24
	p	.1048	.4859	.0429*	.8992	.0289*

* Significant at $p \leq 0.05$

respondents had less than one year of work experience, or from one to two years of work experience. Their responses were mainly, very important on the scale. Answers by respondents with three to four years of experience were also mostly very important for the attribute.

Relative to the knowledge attainment for the attribute customer expectation, chi-square associations were found between the CHRIE group and class ($p = .0429$) and the CHRIE group and geographic area ($p = .0289$) (Table VIII B). The responses by the CHRIE group for customer expectation showed considerable division between high and moderate learning. Of the 211 respondents, 146 seniors made-up the largest group. Their responses included a great deal of learning ($N = 92$), 50 responses for moderate learning, and 4 responses claiming no learning had occurred. Of the 11 graduate students, 9 indicated moderate knowledge of customer expectation, while 2 indicated a great deal of learning of the attribute. The perceptions of knowledge by juniors were high learning ($N = 29$), moderate learning ($N = 17$), and no learning ($N = 3$). Sophomores showed moderate learning scores for customer expectation ($N = 3$) compared to having learned a great deal ($N = 2$).

The majority of the CHRIE answers showed the largest portion of the answers on numbers 2 and 3 on the scale. Of the 211 CHRIE student respondents, 125 marked learned a great deal for their answers, while 79 students marked that they had learned moderately about customer expectation. Most of the responses were from Area VI. Forty-two respondents answered learned a great deal and 26 answered moderate learning of the attribute.

Customer Satisfaction: Importance and Knowledge by Demographic Variables and Types of Student

Significant scores at the .05 level for the importance scores of the attribute customer satisfaction resulted in chi-square associations between the Plan IV group and sex ($p = .0039$), the Plan IV group and class ($p = .0410$), and the Plan IV group and work experience ($p = .0181$) (Table IX A). Respondents in the Plan IV group for customer satisfaction totalled 195. Of those responses, 30 were from male students. The males indicated their answers as very important ($N = 28$) and only 2 males selected somewhat important as an answer. Females ($N = 164$) indicated that customer satisfaction was a very important attribute. Only one female gave the attribute a moderate importance score.

A majority of the Plan IV group of students (161 out of 200), indicated the top 2 numbers on the scale for importance of the customer satisfaction attribute. The seniors comprised 105 of the 200 respondents. Eighty-three of the seniors in Area III, chose very important responses. Area II respondents ($N = 62$), the second largest area, also gave the highest number of responses for very important.

Moreover, most of the Plan IV respondents (125 out of 200) classified themselves as having less than one year of work experience. Over 95 percent of the respondents showed very important responses as answers to the importance of customer satisfaction. The other respondents ($N = 38$) comprising the second largest percentage, 19 percent, classified their work experience in the one to two year category. In this category, 36 respondents answered very important responses, while 2 respondents perceived the attribute to be only somewhat important.

TABLE IX

CHI-SQUARE ANALYSIS OF FOOD ATTRIBUTE CUSTOMER SATISFACTION: IMPORTANCE AND KNOWLEDGE BY DEMOGRAPHIC VARIABLES

(A) Importance

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	3.394	1.274	.247	5.254	12.483
	df	12	3	3	6	18
	p	.9921	.7352	.9696	.5117	.8213
Plan IV	x^2	1.723	13.361	17.533	19.970	16.356
	df	9	3	9	9	18
	p	.9951	.0039*	.0410*	.0181*	.5677
CUP	x^2	1.309	.318	2.646	6.085	10.820
	df	8	2	4	6	12
	p	.9954	.8531	.6188	.4137	.5444
CHRIE	x^2	4.126	6.671	9.309	10.305	18.962
	df	12	4	12	12	24
	p	.9811	.1543	.6764	.5892	.7540

(B) Knowledge

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	20.783	5.112	10.245	6.441	25.969
	df	16	4	4	12	24
	p	.1870	.2760	.0365*	.8922	.3547
Plan IV	x^2	5.799	.996	14.714	9.252	27.594
	df	12	4	12	12	24
	p	.9259	.9104	.2575	.6813	.2775
CUP	x^2	9.809	4.294	13.089	18.596	43.002
	df	16	4	8	12	24
	p	.8764	.3677	.1088	.0987	.0099*
CHRIE	x^2	13.342	3.988	35.145	10.585	50.680
	df	8	4	12	12	24
	p	.1006	.4077	.0004*	.5647	.0012*

* Significant at $p \leq 0.05$

Chi-square associations for the perceptions of knowledge attainment were found significant in two student groups for class. Associations were found between the Dietetic Intern group and class ($p = .0365$) and the CHRIE group and class ($p = .0004$). Two other associations were found between the CUP group and geographic area ($p = .0099$) and the CHRIE group and geographic area ($p = .0012$) (Table IX B).

Dietetic Interns answered the customer satisfaction question on knowledge of the attribute most frequently at learned a great deal on the scale. Out of 321 responses, 188 were for learned a great deal. Respondents were seniors and graduate students. The graduate students answered 92 for learned a great deal compared to 125 answers for moderate learning. The 4 seniors answered one each, on points 1, 2, 3 and 5 on the scale.

Additional ranking by the CHRIE group on customer satisfaction showed that 75 percent of the respondents learned a great deal, while 22 percent attained only moderate learning. About 3 percent indicated no learning whatever. Most of the responses reflected a great deal of learning was made by 114 seniors, 41 juniors and 4 graduate students.

Groups CUP and CHRIE were examined concerning geographic area and the attribute customer satisfaction. CUP responses for this attribute were mostly for learned a great deal ($N = 137$, 67.49 percent). The high frequency of the learned a great deal response was true also for Area II, the largest area represented. Area II scores were 23 for learned a great deal with 13 scores for moderate learning. The CHRIE group ($N = 212$) as a whole, chose answers relative to points 2 and 3 on the scale, 125 chose the learned a great deal response and 79 marked moderate

learning responses. Area II, the largest represented, had scores of 24 for learned a great deal and 10 for moderate learning.

Flavor/Taste: Importance and Knowledge by Demographic Variables and Types of Student

Chi-square associations were found for the importance of the attribute flavor/taste between the Plan IV group and sex ($p = .0499$) and the CHRIE group and sex ($p = .0051$) (Table X A). The Plan IV students scored mostly for very important responses. Only 2 of the 195 students answered somewhat important for the attribute, while all others marked very important. Females numbered 165. All but 1 female answered very important. Males numbered 30 and 29 of them scored very important as answers.

For the attribute flavor/taste, respondents in the CHRIE group numbered 206; 97 percent ($N = 200$) of the students chose very important, 1 student selected not important, and 5 students gave somewhat important as their answers. Eighty-two males chose very important and only 4 males chose somewhat important as scores for the attribute flavor/taste.

All the significant associations for knowledge of the flavor/taste attribute were found in the CHRIE group. Associations were found between the CHRIE group and sex ($p = .0137$), the CHRIE group and class ($p = .0002$), and the CHRIE group and geographic area ($p = .0001$) (Table X B).

The attribute flavor/taste was scored positively by the CHRIE respondents. Of the 205 respondents, 87 were male. Seventy males reported that they had learned a great deal about flavor/taste. Females ($N = 102$) indicated the same response. Fourteen females and 17 males

TABLE X

CHI-SQUARE ANALYSIS OF FOOD ATTRIBUTE FLAVOR/ TASTE: IMPORTANCE AND KNOWLEDGE BY DEMOGRAPHIC VARIABLES

(A) Importance

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	10.661	.193	.504	10.188	9.545
	df	8	2	2	9	12
	p	.2217	.9081	.7771	.3355	.6558
Plan IV	x^2	2.670	5.996	4.586	11.269	11.405
	df	6	2	6	6	12
	p	.8490	.0499*	.5979	.0804	.4946
CUP	x^2	2.889	1.169	2.333	1.114	4.980
	df	8	2	4	6	12
	p	.9411	.5573	.6748	.9809	.9586
CHRIE	x^2	3.787	14.796	4.364	14.157	24.330
	df	12	4	12	12	24
	p	.9870	.0051*	.9759	.2908	.4428

(B) Knowledge

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	6.442	2.781	1.845	16.024	21.493
	df	12	3	3	9	18
	p	.8922	.4266	.6052	.0664	.2553
Plan IV	x^2	4.986	.390	14.958	9.000	16.645
	df	9	3	9	9	18
	p	.8356	.9422	.0921	.4372	.5476
CUP	x^2	12.986	1.354	5.409	12.383	10.578
	df	12	3	6	9	18
	p	.3701	.7163	.4925	.1926	.9114
CHRIE	x^2	9.076	12.557	37.136	18.212	59.204
	df	8	4	12	12	24
	p	.3360	.0137*	.0002*	.1094	.0001*

* Significant at $p \leq 0.05$

reported moderate learning of the attribute. Two females marked did not learn.

Other significant results for knowledge of the attribute flavor/-taste for the CHRIE group indicated association between the CHRIE group and student classification. One hundred and seventy-five students stated they had learned a great deal about flavor/taste, while 34 indicated having learned flavor/taste only moderately. Two respondents gave no learning as a response. Seniors (N = 115) indicated having learned a great deal about flavor/taste. Thirty senior answered moderate learning with only 1 senior claiming no learning at all. Furthermore, graduate students (N = 10) gave high learning answers with only one moderate learning score. Four sophomores scored learned a great deal and 1 sophomore indicated moderate learning. Forty-six juniors answered having learned a great deal, compared to two which indicated moderate learning and 1 claiming no learning of the attribute at all.

Responses to the attribute flavor/taste were significant in the CHRIE group. Respondents from all the geographic areas seemed to view their knowledge of flavor/taste as high, selecting learned a great deal on the scale. Thirty-four respondents claimed moderate learning, while two respondents selected did not learn.

Food Decoration: Importance and Knowledge by Demographic Variables and Types of Student

A chi-square association for the importance of the food decoration attribute was found between the CUP group and class (P = .0004) (Table XI A). The CUP group totalled 221 respondents. Sixty-five of

TABLE XI

CHI-SQUARE ANALYSIS OF FOOD ATTRIBUTE FOOD DECORATION: IMPORTANCE AND KNOWLEDGE BY DEMOGRAPHIC VARIABLES

(A) Importance

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	25.070	2.083	4.476	8.238	24.066
	df	16	4	4	12	24
	p	.0686	.7205	.3454	.7663	.4578
Plan IV	x^2	4.194	.455	5.188	13.382	18.725
	df	9	3	9	9	18
	p	.8982	.9287	.8176	.1461	.4089
CUP	x^2	13.913	1.419	24.856	5.617	9.353
	df	12	3	6	9	18
	p	.3063	.7011	.0004*	.7775	.9510
CHRIE	x^2	3.461	2.621	11.605	3.449	19.032
	df	9	3	9	9	18
	p	.9432	.4538	.2365	.9438	.3899

(B) Knowledge

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	15.261	4.050	5.201	16.522	30.124
	df	16	4	4	12	24
	p	.5056	.3992	.2672	.1685	.1807
Plan IV	x^2	24.472	3.688	24.752	27.967	33.831
	df	12	4	12	12	24
	p	.0175*	.4499	.0160*	.0056*	.0879
CUP	x^2	17.162	4.649	4.074	9.609	36.376
	df	16	4	8	12	24
	p	.3752	.3253	.8504	.6503	.0505
CHRIE	x^2	4.625	4.516	8.569	6.069	37.695
	df	8	4	12	12	24
	p	.7968	.3406	.7393	.9126	.0373*

* Significant at $p \leq 0.05$

the 105 juniors indicated that food decoration was a very important attribute. Of the 112 seniors, 92 answered that they have learned a great deal of food decoration.

Relative to knowledge attainment for the attribute food decoration, associations were found between the Plan IV group and class ($p = .0160$), the Plan IV group and work experience ($p = .0056$), and the CHRIE group and geographic area ($p = .0373$) (Table XI B).

Most of the Plan IV students ($N = 106$) indicated that their knowledge of food decoration was only moderate, however 88 others claimed having learned the attribute a great deal. Of the 199 Plan IV respondents, 105 were seniors.

The Plan IV group ($N = 106$) showed the highest number of responses for moderate knowledge of food decoration. Those with less than one year of work experience (largest category, $N = 73$) indicated that their knowledge of food decoration was only to a moderate degree.

In the CHRIE group for the attribute food decoration, 72 answers were from point 2 on the scale indicating learned a great deal, while 63 responses were at point three or moderate learning. The largest response, Area VI, marked mostly answers that were learned a great deal.

Food Evaluation Equipment: Importance and Knowledge by Demographic Variables and Types of Student

Chi-square associations were found for the importance of the attribute food evaluation equipment between the Dietetic Intern group and geographic area ($p = .0470$) and the CHRIE group and geographic area ($p = .0220$) (Table XII A). Food evaluation equipment showed significant

TABLE XII

CHI-SQUARE ANALYSIS OF FOOD ATTRIBUTE FOOD EVALUATION EQUIPMENT: IMPORTANCE AND KNOWLEDGE BY DEMOGRAPHIC VARIABLES

(A) Importance

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	9.556	6.652	1.320	9.313	36.688
	df	16	4	4	12	24
	p	.8887	.1554	.8579	.6760	.0470*
Plan IV	x^2	7.692	4.042	10.923	9.492	29.444
	df	12	4	12	12	24
	p	.8087	.4003	.5355	.6604	.2039
CUP	x^2	14.270	2.709	4.452	18.714	25.658
	df	16	4	8	12	24
	p	.5786	.6077	.8142	.0957	.3707
CHRIE	x^2	5.039	4.206	8.819	10.502	39.891
	df	12	4	12	12	24
	p	.9567	.3788	.7183	.5720	.0220*

(B) Knowledge

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	30.507	8.191	1.301	4.063	22.759
	df	16	4	4	12	24
	p	.0155*	.0848	.8612	.9823	.5340
Plan IV	x^2	6.402	2.024	9.940	16.389	33.969
	df	12	4	12	12	24
	p	.8945	.7313	.6212	.1741	.0853
CUP	x^2	17.313	.780	6.366	12.286	24.390
	df	16	4	8	12	24
	p	.3656	.9411	.6063	.4230	.4395
CHRIE	x^2	4.359	2.690	10.836	14.762	43.961
	df	8	4	12	12	24
	p	.8234	.6110	.5430	.2547	.0077*

* Significant at $p \leq 0.05$

results for the Dietetic Intern and CHRIE groups. In the Dietetic Intern group, respondents ranked from very important to moderately important for food evaluation equipment. This was true even for the largest area represented, Area II. These results can be compared to CHRIE respondents on the food evaluation equipment attribute. Ranking from the various geographic areas in the CHRIE group proved to be almost equally divided between very important and moderately important for all of the areas.

Associations were found for knowledge of the attribute food evaluation equipment between the Dietetic Intern group and age ($p = .0155$) and the CHRIE group and geographic area ($p = .0077$) (Table XII B). Dietetic Interns responded with answers on points 2 and 3 on the Likert type scale. The majority of the respondents ($N = 306$) were aged 21 to 30. Within this age group, 132 students marked learned a great deal compared to 144 answering moderate learning of food evaluation equipment.

CHRIE responses were predominently at the scale point three. Area VI, the largest area represented, also had most of the answers at point 3 on the scale. Overall, Area VI responses were 43 out of 68 for moderate learning of food evaluation equipment.

Food Styling: Importance and Knowledge by Demographic Variables and Types of Student

There were no significant results for the importance of the attribute food styling. The demographic variables did not significantly affect the scores for importance of the attribute (Table XIII A).

Two significant chi-square associations for knowledge of food styling were found between the CHRIE group and class ($p = .0325$) and the

TABLE XIII

CHI-SQUARE ANALYSIS OF FOOD ATTRIBUTE FOOD STYLING (ART): IMPORTANCE AND KNOWLEDGE BY DEMOGRAPHIC VARIABLES

(A) Importance

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	25.924	1.777	1.782	15.397	21.123
	df	16	4	4	12	24
	p	.0551	.7766	.7758	.2205	.6314
Plan IV	x^2	9.027	2.092	14.577	19.364	24.015
	df	12	4	12	12	24
	p	.7006	.7189	.2654	.0801	.4607
CUP	x^2	11.359	1.417	15.201	13.884	18.730
	df	16	4	8	12	24
	p	.7868	.8413	.0553	.3082	.7662
CHRIE	x^2	6.552	2.488	12.759	9.322	13.315
	df	12	4	12	12	24
	p	.8858	.6468	.3868	.6752	.9606

(B) Knowledge

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	13.102	7.387	1.670	14.391	22.327
	df	16	4	4	12	24
	p	.6653	.1168	.7962	.2765	.5597
Plan IV	x^2	15.247	2.165	7.091	10.642	32.850
	df	12	4	12	12	24
	p	.2282	.7055	.8515	.5598	.1073
CUP	x^2	9.852	5.470	7.778	15.794	25.159
	df	16	4	8	12	24
	p	.8742	.2423	.4554	.2009	.3971
CHRIE	x^2	12.928	2.599	22.475	8.691	37.979
	df	8	4	12	12	24
	p	.1143	.6270	.0325*	.7290	.0348*

* Significant at $p \leq 0.05$

CHRIE group and geographic area (p = .0348) (Table XIII B). CHRIE students scored more on moderate knowledge on the scale than on high knowledge attainment for the food styling attribute. Moderate learning answers were given by graduate students (N = 2), seniors (N = 85), juniors (N = 26), and sophomores (N = 2). Scores for a great deal of learning numbered only 63. In contrast to 6 graduate students, 19 seniors, 5 juniors, and 1 sophomore indicated that they have not learned food styling.

Most CHRIE respondents (115 out of 209) selected moderate knowledge for food styling. The highest area count was in Area VI, with 36 moderate knowledge responses and 8 no knowledge responses. The remaining 25 were high knowledge answers.

Garnishment: Importance and Knowledge by Demographic Variables and Types of Student

Chi-square associations resulted for importance of the food quality attribute garnishment between the CUP group and age (p = .0188) and the CUP group and class (p = .0202) (Table XIV) A). Out of the 221 CUP group responses, 81 percent were in the age group 21-30. One hundred twenty-nine students indicated that garnishment was a very important attribute. Only 51 respondents chose somewhat important, while one respondent said garnishment was not important at all.

CUP respondents also indicated that garnishment was a very important attribute. Most of the juniors (91 out of 112) indicated that garnishment was a very important attribute. Of the sophomores, 67 out of 105 also indicated that garnishment was very important, and to 2 of the 4 graduate students also gave the same response.

TABLE XIV

CHI-SQUARE ANALYSIS OF FOOD ATTRIBUTE GARNISHMENT: IMPORTANCE AND KNOWLEDGE BY DEMOGRAPHIC VARIABLES

(A) Importance

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	6.556	3.375	3.406	14.632	12.172
	df	12	3	3	9	18
	p	.8855	.3373	.3332	.1015	.8382
Plan IV	x^2	10.366	2.856	11.192	19.068	31.321
	df	12	4	12	12	24
	p	.5839	.5823	.5125	.0869	.1448
CUP	x^2	29.843	.414	18.142	11.292	31.273
	df	16	4	8	12	24
	p	.0188*	.9813	.0202*	.5041	.1461
CHRIE	x^2	12.273	6.186	12.481	9.900	35.902
	df	12	4	12	12	24
	p	.4240	.1857	.4079	.6247	.0561

(B) Knowledge

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	14.418	3.245	14.588	12.959	19.657
	df	16	4	4	12	24
	p	.5676	.5177	.0056*	.3720	.7161
Plan IV	x^2	13.693	1.861	17.940	14.340	41.770
	df	12	4	12	12	24
	p	.3208	.7612	.1175	.2795	.0137*
CUP	x^2	18.719	1.509	3.866	15.249	22.930
	df	16	4	8	12	24
	p	.2835	.8250	.8690	.2281	.5239
CHRIE	x^2	19.755	3.529	12.254	3.667	38.980
	df	8	4	12	12	24
	p	.0113*	.4735	.4255	.9887	.0274*

* Significant at $p \leq 0.05$

Associations were found for knowledge of the attribute garnishment between the Dietetic Intern group and class ($p = .0056$), the Plan IV group and geographic area ($p = .0137$), the CHRIE group and age ($p = .0113$), and the CHRIE group and geographic area ($p = .0274$) (Table XIV B). Dietetic Intern students marked their highest number of answers for moderate learning of garnishment. Of the 319 graduate students, 160 selected moderate learning responses whereas 62 chose the response, learned a great deal.

Two groups were analyzed for their significant answers to the garnishment attribute. Ninty-five out of 198 Plan IV respondents, revealed having moderate knowledge of garnishment. Answers from each of the geographic areas were mostly for moderate learning as well. Area VI was the largest group responding, with 19 moderate learning scores, 8 learned a great deal scores and 8 did not learn scores.

CHRIE student responses on garnishment were somewhat different with 127 respondents claiming having learned a great deal and 78 respondents declaring moderate knowledge responses for the attribute garnishment. Area VI, the largest area represented, reported 48 answers for learned a great deal and 21 answers for moderate learning.

Of the 211 CHRIE students who responded to the attribute garnishment, 176 were in the age group 21-30. Of this group, 105 indicated that they have learned a great deal of garnishment, 67 have moderate learning while only 4 have no knowledge of the attribute. Of the respondents in the age group 31-40, 4 selected learned moderately and only 1 student selected did not learn as an answer. Of the respondents under 21 years of age, 22 out of 30 indicated having learned

about garnishment a great deal, 7 claimed moderate learning and only 1 indicated no knowledge of the attribute.

Holding Food: Importance and Knowledge by Demographic Variables and Types of Student

There were no significant associations found for the importance of the attribute holding food. The demographic variables did not significantly affect the scores for importance of the attribute (Table XV A).

Three chi-square associations resulted between the Dietetic Interns and class ($p = .0001$), the Plan IV group and geographic area ($p = .0474$), and the CHRIE group and work experience ($p = .0071$) (Table XV B).

A total of 322 Dietetic Interns claimed to know holding food as it affects quality. Three seniors and 237 graduate students also claimed having a great deal of knowledge regarding holding food. Eight graduate students indicated no knowledge, whereas 73 graduate students and 1 senior indicated moderate learning for holding food.

Plan IV respondents also claimed a great deal of knowledge for holding food as an attribute. Area II, with the most respondents, have 34 responses for learned a great deal and 10 responses for moderate learning.

The CHRIE group also indicated having learned a great deal of holding food as an attribute. Respondents in all categories of work experience answered more often having learned a great deal than moderate knowledge or less.

TABLE XV

CHI-SQUARE ANALYSIS OF FOOD ATTRIBUTE HOLDING FOOD: IMPORTANCE AND KNOWLEDGE BY DEMOGRAPHIC VARIABLES

(A) Importance

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	4.462	.946	2.006	5.562	25.010
	df	16	4	4	12	24
	p	.9978	.9179	.7346	.9365	.4052
Plan IV	x^2	3.761	.787	4.522	7.935	21.792
	df	12	4	12	12	24
	p	.9874	.9401	.9721	.7902	.5916
CUP	x^2	2.837	.753	7.610	2.264	26.489
	df	12	3	6	9	18
	p	.9966	.8607	.2681	.9866	.0891
CHRIE	x^2	1.639	1.247	4.069	6.787	28.291
	df	9	3	9	9	18
	p	.9960	.7417	.9068	.6593	.0578

(B) Knowledge

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	7.664	3.883	40.717	7.088	14.920
	df	16	4	4	12	24
	p	.9583	.4221	.0001*	.8517	.9230
Plan IV	x^2	4.313	2.245	7.451	16.325	36.653
	df	12	4	12	12	24
	p	.9771	.6909	.8265	.1768	.0474*
CUP	x^2	10.101	2.766	4.864	3.450	24.030
	df	12	3	6	9	18
	p	.6071	.4291	.5614	.9437	.1540
CHRIE	x^2	8.773	4.636	3.708	27.276	27.193
	df	8	4	12	12	24
	p	.3618	.3267	.9881	.0071*	.2955

* Significant at $p \leq 0.05$

Nutrient Retention: Importance and Knowledge by Demographic Variables and Types of Student

Associations resulted for the importance of the attribute nutrient retention between the Plan IV group and sex ($p = .0002$) and the Plan IV group and class ($p = .0213$) (Table XVI A). The Dietetic Intern students ($N = 126$) chose most of their answers on point 1 of the scale (very important). Females marked a higher percentage of answers for very important ($N = 153$) while a few ($N = 11$) were for somewhat important scores. Of the males respondents, 20 were for very important compared to 10 for somewhat important scores.

Two hundred Plan IV students responded to the importance of nutrient retention, with seniors ($N = 105$) representing the majority of the group. Very important was ranked by 98 of the seniors with 1 claiming a not important score and 28 indicating moderate importance responses. Approximately half the graduate students ($N = 11$) marked very important and 5 respondents gave moderate importance answers. Of the 5 sophomore responses, 3 gave very important answers and 2 declared moderate importance answers. Sixty-five juniors chose very important scores while only 9 gave moderately important answers for the attribute nutrient retention.

Seventy-three percent of the CHRIE respondents indicated that nutrient retention was a very important attribute. Only 26 percent indicated that nutrient retention was somewhat important. The largest area represented was Area VI, with 41 students marking very important and 55 students answering with somewhat important responses for nutrient retention.

TABLE XVI

CHI-SQUARE ANALYSIS OF FOOD ATTRIBUTE NUTRIENT RETENTION: IMPORTANCE AND KNOWLEDGE BY DEMOGRAPHIC VARIABLES

(A) Importance

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	5.687	.797	2.652	9.927	9.298
	df	12	3	3	9	18
	p	.9310	.8502	.4485	.3564	.9524
Plan IV	x^2	10.002	21.751	23.856	11.835	29.423
	df	12	4	12	12	24
	p	.6157	.0002*	.0213*	.4590	.2046
CUP	x^2	6.628	.817	2.296	10.840	14.335
	df	12	3	6	9	18
	p	.8812	.8454	.8905	.2868	.7070
CHRIE	x^2	9.594	7.528	14.252	17.896	47.048
	df	12	4	12	12	24
	p	.6515	.1105	.2849	.1189	.0033*

(B) Knowledge

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	5.266	2.691	40.717	7.970	22.464
	df	16	4	4	12	24
	p	.9943	.6108	.0001*	.7875	.5516
Plan IV	x^2	7.467	2.409	13.293	4.865	14.477
	df	12	4	12	12	24
	p	.8253	.6610	.3481	.9623	.9351
CUP	x^2	14.804	.547	.8294	18.082	24.456
	df	16	4	8	12	24
	p	.5390	.9687	.4053	.1132	.4357
CHRIE	x^2	7.912	8.977	12.918	14.756	32.475
	df	8	4	12	12	24
	p	.4421	.0617	.3751	.2550	.1157

* Significant at $p \leq 0.05$

Pertaining to knowledge of the attribute nutrient retention, an association was found between the Dietetic Intern group and class (p = .0001) (Table XVI B). Dietetic Interns (N = 321) indicated a great of knowledge for the attribute. All graduate students (N = 265) and seniors (N = 2) answered that they knew a great deal about nutrient retention as a result of their coursework. Fifty-one graduate students and one senior marked moderate learning responses for nutrient retention, while 2 respondents gave answers indicating no learning of nutrient retention.

Portion Size: Importance and Knowledge by Demographic Variables and Types of Student

Chi-square associations for importance of the food quality attribute portion size were found between the Dietetic Intern group and age (p = .0434), the Dietetic Intern group and geographic area (p = .0011), the Plan IV group and class (p = .0366), the Plan IV group and work experience (p = .0053), the CUP group and geographic area (p = .0122), and the CHRIE group and work experience (p = .0388) (Table XVII A). The largest percentage of respondents aged 21-30 (N = 285) selected answers indicating that portion size was a very important attribute. Only 2 individuals aged 21-30 thought that portion size was somewhat important. Four students aged 31-40, answered very important and 4 students marked somewhat important answers to portion size as an attribute.

Dietetic Interns ranked portion size as a very important attribute. Areas II and V were the largest areas represented, and

TABLE XVII

CHI-SQUARE ANALYSIS OF FOOD ATTRIBUTE PORTION SIZE: IMPORTANCE AND KNOWLEDGE BY DEMOGRAPHIC VARIABLES

(A) Importance

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	21.506	.613	3.143	3.078	42.111
	df	12	3	3	9	18
	p	.0434*	.8934	.3702	.9611	.0011*
Plan IV	x^2	3.340	6.480	17.883	23.420	24.814
	df	9	3	9	9	18
	p	.9493	.0905	.0366*	.0053*	.1301
CUP	x^2	19.482	5.087	6.794	4.018	34.119
	df	12	3	6	9	18
	p	.0775	.1656	.3403	.9102	.0122*
CHRIE	x^2	4.910	6.041	3.040	17.702	23.044
	df	9	3	9	9	18
	p	.8421	.1096	.9627	.0388*	.1889

(B) Knowledge

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	24.850	1.118	4.431	4.949	21.068
	df	16	4	4	12	24
	p	.0725	.8914	.3507	.9597	.6347
Plan IV	x^2	5.698	7.022	9.659	17.698	28.143
	df	9	3	9	9	18
	p	.7697	.0712	.3788	.0388*	.0599
CUP	x^2	8.383	1.297	.842	14.644	22.930
	df	12	3	6	9	18
	p	.7546	.7299	.9909	.1012	.1933
CHRIE	x^2	14.689	3.692	10.039	13.453	24.869
	df	8	4	12	12	24
	p	.0655	.4493	.6126	.3370	.4129

* Significant at $p \leq 0.05$

answers from respondents in both areas were mostly for portion size as a very important attribute.

For portion size, CUP respondents had the largest group of answers under number 1, very important, on the scale. Area II with 63 responses had 60 answers under very important also.

Of the 200 Plan IV respondents, 84 percent answered that portion size was a very important attribute. Only 16 percent gave moderate importance to the attribute, while a graduate student respondent marked the attribute not important.

A large proportion of the Plan IV group (168 out of 200) judged portion size as a very important attribute. Most respondents had less than one year of work experience; 103 of the 125 students in this category selected very important answers for the attribute portion size.

Over 84 percent of the CHRIE group also considered portion size as a very important attribute. Under categories of work experience, students were fairly equally distributed between those with less than one year, one to two years, and two to three years experience. All of the students in these categories of work experience indicated by their scores that the attribute was very important.

Relative to knowledge of the attribute portion size, an association was found between the Plan IV group and work experience ($p = .0388$) (Table XVII B). About 80 percent of those, in the Plan IV group, indicated having learned a great deal about portion size. The largest number of respondents, in the less than one year category, claimed having learned a great deal ($N = 95$). Only 30 Plan IV respondents marked moderate knowledge of portion size.

Product Identifiability: Importance and Knowledge by Demographic Variables and Types of Student

Chi-square associations for importance of product identifiability resulted between the CHRIE group and class (p = .0462) and the CHRIE group and work experience (p = .0097) (Table XVIII A). Over 80 percent of the CHRIE respondents indicated that product identifiability was very important. Of the 80 percent, 110 were seniors, 5 were sophomores, 45 were juniors, and 9 were graduate students. One junior gave no importance to product identifiability, while 19 percent of the respondents indicated that the attribute was moderately important.

Respondents in the work experience groups from less than one year through three to four years gave mostly very importance scores to product identifiability.

Associations were found for the perception of knowledge of the attribute product identifiability between the CUP group and geographic area (p = .0324), the CHRIE group and class (p = .0047), and the CHRIE group and work experience (p = .0480) (Table XVIII B). Of the CHRIE group, 47 respondents (23 percent) indicated having learned a great deal of the attribute product identifiability. At the same time, 70 respondents (34.48 percent) selected point two on the scale, while 60 respondents (30 percent) marked moderate knowledge answers for product identifiability. Area II, had 39 answers for learned a great deal and 25 answers for moderate learning of the attribute.

Of the 200 respondents in the CHRIE group, 45 chose learned a great deal, while 143 chose within points 2 and 3 on the scale for knowledge of the attribute. Most of the scores were given by seniors, with 49

TABLE XVIII

CHI-SQUARE ANALYSIS OF FOOD ATTRIBUTE PRODUCT IDENTIFIABILITY: IMPORTANCE AND KNOWLEDGE BY DEMOGRAPHIC VARIABLES

(A) Importance

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	7.604	2.786	.607	8.694	16.581
	df	12	3	3	9	18
	p	.8152	.4258	.8947	.4660	.5521
Plan IV	x^2	10.070	1.355	6.024	3.393	15.319
	df	9	3	9	9	18
	p	.3449	.7160	.7375	.9467	.6400
CUP	x^2	8.013	1.756	2.370	5.948	19.617
	df	12	3	6	9	18
	p	.7841	.6245	.8827	.7451	.3548
CHRIE	x^2	15.416	8.154	21.296	26.294	35.807
	df	12	4	12	12	24
	p	.2195	.0861	.0462*	.0097*	.0573

(B) Knowledge

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	16.374	8.178	8.245	18.400	20.541
	df	16	4	4	12	24
	p	.4272	.0853	.0830	.1041	.6656
Plan IV	x^2	5.138	.751	7.934	15.436	32.023
	df	12	4	12	12	24
	p	.9532	.9449	.7903	.2185	.1265
CUP	x^2	11.974	1.760	10.058	9.751	38.283
	df	16	4	8	12	24
	p	.7458	.7798	.2609	.6378	.0324*
CHRIE	x^2	9.849	1.956	28.476	21.169	26.906
	df	8	4	12	12	24
	p	.2758	.7439	.0047*	.0480*	.3089

* Significant at $p \leq 0.05$

marking number 2 on the scale and 55 ranking number 3. Three seniors as compared to 1 junior claimed no knowledge of product identifiability.

A comparison was made between the CHRIE students with one to two year work experience and those with three to four year work experience. Those with one to two years experience (N = 35) claimed having a great deal of knowledge, while 24 claimed having moderate learning of product identifiability. Those with three to four year experience, however, claimed having learned a great deal (N = 42) or having only moderate learning (N = 15).

Reheating Food: Importance and Knowledge by Demographic Variables and Types of Student

Chi-square associations for the importance of reheating food were found between the Plan IV group and age (p = .0003) and the Plan IV group and sex (p = .0412) (Table XIX A). A total of 140, out of 198 Plan IV respondents, in all the age groups indicated that reheating was a very important attribute. Only 58 respondents selected the somewhat important scores for reheating food.

Plan IV answers for reheating food indicated a split between somewhat important responses (N = 15) and very important responses (N = 15) for the males. In contrast, 122 females considered reheating food as a very important attribute and only 41 thought it was moderately important.

Relative to knowledge attainment for the attribute reheating food, associations were found between the Plan IV group and work experience (p = .0136), the CUP group and geographic area (p = .0003), and the CHRIE group and age (p = .0459) (Table XIX B). Reheating food as answered by

TABLE XIX

CHI-SQUARE ANALYSIS OF FOOD ATTRIBUTE REHEATING FOOD: IMPORTANCE AND KNOWLEDGE BY DEMOGRAPHIC VARIABLES

(A) Importance

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	23.537	3.903	2.146	14.606	22.988
	df	16	4	4	12	24
	p	.1001	.4193	.7090	.2637	.5205
Plan IV	x^2	30.879	8.248	12.938	5.766	12.338
	df	9	3	9	9	18
	p	.0003*	.0412*	.1654	.7631	.8293
CUP	x^2	7.735	1.170	6.050	12.900	26.774
	df	16	4	8	12	24
	p	.9564	.8830	.6417	.3764	.3151
CHRIE	x^2	15.790	7.236	12.903	7.702	35.509
	df	12	4	12	12	24
	p	.2011	.1239	.3761	.8079	.0612

(B) Knowledge

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	20.535	5.651	5.537	12.747	26.511
	df	16	4	4	12	24
	p	.1971	.2268	.2365	.3877	.3277
Plan IV	x^2	11.104	3.427	18.539	25.273	16.517
	df	12	4	12	12	24
	p	.5200	.4891	.1003	.0136*	.8685
CUP	x^2	18.145	2.104	6.530	12.897	54.673
	df	16	4	8	12	24
	p	.3154	.7166	.5880	.3766	.0003*
CHRIE	x^2	15.766	4.035	12.014	20.182	25.711
	df	8	4	12	12	24
	p	.0459*	.4012	.4445	.0637	.3680

* Significant at $p \leq 0.05$

the Plan IV group had the largest number of the responses on numbers 2 and 3 of the rating scale. These scores were between a great deal of learning and moderate learning. Across all work experience categories, 68 respondents claimed having learned a great deal while 66 indicated moderate learning for reheating food.

Of the CUP respondents, 105 claimed having learned a great deal of reheating food. Only 91 indicated having learned it moderately.

Of the 210 CHRIE respondents, 93 selected having learned a great deal of reheating food, 110 having learned moderately and only 7 indicating no knowledge of the attribute. Most of the student respondents were from the 21-30 age category, and among them, 81 students selected learned a great deal, while 88 respondents chose moderate learning answers for reheating food.

Satiety: Importance and Knowledge by Demographic Variables and Types of Student

Chi-square associations were found significant at the .05 level for importance of the satiety attribute between the Dietetic Intern group and sex ($p = .0044$) and the CUP group and age ($p = .0119$) (Table XX A). Dietetic Intern answers for the attribute satiety were categorized almost equally between very important and moderately important. Out of 325 responses, 181 students ranked satiety as very important. Of this group, 172 females and 8 males gave this answer. Moderate importance answers were given by 1 male and 19 female respondents.

Of the 219 CUP group respondents, over all age groups, 149 indicated that satiety was a very important attribute. One hundred and sixteen of those that selected that response were in the age category of

TABLE XX

CHI-SQUARE ANALYSIS OF FOOD ATTRIBUTE SATIETY: IMPORTANCE AND KNOWLEDGE BY DEMOGRAPHIC VARIABLES

(A) Importance

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	9.813	15.144	.752	7.437	27.391
	df	16	4	4	12	24
	p	.8762	.0044*	.9447	.8275	.2866
Plan IV	x^2	12.902	3.968	12.803	7.572	17.401
	df	12	4	12	12	24
	p	.3762	.4104	.3836	.8176	.8310
CUP	x^2	31.403	5.408	4.176	4.622	24.288
	df	16	4	8	12	24
	p	.0119*	.2479	.8409	.9694	.4452
CHRIE	x^2	12.867	2.861	16.264	7.541	27.557
	df	12	4	12	12	24
	p	.3788	.5813	.1795	.8199	.2792

(B) Knowledge

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	18.028	1.260	4.874	4.330	30.709
	df	16	4	4	12	24
	p	.3223	.8682	.3004	.9767	.1624
Plan IV	x^2	11.255	5.547	7.778	13.357	19.987
	df	12	4	12	12	24
	p	.5072	.2356	.8023	.3436	.6975
CUP	x^2	14.988	2.268	5.419	12.434	21.505
	df	16	4	8	12	24
	p	.5255	.6866	.7121	.4115	.6088
CHRIE	x^2	14.408	.436	15.741	12.116	37.107
	df	8	4	12	12	24
	p	.0717	.9794	.2034	.4364	.0427*

* Significant at $p \leq 0.05$

21-30. Only one respondent selected not important as a response, compared to zero responses in that category for the other age groups.

Pertaining to knowledge of the attribute satiety, an association was found between the CHRIE group and geographic area (p = .0427) (Table XX B). Over half of the CHRIE group (N = 113) indicated moderate knowledge, while 85 students indicated a great deal of learning about satiety. The largest area of respondents were from Area IV, and 44 marked learned a great deal compared to 24 answers for moderate learning.

Seasoning: Importance and Knowledge by Demographic Variables and Types of Student

An association was found for the importance of the attribute seasoning between the Dietetic Interns and class (p = .0002) (Table XXI A). Within the Dietetic Intern group, 325 responded to the seasoning attribute relative to its importance. The majority of the group, 267 respondents, chose very important scores while 58 gave moderate importance scores to seasoning. Respondents were either seniors or graduate students. Of the graduate students, 264 out of 321 indicated that seasoning was very important. Three seniors marked very important, with only one senior claiming a somewhat important answer.

A significant association for knowledge of the attribute seasoning and two groups: Plan IV and geographic area (p = 0.362), and CHRIE and geographic area (p = .0017) (Table XXI B). Answers for the Plan IV group were strongest under moderate learning (N = 115, 57 percent) compared to 6 students stating no learning had taken place. Eighty students marked a great deal of knowledge obtained of the attribute.

TABLE XXI

CHI-SQUARE ANALYSIS OF FOOD ATTRIBUTE SEASONING: IMPORTANCE AND KNOWLEDGE BY DEMOGRAPHIC VARIABLES

(A) Importance

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	14.108	2.285	19.421	6.298	14.024
	df	12	3	3	9	18
	p	.2939	.5155	.0002*	.7097	.7275
Plan IV	x^2	5.997	2.248	6.056	10.624	28.823
	df	12	4	12	12	24
	p	.9162	.6902	.9132	.5613	.2269
CUP	x^2	8.651	1.247	6.557	8.895	15.535
	df	12	3	6	9	18
	p	.7324	.7418	.3638	.4470	.6250
CHRIE	x^2	17.353	3.992	11.438	7.813	25.932
	df	12	4	12	12	24
	p	.1368	.4071	.4918	.7996	.3566

(B) Knowledge

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	14.196	1.760	4.641	19.078	16.421
	df	16	4	4	12	24
	p	.5841	.7797	.3262	.0867	.8723
Plan IV	x^2	21.063	4.636	11.471	18.560	37.821
	df	12	4	12	12	24
	p	.0495*	.3267	.4891	.0997	.0362*
CUP	x^2	9.750	1.657	10.369	9.395	23.280
	df	16	4	8	12	24
	p	.8793	.7985	.2401	.6688	.5033
CHRIE	x^2	14.463	1.285	8.412	12.282	49.302
	df	8	4	12	12	24
	p	.0705	.8640	.7522	.4233	.0017*

* Significant at $p \leq 0.05$

Responses in the largest area, Area II, were for learned a great deal and only 26 claimed moderate learning. Although, CHRIE respondents stressed having learned a great deal of the attribute seasoning, 89 out of 111 indicated only moderate learning while 9 claimed no knowledge of seasoning. Area VI respondents, representing the largest group, marked 44 responses for learned a great deal compared to 24 responses for moderate learning.

Sensory Evaluation: Importance and Knowledge by Demographic Variables and Types of Student

There were no significant results for the importance of the food quality attribute sensory evaluation. The demographic variables did not significantly affect the scores for importance of the attribute (Table XXII A).

Relative to knowledge attainment for the attribute sensory evaluation, associations were found between the Dietetic Intern group and age ($p = .0262$), the CUP group and class ($p = .0056$), and the CUP group and geographic area ($p = .0013$) (Table XXII B). Responses as perceptions of knowledge attained were calculated for sensory evaluation from a total of 321 Dietetic Interns. Over 96 percent of the responses, totalling 309 were from the age group 21-30. Of these responses, 221 ranked learned a great deal, 81 answered moderate learning, and 7 indicated no learning with regards to seasory evaluation.

Classification of the answers given by CUP students ($N = 217$) showed responses for sensory evaluation, 110 were seniors, 103 were juniors, and 4 were graduate students. Most of the scores revealed that a great deal of learning had occurred. Two graduate students, 74

TABLE XXII

CHI-SQUARE ANALYSIS OF FOOD ATTRIBUTE SENSORY EVALUATION: IMPORTANCE AND KNOWLEDGE BY DEMOGRAPHIC VARIABLES

(A) Importance

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	10.944	3.024	.983	10.159	13.136
	df	12	3	3	9	18
	p	.5337	.3880	.8055	.3378	.7834
Plan IV	x^2	7.669	2.786	13.212	9.321	15.852
	df	12	4	12	12	24
	p	.8104	.5943	.3538	.6753	.8933
CUP	x^2	8.848	.989	9.758	3.854	28.380
	df	12	3	6	9	18
	p	.7158	.8040	.1352	.9207	.0565
CHRIE	x^2	11.649	6.182	9.671	10.214	34.486
	df	12	4	12	12	24
	p	.4743	.1859	.6448	.5972	.0764

(B) Knowledge

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	28.679	5.386	2.629	10.520	16.379
	df	16	4	4	12	24
	p	.0262*	.2500	.6217	.5705	.8739
Plan IV	x^2	9.636	1.986	18.872	11.151	34.844
	df	12	4	12	12	24
	p	.6479	.7384	.0917	.5160	.0708
CUP	x^2	22.482	8.450	21.675	10.117	50.219
	df	16	4	8	12	24
	p	.1283	.0764	.0056*	.6057	.0013*
CHRIE	x^2	8.991	3.170	13.886	14.538	34.189
	df	8	4	12	12	24
	p	.3430	.5297	.3080	.2677	.0814

* Significant at $p \leq 0.05$

seniors and 58 juniors indicated knowing a great deal of knowledge of sensory evaluation; 79 indicated moderate learning while only 4 claimed no knowledge of the attribute.

CUP respondents scored almost equally under points 1, 2, and 3 on the scale for their answers to their knowledge of sensory evaluation. Over 60 percent marked learned a great deal. The largest number of reported scores was from Area II. Of the 63 Area II students, 36 chose learned a great deal and 27 claimed moderate learning of sensory evaluation.

Shape: Importance and Knowledge by Demographic Variables and Types of Student

Chi-square associations were found for the importance of the attribute shape between the Plan IV group and sex ($p = .0021$) and the CHRIE group and sex ($p = .0116$) (Table XXIII A). Two hundred responses to the attribute shape were made by the Plan IV group. A total of 126 females and 22 males indicated that shape of food was very important, while 39 females and 8 males gave somewhat important responses.

As a comparison, the CHRIE group for the attribute shape selected various rankings on the scale. Three males chose the score not important for shape, and 43 responses were for very important, while 40 marked somewhat important. Females ($N = 34$) on the other hand, answered that shape was somewhat important or very important.

Relative to knowledge attainment for the attribute shape, associations were found between the Dietetic Intern group and age ($p = .0129$) and the Plan IV group and work experience ($p = .0265$) (Table XXIII B). Over 96 percent of the Dietetic Interns ($N = 312$) who responded to the

TABLE XXIII

CHI-SQUARE ANALYSIS OF FOOD ATTRIBUTE SHAPE (VARIETY): IMPORTANCE AND KNOWLEDGE BY DEMOGRAPHIC VARIABLES

(A) Importance

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	7.667	1.155	.250	10.503	26.136
	df	12	3	3	9	18
	p	.8106	.7638	.9691	.3113	.0967
Plan IV	x^2	6.176	14.647	8.207	12.879	16.389
	df	9	3	9	9	18
	p	.7222	.0021*	.5134	.1681	.5654
CUP	x^2	19.516	2.326	4.682	5.079	12.032
	df	12	3	6	9	18
	p	.0768	.5075	.5852	.8274	.8456
CHRIE	x^2	10.453	12.935	13.953	9.998	29.514
	df	12	4	12	12	24
	p	.5762	.0116*	.3037	.6161	.2014

(B) Knowledge

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	31.141	2.215	4.555	7.141	25.733
	df	16	4	4	12	24
	p	.0129*	.6964	.3361	.8482	.3668
Plan IV	x^2	11.625	7.594	15.989	23.146	35.692
	df	12	4	12	12	24
	p	.4763	.1077	.1918	.0265*	.0588
CUP	x^2	19.171	3.991	4.987	11.296	20.886
	df	16	4	8	12	24
	p	.2599	.4072	.7589	.5038	.6454
CHRIE	x^2	7.566	2.136	20.363	11.416	33.601
	df	8	4	12	12	24
	p	.4770	.7108	.0605	.4936	.0920

* Significant at $p \leq 0.05$

attribute shape were in the age group of 21-30. Interns ranked shape as an attribute they had learned as follows: 222 chose learned a great deal, 88 answered moderate learning, while only 2 selected no learning.

Other answers for the Plan IV group concerned work experience and its association with the food attribute shape. Within this group, respondents as a whole answered number 2 on the scale (very important). Most of respondents were in the category of less than one year of work experience.

Sound: Importance and Knowledge by Demographic Variables and Types of Student

One significant chi-square association was found for the importance of the attribute sound between the Dietetic Intern group and class ($p = .0132$) (Table XXIV A). Out of 325 Dietetic Interns, 129 indicated that sound was a very important attribute while 186 claimed that the attribute was moderately important. Of the 325 respondents, 321 were also considered as graduate students. Of the graduate students 129 considered sound as very important, while 182 said that sound was only moderately important.

There were no significant associations for knowledge of the food quality attribute sound. The demographic variables did not significantly affect the scores for knowledge of the attribute (Table XXIV B).

Temperature: Importance and Knowledge by Demographic Variables and Types of Student

A chi-square association for the importance of temperature was found between the CUP group and geographic area ($p = .0385$) (Table XXV

TABLE XXIV

CHI-SQUARE ANALYSIS OF FOOD ATTRIBUTE SOUND: IMPORTANCE AND KNOWLEDGE BY DEMOGRAPHIC VARIABLES

(A) Importance

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	16.814	1.344	12.633	6.947	18.814
	df	16	4	4	12	24
	p	.3977	.8538	.0132*	.8611	.7618
Plan IV	x^2	11.769	2.905	6.121	8.652	29.816
	df	12	4	12	12	24
	p	.4644	.5739	.9099	.7324	.1910
CUP	x^2	16.512	4.481	8.342	13.666	23.560
	df	16	4	8	12	24
	p	.4178	.3448	.4008	.3225	.4869
CHRIE	x^2	9.838	3.657	11.970	8.219	26.027
	df	12	4	12	12	24
	p	.6302	.4544	.4481	.7678	.3518

(B) Knowledge

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	23.431	3.394	9.227	9.285	29.190
	df	16	4	4	12	24
	p	.1027	.4942	.0557	.6784	.2131
Plan IV	x^2	9.124	3.764	11.533	10.406	27.037
	df	12	4	12	12	24
	p	.6923	.4388	.4839	.5804	.3027
CUP	x^2	23.062	2.235	12.053	8.409	30.624
	df	16	4	8	12	24
	p	.1121	.6927	.1488	.7524	.1650
CHRIE	x^2	15.308	1.834	13.706	9.396	19.278
	df	8	4	12	12	24
	p	.0534	.7663	.3199	.6688	.7370

* Significant at $p \leq 0.05$

A). Of the 206 CUP answers, 194 considered temperature as a very important attribute (Table XXV A). Area II had the largest number of answers (N = 65) all students indicated that temperature was very important.

There was an association for knowledge of the attribute temperature between the CHRIE group and geographic area (p = .0182) (Table XXV B). CHRIE respondents scored very high overall answers with 166 students claiming learned a great deal and 40 students marking moderate knowledge responses. Only 4 responses indicated no learning had taken place concerning the attribute temperature. Area VI gave the highest number of responses. Fifty-three students marked learned a great deal and 35 marked moderate learning of temperature.

Texture/Mouthfeel: Importance and Knowledge by Demographic Variables and Types of Student

There were no significant associations found for importance of the attribute texture/mouthfeel. The demographic variables did not significantly affect the scores for knowledge of the attribute (Table XXVI A).

A significant association was found for knowledge of texture/mouthfeel between the CHRIE group and geographic area (p = .0475) (Table XXVI B). CHRIE responses were spread out across the various scale points. Of the 209 respondents, 48 respondents (23 percent) chose scale point 1, (learned a great deal) while 60 students (29 percent) chose point 2. Responses for points 3 and 4 totalled 87 the largest response came from Area IV, where 30 claimed a great deal of learning for the attribute texture/mouthfeel, while 35 claimed only moderate learning for the attribute.

TABLE XXV

CHI-SQUARE ANALYSIS OF FOOD ATTRIBUTE TEMPERATURE: IMPORTANCE AND KNOWLEDGE BY DEMOGRAPHIC VARIABLES

(A) Importance

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	12.353	.616	.932	2.323	12.200
	df	8	2	2	6	12
	p	.1361	.7349	.6274	.8877	.4298
Plan IV	x^2	4.845	7.163	5.930	9.793	16.839
	df	9	3	9	9	18
	p	.8476	.0669	.7469	.3675	.5342
CUP	x^2	3.564	.546	1.826	2.284	29.894
	df	12	3	6	9	18
	p	.9901	.9087	.9350	.9861	.0385*
CHRIE	x^2	1.948	3.857	8.453	8.045	19.263
	df	9	3	9	9	18
	p	.9973	.2773	.4892	.5296	.3758

(B) Knowledge

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	17.270	1.468	2.723	10.794	20.104
	df	16	4	4	12	24
	p	.3683	.8322	.6053	.5467	.6908
Plan IV	x^2	8.111	6.397	11.087	15.753	14.402
	df	9	3	9	9	18
	p	.5230	.0938	.2698	.0722	.7025
CUP	x^2	12.601	.740	1.042	10.638	27.522
	df	12	3	6	9	18
	p	.3987	.8638	.9840	.3014	.0697
CHRIE	x^2	12.507	4.826	12.694	20.934	40.642
	df	8	4	12	12	24
	p	.1300	.3057	.3917	.0514	.0182*

* Significant at $p \leq 0.05$

TABLE XXVI

CHI-SQUARE ANALYSIS OF FOOD ATTRIBUTE TEXTURE/ MOUTHFEEL: IMPORTANCE AND KNOWLEDGE BY DEMOGRAPHIC VARIABLES

(A) Importance

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	3.725	.213	1.354	8.605	10.170
	df	12	3	3	9	18
	p	.9879	.9755	.7164	.4745	.9262
Plan IV	x^2	8.513	6.581	9.326	8.065	14.411
	df	9	3	9	9	18
	p	.4834	.0865	.4078	.5276	.7019
CUP	x^2	4.080	1.919	2.697	4.179	18.163
	df	12	3	6	9	18
	p	.9820	.5894	.8458	.8992	.4449
CHRIE	x^2	3.716	1.489	7.421	4.000	25.789
	df	9	3	9	9	18
	p	.9291	.6848	.5933	.9114	.1047

(B) Knowledge

		Age	Sex	Class	Experience	Geographic Area
Intern	x^2	13.324	5.304	1.005	6.216	30.072
	df	16	4	4	12	24
	p	.6489	.2575	.9091	.9048	.1824
Plan IV	x^2	11.338	5.131	11.535	3.811	27.741
	df	9	3	9	9	18
	p	.2533	.1625	.2408	.9234	.0661
CUP	x^2	13.480	3.199	10.026	4.561	14.661
	df	16	4	8	12	24
	p	.6374	.5251	.2632	.9711	.9303
CHRIE	x^2	5.898	6.189	10.494	17.423	36.645
	df	8	4	12	12	24
	p	.6587	.1855	.5727	.1344	.0475*

* Significant at $p \leq 0.05$

Testing of the Hypotheses

The hypotheses postulated for this study were:

Ho_1 There will be no significant differences in the importance scores of the quality attributes for each of the four types of students: Dietetic Intern, Plan IV, Coordinated Undergraduate Program (CUP), and Hotel, Restaurant, and Institution (CHRIE) based on each of the following demographic variables:

a. Age

b. Sex

c. Classification

d. Declared major

e. Number of credits

f. Number of years work experience in foodservice

g. Geographic area

Ho_2 There will be no significant differences in the knowledge scores of the quality attributes for each of the four types of students: Dietetic Intern, Plan IV, CUP, and CHRIE based on the demographic variables as in Ho_1.

Declared Major

The variable was not tested due to errors in both distribution of the surveys at the institutions, as well as, incorrect student responses.

Number of Credits

The variable was not tested because of the inaccuracy of responses. It appeared that students in many cases misunderstood the question.

Based on the results from Tables IIIA, IVA, VIA, VIIA, VIIIA, IXA, XA, XIA, XIIA, XIVA, XVIA, XVIIA, XVIIIA, XIXA, XXA, XXIA, XXIIIA, XXIVA, and XXVA, Ho_1 was rejected. Based on the results from Tables IIIB, IVB, VB, VIB, VIIB, VIIIB, IXB, XB, XIB, XIIB, XIIIB, XIVB, XVB, XVIB, XVIIB, XIIIB, XIXB, XXB, XXIB, XXIIB, XXIIIB, XXVB, AND XXVIB, Ho_2 was rejected.

A Conceptual Model of Food Quality

Results obtained from this research as well as from a synthesis of information found in the literature, formed the basis for this food quality model (Figure 13). The model as a whole serves to provide a framework for systematically controlling food quality for quantity prepared foods. The foundation of the conceptual model is the examination of the demands and expectations of the customer compared to what the quality food system model can provide. This food quality model assumes an interdependence of all its parts. It is invisioned that the implementation of this model into a foodservice system will serve as a guide to ensure production of quality food.

There are several components to the quality model: the commitment, the quality attributes, the operational cycle, the quality program, the final product, and the customer satisfaction dimensions. The 24 quality attributes function as a single unit. Together, these attributes strengthen quality control; separately they form an unbalanced system, a system that is incomplete. An assumption has to be made however, that the individual user of the model has a knowledge base sufficient to facilitate the integration of the quality attributes into the system.

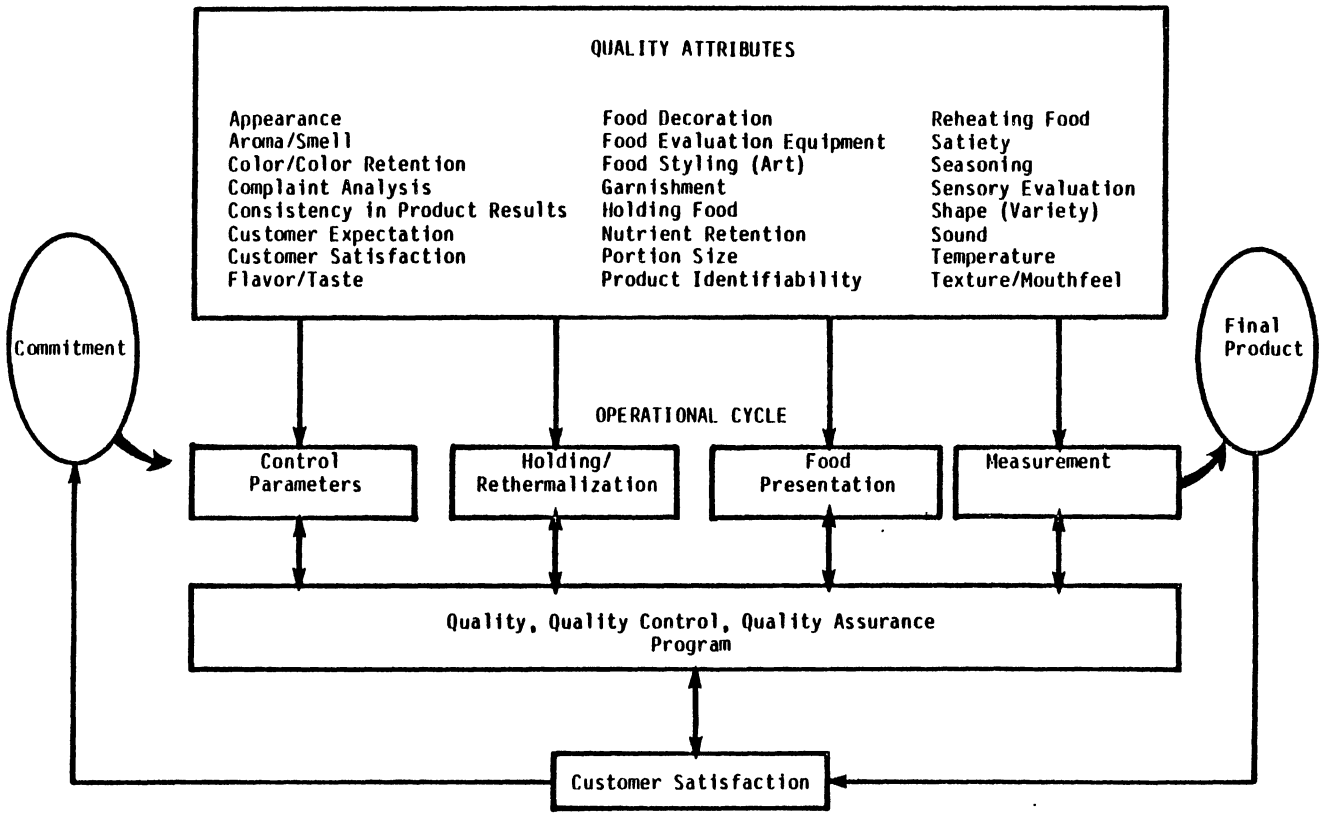


Figure 13. A Conceptual Model of Food Quality

The four categories of the operational cycle: control parameters, holding/rethermalization, food presentation, and measurement serve to operationalize the activities within the cycle. They also assume integration of the food attributes into the cycle. The final product is the endpoint of the operational cycle. The control parameters encompass many functions. These operational functions are achieveable through a sequential process. The functions are: specifications, preparation, portion control, and time and temperature control. The process begins with specifications. Specifications are developed to establish an acceptance level for incoming food products. The specifications monitor purchasing, receiving, inspecting, and storage.

Preparation follows procurement. Preparation incorporates all phases of foodhandling in a sanitary environment. Preparation is followed by all types of portion control. Time and temperature control involves consideration for microbiological activity. The goal of of time and temperature phase is to control the food so as to allow consistency in product results. Additionally, portion control factors are allowed to function for optimum food quality output.

The control parameters establish definite criteria to maintain satisfactory standards for food products. These products are distributed from a conventional food system or an alternative food system: cook/chill or cook/freeze which requires holding of food before service. Holding/rethermalization, another category within the operational cycle, deals with criteria important in maintaining preestablished food quality as the result of careful handling in the previous stages. Use of specialized equipment suited to holding/rethermalization is assumed.

Food presentation is a preplanned commitment, but its application fits into the system just prior to the service. The presentation of food is designated by the management in the planning and procurement phase. Products are garnished as late in the production as possible to assure freshness and sensory acceptance. Food decoration plays a large role customer satisfaction.

Measurement involves evaluation of the product both before and after it is released for service. Evaluation is both objective and subjective. This requires use of food evaluation equipment and sensory evaluation. Management creates policy for quality of prepared products. Use of sample tables, taste tests, and visual examination of products is completed at this process stage. The assumption is that formative evaluations on products are made throughout the phases of the operational cycle and this phase finalizes summative evaluation.

Once the final product is completed, the input from the customer's perception of product satisfaction will follow. Customer satisfaction is shown to influence the entire food quality model as it forms a strong indicator for food quality parameters.

The quality program component of the model serves as the control mechanism for the entire model. A quality control program is methodical and precise. The use of a quality program is governed by management policy; scheduling quality control checks within the foodservice facility; and implementation of a formal and written quality program. Standard operating procedures are established through control charts, production cycles, or other appropriate criteria.

The element of commitment by the food provider is an essential feature of the model. The commitment component serves to strengthen

quality standards which are a result of the application of human values and management loyalty to the quality control effort.

This quality model provides a concrete method for dealing successfully with the vast, encompassing area of quality in food systems. The model provides structure and organization to a system that is often out of control in the practice of foodservice quality. The components of the system act as a check and balance for each other. This assures fair and reliable functioning.

In the quality area where tangible procedures and methods are hard to integrate into a foodservice system, basic guidelines have been established. This model also serves as a basis for determining those concepts that are necessary to incorporate into the educational structure for curriculum effectiveness in foodservice systems. The foodservice systems curriculum needs to be comprehensive enough to assure that future managers will have sufficient facility and expertise in food quality in order to maintain quality control. Use of the model will require continual revisions in order to incorporate changes relevant to foodservice systems.

CHAPTER V

SUMMARY, RECOMMENDATIONS, AND IMPLICATIONS

This study was guided by the following objectives: to establish a consensus of quality attributes for food prepared in quantity; to determine the perceptions of the four types of students: Dietetic Intern, Plan IV, CUP, and CHRIE regarding the importance of and knowledge attained of the food quality attributes; and to develop a conceptual model of food quality for quantity prepared foods.

To accomplish these objectives, a consensus of food quality attributes for quantity prepared foods was developed. Experts in food quality from the FNIA Department and the HRAD School at Oklahoma State University participated in the Nominal Group Technique (see Appendix A) that established the list of attributes (Appendix B). These attributes were then used to construct a questionnaire which was given to four types of students: Dietetic Intern, Plan IV, CUP, and CHRIE.

The population and sample are described in Chapter 3, Methods on page 44. The questionnaire responses indicated the current status of the four types of students regarding their perceptions of the degree of knowledge attained and the importance of the 24 quality attributes for foods prepared in quantity.

Approximately 2,380 questionnaires were distributed by cluster sampling to the four types of students. Responses were analyzed using frequency distribution and chi-square.

Demographic Description of the Sample

There were 973 respondents in the food quality survey. Eighty-five percent (N = 814) were female and 15 percent (N = 13) were male. Eighty-six percent (N = 836) of the respondents were between the ages of 21 to 30. Graduate students made-up 37 percent of the survey (N = 360); the remainder were undergraduates. Seniors comprised 38.2 percent (N = 372) of the sample. The largest percentage, 31.8 (N = 309) declared Dietetics (Plan IV) as their major. Total credits hours for food preparation, foodscience, and foodservice were reported by the respondents. Six was the average number of course credits given for all the categories of credits: foods, foodscience, and foodservice. Less than one year of work experience was reported by 53.6 (N = 521) of the respondents. The largest number of surveys were returned by students in geographic Area II (N = 234, 24.9 percent) (Appendix D).

Food Quality Attributes

Twenty-four food quality attributes for quantity prepared foods were described by the respondents as responses to the Likert rating scales (Appendix C). Students rated the importance of and the knowledge attained for each of the attributes.

Survey repondents indicated the degree of importance given to the attributes relative to food quality. In general, most of the attributes were rated as very important by more than half of the respondents. Eighty-seven (87.9) percent of the students (N = 844) indicated that appearance was very important; 58.5 percent (N =559) of the students reported very important for color/color retention; 61.2 (N = 584) percent indicated very important for consistency in product results.

Customer satisfaction was said to be very important by 78.8 percent (N = 754) of the sample; flavor and taste scored 84.1 percent (N = 807). Nutrient retention was cited as very important by 58.1 percent (N = 558) of those surveyed. Portion size was very important for 52.3 percent (N = 501) of the respondents Temperature was indicated to be very important by 75.1 percent (N = 721) of the sample.

Respondents did not appear to consider the following attributes as very important. The attribute of food decoration was answered as somewhat important, or midpoint on the scale, by 25.3 percent (N = 242). Food evaluation equipment was given somewhat important or less by 51.6 percent (N = 484); 51.2 percent (N = 492) gave food styling only a somewhat important or less rating; 26.0 percent (N = 248) evaluated reheating food as only somewhat important or less; 30.5 percent (N = 290) gave satiety a somewhat important response; 35.6 percent (N = 341) rated sound as only somewhat important.

Respondents were asked to determine their perception of the degree of knowledge attained through their coursework for all 24 of the food quality attributes. The attribute of aroma/smell was given a 36.6 percent (N = 361) representing only moderate learning. Complaint analysis was rated only moderate learning or less by 77.4 percent (N = 635) of the respondents. The attribute of customer expectation was analyzed as 47.3 percent (N = 552) for moderate learning or less. Food decoration was rated by the respondents as learned moderately with 31.7 percent (N = 303) representing that answer.

Approximately sixty-one percent (N = 581) determined that they learned moderately or less about food evaluation equipment. Food styling (art) answers were given by 76.9 percent (N = 734) of the

respondents as moderate learning or less. Garnishment was learned moderately by 32 percent (N = 304) of the respondents. Product identifiability was also learned moderately by 32 percent (N = 302) of the students, while almost 60 percent (N = 564) reported moderate learning or lower for reheating food.

Moderate learning was claimed by 554 (58 percent) for satiety value, 511 (54 percent) for seasoning, 298 (31 percent) for sound and 240 (36 percent) of the respondents. Some respondents did not rank sound.

Highest results for knowledge attainment were obtained for the following attributes: appearance, color/color retention, consistency in product results, flavor/taste, holding food, nutrient retention, sensory evaluation, and temperature. For the attribute appearance, 79 percent (N = 761) ranked either learned a great deal or one rank below that rating. Color/color retention was given learned a great deal or one rank below that by 75 percent (N = 719) of those surveyed. Similar results were obtained for consistency in product results where 76 percent (N = 728) of the respondents chose learned a great deal or one rank below that category. Moreover, 81 percent (N = 772) chose learned a great deal or one ranking below that for the attribute of flavor/taste, while 38 percent claimed having learned a great deal for holding food. Forty-one percent scored the same response for nutrient retention. Portion size was answered as learned a great deal or ranked just below that by 80 percent (N = 765). Sixty-two percent (N = 589) marked learned a great deal or just below that score for sensory evaluation, while temperature was learned a great deal by 55 percent (N = 527) of the respondents.

A conceptual model of food quality for quantity prepared foods was created. This model was developed as the result of the findings from the survey responses for knowledge attained and importance of the food quality attributes by the students. A description of the model and a figure of the model is located in Chapter 4.

A discussion describing the scores of the respondents by type of student group, based on the different variables, is also found in Chapter 4. Results in Chapter 4, Figures 4 through 12, show the mean scores of the respondents for importance and knowledge of the food quality attributes by the overall sample and by each student group. The importance and knowledge scores for the four types of students were affected by the different variables: age group, sex, student classification, geographic area, and foodservice work experience. Based on these results, the hypotheses were rejected.

Recommendations

Recommendations Based on the Questionnaire

1. The Survey questionnaires to educational institutions should perhaps be mailed earlier in the semester to allow ample time for faculty and/or students to respond. If at all possible, there needs to be a second mailing as a follow up measure to achieve a higher response rate.
2. Since universities are on varying academic schedules, questions regarding credit hours should ask students to delineate if hours previously taken or currently enrolled in are semester, quarter or trimester credits.
3. For multiple samples, questionnaires need to be identified by a feparate coding for the various groups, such as "For Plan IV Students"

or "For Dietetic Interns", besides using color or numerical codes. This assures distribution to the correct group and aids in data analysis as well.

4. Certain food attributes may need more descriptors to enhance the comprehensibility of the food attribute characteristic. Some of the undergraduates may not have taken courses where these attributes are taught.

Recommendations Based on the Results of the Study

Although the four types of student programs: Dietetic Intern, Plan IV, CUP, and CHRIE follow academic requirements in professional sciences which encompasses the food attributes, there are no standardized procedures to implement and/or evaluate these requirements. Every college or university uses varying numbers and kinds of courses to meet the academic requirements, hence student perceptions of the importance of and knowledge of the food attributes varied considerably in this study.

1. A more uniform set of standards should be established pertaining to course requirements in foods, foodscience, and foodservice management, as well as in course content, instruction, and evaluation to ensure that students attain knowledge of food quality.

2. Greater emphasis must be placed on food quality relative to foodservice management courses.

3. Additional research studies are needed to clearly define and to delineate food quality attributes due to changes in foodservice systems, changing of lifestyle, and customer expectations over the passage of time.

4. Use of objective assessments (written tests and/or laboratory practical examinations) administered to students on the 24 food quality attributes would serve to obtain results that are less subjective and perception based.

Implications

Overall, this study reflects the need for more emphasis on food quality in quantity food production management and other foodservice courses in the college curricula. Additional student surveys are suggested by school, state, and region to further validate the findings of this study. To further enhance the results of this research, the students' instructional counterparts need to be surveyed as well. A comparison could then be made between the instructors' and the students' perceptions of food quality. Moreover, examination of the food attributes that were emphasized as important by the instructors in their courses versus which attributes were perceived as important by the students could be studied.

Input from food related industries as well as from customers regarding food quality needs to be explored and correlated, with findings from students' and instructors surveys. Then, overall findings need to be integrated into various foodservice courses.

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APPENDIXES

APPENDIX A

NOMINAL GROUP TECHNIQUE

NOMINAL GROUP TECHNIQUE

The Nominal Group Technique is simply one of many structured group processes that have been designed and developed. The Nominal Group Technique (NGT) is a special-purpose technique useful for situations where individual judgements must be tapped and combined to arrive at decisions which cannot be calculated by one person. It is a problem-solving or idea-generating strategy, not typically used for routine meetings.

NGT was developed by Andre L. Delbecq and Andrew H. Van de Ven in 1968. It was derived from social-psychological studies of decision conferences, management-science studies of aggregating group judgements, and socialwork studies of problems surrounding citizen participation in program planning. Since that time, NGT has gained extensive recognition and has been widely applied.

NGT takes its name from the fact that it is a carefully designed, structured, group process which involves carefully selected participants in some activities as independent individuals, rather than in the usual interactive mode of conventional groups. It is a well developed and tested method which is fully presented in the work of Delbecq, Van de Ven, and Gustafson, 1975. This book is strongly recommended.

The NGT is a four-phase process. The participants are physically present in groups of 8 to 12 and the session is controlled by a process consultant or facilitator.

Following an opening introduction in which the purposes of the session are outlined, participants are presented a carefully worded task statement. The group members are then instructed to write on the sheet provided, their responses to the task statement. The first phase is called silent generation and typically takes about 10 minutes.

Next comes the round robin phase. The facilitator calls on participants one-by-one to state one of the responses he or she has written. Participants may pass at any time and join in on any subsequent round. A participant may propose only one item at a time and either the facilitator or an assistant records each item as it is presented. The only discussion allowed is between the facilitator and the participant who proposes the item and it is limited to seeking a concise rephrasing for ease of recording. Participants are encouraged to add items to their personal list should new ones occur to them during the round robin.

The third phase is called clarification. Once all items have been recorded, the facilitator goes over each, one at a time, to ascertain that all participants understand the action programs which have been

recorded. Any participant may offer clarification or may suggest combination, modification, deletion, etc. of items, however, no evaluation is permitted.

In phase four, voting and ranking, participants are provided with eight blank cards. Each must now select eight items and write them, one per card. Participants then spread the eight cards such that they can be viewed simultaneously. Working alone, each selects the single most preferred item and writes the score 8 on the card, and puts it aside. Of the remaining seven cards, the least preferred item is selected and scored 1. This iterative process continues until all are scored.

During the period of time before the next activity, the scores are recorded, beside the items, on the clarified list. The resulting consensus items are discussed and the group will now be prepared for future steps.

TASK STATEMENT

The task statement is simply the carefully worded task that you wish the participants to respond to during the structured group session. It is perhaps the most critical element of the NGT process. The task statement should be simple and direct. Strive for clarity and then test the statement on a few members of the organization to detect potentially confusing or biasing expressions.

COMPOSITION

Selection of the appropriate participants for structured group activities is another crucial activity. The quality of the eventual results is directly dependent upon the degree to which you select the right personnel to participate.

LOGISTICS

Group effectiveness is strongly related to the facilitator's ability to operate the method smoothly and confidently. The following minimum logistic preparations are essential:

a) the facilitator should have a detailed agenda of group activities, resources needed, and time durations for the group activities.

b. a trained assistant should be available whose duty is simply to record participants on large sheets of flip-chart type paper, to display these sheets, to tabulate and record votes, and to provide participants with necessary materials.

c. A packet should be prepared for each participant containing the materials needed for the session. For example the packet should contain:

-a card displaying the participant's name on both sides, folded so as to stand on the table

-a sheet of 8 1/2 x 11 paper with the task statement typed at the top

-sufficient number of 3" x 5" cards for ranking the voting (a convenience would be to have them in packets of the correct number one for each participant)

-marking pens for the assistant

-masking tape to used for taping up sheets of measures

d) A conveniently located conference room with a table that will confortably accommodate the group while writing. Excessively large or small rooms are distracting. The room must permit the taping of the large sheets on the wall.

e) one or two large display easels on which the pads (approximately 27" x 34") can be mounted.

f) the group task should be written on one of the large sheets of paper.

g) the following simple visual aids, while not essential, have proven very useful in communicating quickly and effectively with participants:

a display of the steps in the nominal group technique.

a series of displays to supplement the facilitator's introduction to the purpose and method for the group session.

Part of the logistics is the actual execution of the nominal group technique. Execution of the nominal group technique involves the four basic steps mentioned earlier in addition to an introduction and conclusion. All participants should be made aware, in the facilitators opening statement to the group, of the nature of the task, process, etc.

PROCESS INSTRUCTIONS

The method begins with a carefully prepared statement of the group task. This task statement appears at the top of a sheet of paper in each participant's packet and on a large sheet in front of the group. The facilitator should familiarize the participants with the process and attempt to make them feel comfortable and at ease with what will transpire in the next two hours. The facilitator should discuss very briefly at least the following items:

a) the purpose of the session and the importance of the process in order to effectively and efficiently complete the task.

b) the steps of the nominal group method.

c) how the results will be used, next steps, etc.

The facilitator reads the task statement aloud. If the facilitator is asked what is meant by the task statement, it is probably best to avoid introducing bias by giving examples. Instead the facilitator might ask several of the participants to give their interpretation of the task statement. Additionally, the facilitator may simply ask several participants to directly respond to the task statement, that is, to provide a response. If the responses appear to be coincident with the objective and the remainder of the participants appear to have now grasped the task, it is time to proceed to the first basic step of the nominal group technique, silent generation. The process of forcing the participants to clarify the task statement themselves is called self priming, and has been found to be very effective.

The group members are instructed to write on the sheet provided, their responses to the task statement. The first phase is called silent generation and typically takes about 10 to 15 minutes.

Both the facilitator and the assistant should write during this period. Even if a majority of participants appear to stop writing before 10 minutes has elapsed, the period should not be shortened. If some talking occurs the facilitator should tactfully ask for cooperation in permitting others to think through their ideas.

Like each of the steps in the nominal group process, silence is purposefully designed. Research has shown that for creation, generation, and production of ideas, individuals are more effective than groups. Thus for this portion of the session, individual behavior is sought. Silent generation focuses attention on a specific task, frees the participants from distractions, and provides an opportunity to think through their ideas rather than to simply react to the comments of others. In this sense, it is a proactive search process which yields contributions of greater quality and variety. Participants are motivated by the tension of seeing those around them working hard at the group task. They are forced to attend for a longer time to the task, rather than rushing immediately to consideration of the first which is suggested to the group. They are freed from all the inhibiting effects of the usual face-to-face interaction of unstructured groups. Judgement of ideas cannot take place during this early and crucial portion of the group process.

At the end of the silent generation period, the facilitator interrupts the silent generation process. It should be emphasized that there is no need to stop generating and that the listing process which is about to begin may well lead to additional ideas. The facilitator calls on participants one-by-one to state one of the responses written. Participants may pass at any time and may also join in on any subsequent round. A participant may propose only one item at a time and either the facilitator or an assistant records each items as it is offered. The only discussion allowed is between the facilitator and the participant who proposed the item and it is limited to seeking a concise rephrasing for ease of recording. As each participant responds, the facilitator repeats verbatim what has been said, and the assistant records the concise phrase on a sheet. As mentioned earlier, the consultant may assist rephrasing in order to maintain consistency and achieve session

goals as long as the basic idea or concept is not altered. This phase goes on until all the ideas generated by the group are listed and displayed.

The round robin phase, described above, permits the leader to establish an atmosphere of acceptance and trust. He does not unduly rephrase or evaluate the contributions and they are equally and prominently displayed before the group. Leader openness and non-evaluative behavior are essential here. Each idea and each participant receive equal attention and acceptance. There is little opportunity for the process to be dominated by strong personalities, inhibited by possible sanctions or conflicts, or suppressed by status differences. The process separates ideas from their authors and permits conflicting and incompatible ideas to be explicitly tolerated. It provides written record of the group's efforts on a basis for any next steps.

The third phase is call clarification. Once all the items have been recorded, the facilitator goes over each one in order to ascertain that all participants understand the item as it has been recorded. Any participant may offer clarification or may suggest combination, modification, deletion, etc. of items, however, evaluation should be avoided. It is not required nor is it expected that the author provide the clarification. The consultant moves rapidly from one measure to the next, keeping up the pace of the process. During this step the underlying logic behind items may be thought out, there may be some expressions of differences of opinion, and the group may conclude that some items can be eliminated or combined because they duplicate others.

Pace is important to this step and the facilitator's job is to keep the group moving rapidly through the list of items. While in this phase the group is more like an interacting one, the facilitator seeks to control lengthy discussions, arguments, and "speech making". Again, the effort is to separate ideas from their authors, to clarify rather than to evalute, and to insure full opportunities for participation.

It is important to point out that the clarification aspect of the nominal group technique is perhaps the primary determinant for the resultant quality of the list of items. If there is a great deal of overlap from item to item and if there is ambiguity on the part of the group members as to exactly what each item means, the next step which involves voting and ranking will be invalid. Experience has indicated that a certain amount of combination is necessary. The facilitator should be sensitive to any hierarchy of items represented on each list. This hierarchy has to do with the breadth, scope or generality of the item itself. The list should contain items of uniform scope, breadth or generality in order for voting and ranking to be "successful". Just exactly how this is attained will depend upon the group and the facilitator. After experiencing a session you will begin to recognize the characteristics of this issue. Some find that careful combination or subtle clarification during the round robin session will help to alleviate clarification difficulties which often occur.

The fourth phase, voting and ranking. provides the participants with an opportunity to select the most important items and to rank those

items. The participants are asked to remove the blank 3" x 5" cards from the packets. The number of blank cards can vary. Each participant is asked to select eight most important items from the list displayed before them. Typically the list will contain 20-30 items. To avoid any confusion in handling their judgements, they are asked to write the items out, in abbreviated fashion, in the center of the blank card. They are also asked to write the sequential list number of the item in the upper left hand corner of the card. When all have completed this step, they are asked to spread the eight cards out in front of them and to follow the next steps designed to rank and weigh the items.

> "From the eight cards, choose the most important item, write the number 8 with a circle around it in the lower right hand corner of the card, an set the card aside."

Another way of phrasing this which may assist some in deciding which is most important is as follows:

> "Which of the eight items would you use to guide future actions relative to this topic if you could only use one?"

The ranking process continues:

> "From the remaining seven cards, choose the least important item, write the number 1 with a circle around it in the lower right hand corner of the card, and set the card aside."

Another way of phrasing this which may assist some in deciding which is the least important is as follows:

> "If you could only use six items of the seven in front on you, which one item would you just as soon drop off?"

The ranking process continues:

> "From the remaining six cards, choose the most important item, write the number 7 with a circle around it in the lower right hand corner of the card, and set the card aside."

The process continues in this outside in ranking fashion, most important--least important--most important--etc., until all the cards have been ranked.

At this point of the process, tabulation of the votes needs to take place, the facilitator has three alternatives:

a) invite the participants to take a ten minute break (possibly for refreshment) while he and the assistant tabulate and display the results.

b) invite the participants to watch while the tabulation process takes place.

c) invite the participants to fill out a brief questionnaire which has been prepared by the coordinator for the specific purpose of; evaluating the reaction of the participants to the process, obtaining suggestions from the participants as to the next steps, evaluation on the part of the participants as to likelihood of implementation, etc.

The tabulation process involves sorting the cards by sequential item number from the original list and recording the weights given to each. Later on, sums or averages can be computed, but for immediate discussion, individual weights should be displayed to communicate the number of weights given and their variation.

This step serves the fundamental purpose of permitting the participants to express their individual evaluations of the items in a way which is free of social pressure. It provides a constructive method for dealing with conflicts, and leads to a clear expression of whatever degree of consensus there may be with respect to the importance of terms generated. It provides a strong sense of closure, a feeling of group accomplishment, and a high level of interest for future steps in the activity being examined. While participants may not individually agree with the final product, they will typically support it as the achievement of their group.

The session closes with a brief discussion of results of the voting process in which the facilitator emphasizes those items for which there is strong consensus. He may ask the group if they would like to eliminate from further consideration any items which received no votes. Again, this should not be done unless there is complete consensus. No participant should be overriden here. At this point the facilitator may wish to comment on the future steps or to discuss the groups feelings about future action.

REFERENCES FOR FURTHER READING:

1. Delbecq, A.L., Van de Ven, A.H., and Gustafson, D.H., Group Techniques for Program Planning: A Guide to Nominal Group and Delphi Processes, Scott, Foresman & Co., 1975.

2. Group Development, Leland P. Bradford (ed.), University Assoc., 1974.

3. Huse, E.F., Organization Development and Change, West Publishing, Co., 1975.

4. Problem Analysis and Decision Making, Kepner-Tregoe, Inc., Princeton Research Press, 1973.

APPENDIX B

MATERIALS PERTAINING TO A CONSENSUS OF FOOD QUALITY ATTRIBUTES

[redacted]

OKLAHOMA STATE UNIVERSITY

M E M O R A N D U M

DATE January 16, 1985

TO FNIA & HRAD Faculty, Dietetic Interns, GRAs and GTAs

FROM Gretchen Furstenau & Lea Ebro

SUBJECT Brainstorm Session on "Attributes of Quality of Food Prepared in Quantity"

There is an urgent need to come up with a consensus on what are the quality attributes for food prepared in quantity. We cordially invite you to participate in a brainstorming session to derive such a consensus on Monday, Jan. 28, 1985 from 5:00-6:00 p.m. in HEW 316.

The outcome of this session will then be combined with the consensus from foodservice practitioners and food manufacturers to develop a research questionnaire which will be sent out to educators and students nationwide.

We need your input and appreciate your participation and assistance. Please feel free to bring notes, articles, magazines, etc. to the session.

Listing of Attributes from January 28, 1985
Nominal Group Technique Session

1. Flavor
2. Appearance
3. Proper temperature
4. Mouthfeel or texture
5. Color
6. Consistency
7. Nutritious
8. Wholesomeness
9. Well balanced food groups
10. Identifiable
11. Meet the need of consumer
12. Basic characteristics defined (image)
13. Cultural need
14. Aroma/smell
15. Tenderness
16. Freshness
17. Attractive service
18. Standard recipe
19. Size of servings and size of serving container
20. Retention of original color and texture
21. Economy
22. Satiety feeling
23. Seasonings
24. Recipe evaluation
25. Interfacing with surroundings and decor
26. Enhancement of characteristics
27. Variety
28. Proper working technique
29. Garnishes
30. Digestible
31. Suitable food choice for occasion
32. Preparation standards
33. Acceptable food combinations
34. Shapes of food
35. Convenience
36. Proper table appointments
37. Skill of employees
38. Proper equipment
39. Skillful chef
40. Food availability

DATE: February 6, 1985

TO: FNIA and HRAD Faculty, GTA's and GRA's

FROM: Gretchen Furstenau and Lea Ebro

RE: Brainstorm Session Results on Quality Attributes of Food Prepared in Quantity: Development of a Consensus

The results of the brainstorm session on January 28, 1985 established several categories for quality attributes of foods prepared in quantity. These categories and their corresponding attributes are presented in the attached sheets.

Please comment on each of the attributes and the categories as well. Clarity and understandability of the attributes is imperative. The best manner of representing the attributes through descriptive statement is sought. Feel free to contribute additional attributes and/or categories. The comprehensibility of this list is important.

Please provide feedback by February 12. Leave the results in the FNIA office. Thanks very much.

Appearance

1. Color
2. Shape
3. Garnish
4. Identifiability
5. Retention of original or natural appearance
6. Basic characteristics defined (image)

Nutrition

1. Meets needs of consumer
2. Wholesomeness
3. Microbiological and chemical safety
4. Freshness
5. Well balanced food groups

Feeling of Satisfaction

1. Aroma/smell
2. Satiety feeling
3. Flavor
4. Mouthfeel or texture
5. Consistency
6. Tenderness
7. Variety
8. Enhancement of characteristics
9. Digestibility

Attractive Service

1. Interfacing with surroundings and decor
2. Proper table appointments
3. Suitable choice for occasion
4. Acceptable food combinations
5. Size of serving
6. Size of container (serving or plate)

Preparation

1. Proper cooking techniques
2. Recipe evaluation
3. Seasonings
4. Preparation standards
5. Proper equipment
6. Skillful Chef
7. Food availability
8. Design and layout
9. Economy

Consumer Acceptance

1. Complaint analysis
2. Taste panel scoring
3. Customer feedback
4. Plate waste

Selection of Foods

1. Grades
2. Standards
3. Suitability for occasion

Other Comments:

APPENDIX C

COVER LETTER & RESEARCH INSTRUMENT

Oklahoma State University
Department of Food, Nutrition and Institution Administration
425 HOME ECONOMICS WEST
STILLWATER, OKLAHOMA 74078
(405) 624-5039

April 8, 1985

Dear Colleague:

Managing food quality for foods prepared in quantity has become a highly challenging responsibility. This challenge is due to the changes in and development of new and complex foodservice systems. With these changes there is an additional concern for the proper techniques used to judge food quality.

Foodservice students need to deal with these changes effectively. As future foodservice managers, they will be responsible for the food quality in their operations. The enclosed survey seeks to discover how students perceive food quality and how much they have learned about it in their courses. Information gathered from the surveys will then be used to conceptualize food quality and its attributes.

Kindly distribute this survey to ten students currently enrolled in or who have completed Quantity Food Production Management. Please return the survey by April 30 in the postage paid envelope.

Thank you very much for your assistance and cooperation in this effort to examine food quality.

Sincerely,

Gretchen E. Furstenau, M.S.
Graduate Teaching Associate

Lea L. Ebro, Ph.D., R.D.
Professor

CENTENNIAL DECADE 1980 • 1990

Oklahoma State University

Department of Food, Nutrition and Institution Administration

425 HOME ECONOMICS WEST
STILLWATER, OKLAHOMA 74078
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Foodservice students need to deal with these changes effectively. As future foodservice managers, they will be responsible for the food quality in their operations. The enclosed survey seeks to discover how students perceive food quality and how much they have learned about it in their courses. Information gathered from the surveys will then be used to conceptualize food quality and its attributes.

Please distribute this survey to your CUP students currently enrolled in or who have completed Quantity Food Production Management or to your dietetic interns. Please return the survey by April 30 in the postage paid envelope.

Thank you very much for your assistance and cooperation in this effort to examine food quality.

Sincerely,

Gretchen E. Furstenau, M.S.
Graduate Teaching Associate

Lea L. Ebro, Ph.D., R.D.
Professor

CENTENNIAL DECADE 1980 • 1990

Food Quality Attributes Survey
For Foods Prepared in Quantity

This is a questionnaire on the quality of foods prepared in quantity. The questionnaire will help to determine the degree of knowledge students have obtained through their foodservice coursework.

I. General Information
Directions: Please place a check or fill in the appropriate answer for each question below.

1. Student classification:

_____ sophomore
_____ junior
_____ senior
_____ other (specify)

2. Age group:

_____ under 21
_____ 21-30
_____ 31-40
_____ 41-50
_____ 51 & older

3. Sex of respondent: _____ female _____ male

4. Declared major for program currently enrolled in:

_____ dietetics (plan IV)
_____ nutrition
_____ food science
_____ foodservice management
_____ hotel administration
_____ home economics
_____ other (specify)

5. Number of credit hours taken (including current coursework) in the following areas. List course titles beside appropriate category:

Sem.	Qtr.		
___	___	food preparation	_____
___	___	food science	_____
___	___	foodservice	_____

6. Extent of full-time (40 hrs. per week) foodservice work experience:

_____ less than 1 yr.
_____ 1-2 yrs.
_____ 3-4 yrs.
_____ 5 or more yrs.

II. Listed in column A below are attributes which have been associated with or used to evaluate the quality of quantity prepared foods prior to service. An attribute is a characteristic or component which relates to the quality of the product.

Directions: In Column B circle the number which best describes the importance of the food quality attribute; from (1) for very important, (2) for next in importance, and etc. In Column C circle the number which indicates how much you have learned in your foodservice courses relative to food quality in foods prepared in quantity; from (1) learned a great deal, through (5) did not learn.

Column A	Column B					Column C				
Food Attributes	Importance					Knowledge Attained				
	very		somewhat		not	learned a great deal		learned moderate		did not learn
Appearance	1	2	3	4	5	1	2	3	4	5
Aroma/Smell	1	2	3	4	5	1	2	3	4	5
Color/Color Retention	1	2	3	4	5	1	2	3	4	5
Complaint Analysis	1	2	3	4	5	1	2	3	4	5
Consistency in Product Results	1	2	3	4	5	1	2	3	4	5
Customer Expectation	1	2	3	4	5	1	2	3	4	5
Customer Satisfaction	1	2	3	4	5	1	2	3	4	5
Flavor/Taste	1	2	3	4	5	1	2	3	4	5
Food Decoration	1	2	3	4	5	1	2	3	4	5
Food Evaluation Equipment	1	2	3	4	5	1	2	3	4	5
Food Styling (Art)	1	2	3	4	5	1	2	3	4	5
Garnishment	1	2	3	4	5	1	2	3	4	5
Holding Food	1	2	3	4	5	1	2	3	4	5
Nutrient Retention	1	2	3	4	5	1	2	3	4	5
Portion Size	1	2	3	4	5	1	2	3	4	5
Product Identifiability	1	2	3	4	5	1	2	3	4	5
Reheating Food	1	2	3	4	5	1	2	3	4	5
Satiety	1	2	3	4	5	1	2	3	4	5
Seasoning	1	2	3	4	5	1	2	3	4	5
Sensory Evaluation	1	2	3	4	5	1	2	3	4	5
Shape (Variety)	1	2	3	4	5	1	2	3	4	5
Sound (While Eating)	1	2	3	4	5	1	2	3	4	5
Temperature	1	2	3	4	5	1	2	3	4	5
Texture/Mouthfeel	1	2	3	4	5	1	2	3	4	5
Other Attributes (Specify)	1	2	3	4	5	1	2	3	4	5

Thank you for your participation.

APPENDIX D

GEOGRAPHIC AREAS

Area I: Alaska, California, Hawaii, Idaho, Montana, Oregon, Washington, Wyoming

Area II: Iowa, Michigan, Minnesota, Missouri, Nebraska, North Dakota, South Dakota, Wisconsin

Area III: Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, Puerto Rico, South Carolina

Area IV: Arizona, Colorado, Kansas, Nevada, New Mexico, Oklahoma, Texas, Utah

Area V: Illinois, Indiana, Kentucky, Ohio, Tennessee, West Virginia

Area VI: Delaware, District of Columbia, Maryland, North Carolina, Pennsylvania, Virginia

Area VII: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, Vermont

Source: American Dietetic Association. Designation of Geographic Areas.

APPENDIX E

CHI-SQUARE ANALYSES

Code for Food Quality Survey Results

Columns

B = Importance of Attributes
C = Knowledge of Attributes

Attributes

1 = Appearance
2 = Aroma/Smell
3 = Color/Color Retention
4 = Complaint Analysis
5 = Consistency in Product Results
6 = Customer Expectation
7 = Customer Satisfaction
8 = Flavor/Taste
9 = Food Decoration
10 = Food Evaluation Equipment
11 = Food Styling (Art)
12 = Garnishment
13 = Holding Food
14 = Nutrient Retention
15 = Portion Size
16 = Product Identifiability
17 = Reheating Rood
18 = Satiety
19 = Seasoning
20 = Sensory Evaluation
21 = Shape (Variety)
22 = Sound (While Eating)
23 = Temperature
24 = Texture/Mouthfeel

Example:
Table of Age by B1

B1 — Importance
B1 — Appearance

Disclaimer Statement

In some of the chi-square tests, the expected values for the frequencies were low enough to create concern. Within the scope of this survey, low counts in some cells were attributable to two causes. First, answers by respondents, within the one to five ranking structure, were mostly of similar ranking numbers by the majority of the respondents. Secondly, some options were rarely selected by respondents due to the nature of the population (i.e. a category of an age group of over fifty years old).

Statistical literature discusses that low expected values may cause the distribution of the test statistic under a true null hypothesis to not be asymptotically chi-square. (Cochran, 1952 and Yarnold, 1970). Other opinions claim that the average expected value can be less than one (Slakter, 1973). Because most of the following chi-square tables had at least one cell with less than five samples per cell, the computer generated the following statement:

> Warning: Over 20% of the cells have expected counts less than 5. Table is so sparce that chi-square may not be a valid test.

DIETETIC INTERN

TABLE OF AGE BY B1

AGE B1

FREQUENCY	.	1	2	3	TOTAL
1	0	1	0	0	1
2	5	282	29	2	313
3	2	8	0	0	8
4	0	2	0	1	3
5	0	1	0	0	1
TOTAL	.	294	29	3	326

CHI-SQUARE 36.106 DF= 8 PROB=0.0001

TABLE OF AGE BY B15

AGE B15

FREQUENCY	.	1	2	3	4	TOTAL
1	0	0	1	0	0	1
2	6	178	107	25	2	312
3	2	3	1	4	0	8
4	0	1	1	1	0	3
5	0	1	0	0	0	1
TOTAL	.	183	110	30	2	325

CHI-SQUARE 21.506 DF= 12 PROB=0.0434

TABLE OF AGE BY C10

AGE C10

FREQUENCY	.	1	2	3	4	5	TOTAL
1	0	0	0	0	0	1	1
2	12	37	95	101	43	30	306
3	3	1	3	0	3	0	7
4	0	0	1	0	2	0	3
5	0	1	0	0	0	0	1
TOTAL	.	39	99	101	48	31	318

CHI-SQUARE 30.507 DF= 16 PROB=0.0155

TABLE OF AGE BY C20

AGE C20

FREQUENCY	.	1	2	3	4	5	TOTAL
1	0	0	0	0	1	0	1
2	9	119	102	70	11	7	309
3	3	3	1	2	1	0	7
4	0	1	1	1	0	0	3
5	0	1	0	0	0	0	1
TOTAL		124	104	73	13	7	321

CHI-SQUARE 28.679 DF= 16 PROB=0.0262

TABLE OF AGE BY C21

AGE C21

FREQUENCY	.	1	2	3	4	5	TOTAL
1	0	1	0	0	0	0	1
2	6	100	122	74	14	2	312
3	3	4	1	1	1	0	7
4	0	0	1	0	2	0	3
5	0	0	1	0	0	0	1
TOTAL		105	125	75	17	2	324

CHI-SQUARE 31.141 DF= 16 PROB=0.0129

TABLE OF SEX BY B18

SEX B18

FREQUENCY	.	1	2	3	4	5	TOTAL
1	8	52	120	122	18	1	313
2	0	3	6	2	0	1	12
TOTAL		55	126	124	18	2	325

CHI-SQUARE 15.144 DF= 4 PROB=0.0044

TABLE OF CLASS BY B19

CLASS	B19					
FREQUENCY	.	1	2	3	4	TOTAL
3	0	1	2	0	1	4
4	8	117	147	54	3	321
TOTAL		118	149	54	4	325

CHI-SQUARE 19.421 DF= 3 PROB=0.0002

TABLE OF CLASS BY B22

CLASS	B22						
FREQUENCY	.	1	2	3	4	5	TOTAL
3	0	0	0	1	3	0	4
4	8	26	93	139	43	20	321
TOTAL		26	93	140	46	20	325

CHI-SQUARE 12.633 DF= 4 PROB=0.0132

TABLE OF CLASS BY C7

CLASS	C7						
FREQUENCY	.	1	2	3	4	5	TOTAL
3	0	1	1	1	0	1	4
4	12	80	106	87	38	6	317
TOTAL		81	107	88	38	7	321

CHI-SQUARE 10.245 DF= 4 PROB=0.0365

TABLE OF CLASS BY C12

CLASS	C12						
FREQUENCY	.	1	2	3	4	5	TOTAL
3	0	1	0	1	0	2	4
4	10	52	89	109	51	18	319
TOTAL		53	89	110	51	20	323

CHI-SQUARE 14.588 DF= 4 PROB=0.0056

TABLE OF CLASS BY C14

CLASS C14

FREQUENCY	.	1	2	3	4	5	TOTAL
3	0	2	0	1	0	1	4
4	12	140	125	43	8	1	317
TOTAL		142	125	44	8	2	321

CHI-SQUARE 40.717 DF= 4 PROB=0.0001

TABLE OF WKEXP BY B6

WKEXP B6

FREQUENCY	.	1	2	3	4	TOTAL
1	2	76	83	28	2	189
2	7	29	44	14	0	87
3	0	14	11	3	4	32
4	0	6	6	4	0	16
TOTAL		125	144	49	6	324

CHI-SQUARE 26.569 DF= 9 PROB=0.0016

TABLE OF AREA BY B4

AREA B4

FREQUENCY	.	1	2	3	4	5	TOTAL
.	2	7	6	4	1	0	.
1	2	4	20	8	0	0	32
2	10	21	38	15	1	0	75
3	1	11	12	3	4	0	30
4	0	7	16	9	2	0	34
5	4	18	35	15	3	2	73
6	1	6	13	6	2	3	30
7	1	10	6	4	0	0	20
TOTAL		77	140	60	12	5	294

CHI-SQUARE 41.276 DF= 24 PROB=0.0155

TABLE OF AREA BY B10

AREA B10

FREQUENCY		1	2	3	4	5	TOTAL
.	3	0	6	9	2	0	.
1	5	4	7	11	5	2	29
2	5	9	33	28	9	1	80
3	0	5	14	7	5	0	31
4	0	2	12	12	8	0	34
5	2	2	37	30	5	1	75
6	3	3	6	12	4	3	28
7	0	3	9	5	4	0	21
TOTAL	.	28	118	105	40	7	298

CHI-SQUARE 36.688 DF= 24 PROB=0.0470

TABLE OF AREA BY B15

AREA B15

FREQUENCY	.	1	2	3	4	TOTAL
.	1	13	6	0	0	.
1	2	14	8	10	0	32
2	4	49	25	7	0	81
3	0	17	8	5	1	31
4	0	18	15	1	0	34
5	0	44	32	1	0	77
6	1	18	6	5	1	30
7	0	10	10	1	0	21
TOTAL		170	104	30	2	306

CHI-SQUARE 42.111 DF= 18 PROB=0.0011

PLAN IV

TABLE OF AGE BY B17

AGE B17

FREQUENCY	.	1	2	3	4	TOTAL
.	0	1	0	0	0	.
1	0	16	6	8	4	34
2	5	39	71	41	3	154
3	0	5	1	0	2	8
4	0	1	1	0	0	2
TOTAL	.	61	79	49	9	198

CHI-SQUARE 30.879 DF= 9 PROB=0.0003

TABLE OF AGE BY C9

AGE C9

FREQUENCY	.	1	2	3	4	5	TOTAL
.	0	0	0	1	0	0	.
1	0	3	15	9	7	0	34
2	4	16	50	46	37	6	155
3	0	2	0	5	1	0	8
4	0	0	0	1	0	1	2
TOTAL	.	21	65	61	45	7	199

CHI-SQUARE 24.472 DF= 12 PROB=0.0175

TABLE OF AGE BY C19

AGE C19

FREQUENCY	.	1	2	3	4	5	TOTAL
.	0	0	1	0	0	0	.
1	0	5	6	14	8	1	34
2	3	22	41	58	31	4	156
3	0	1	4	3	0	0	8
4	0	0	0	1	0	1	2
TOTAL	.	28	51	76	39	6	200

CHI-SQUARE 21.063 DF= 12 PROB=0.0495

TABLE OF SEX BY B2

SEX B2

FREQUENCY	.	1	2	3	4	TOTAL
.	0	3	2	1	0	.
1	2	92	63	9	1	165
2	1	13	11	6	0	30
TOTAL	.	105	74	15	1	195

CHI-SQUARE 7.907 DF= 3 PROB=0.0480

TABLE OF SEX BY B5

SEX B5

FREQUENCY	.	1	2	3	4	TOTAL
.	0	6	0	0	0	.
1	3	100	57	6	1	164
2	1	11	15	3	1	30
TOTAL	.	111	72	9	2	194

CHI-SQUARE 8.230 DF= 3 PROB=0.0415

TABLE OF SEX BY B7

SEX B7

FREQUENCY	.	1	2	3	4	TOTAL
.	0	6	0	0	0	.
1	2	138	26	1	0	165
2	1	18	10	1	1	30
TOTAL	.	156	36	2	1	195

CHI-SQUARE 13.361 DF= 3 PROB=0.0039

TABLE OF SEX BY B8

SEX B8

FREQUENCY	.	1	2	3	TOTAL
.	0	6	0	0	.
1	2	143	21	1	165
2	1	21	8	1	30
TOTAL	.	164	29	2	195

CHI-SQUARE 5.996 DF= 2 PROB=0.0499

TABLE OF SEX BY B14

SEX B14

FREQUENCY	.	1	2	3	4	5	TOTAL
.	0	3	2	1	0	0	.
1	2	115	38	10	1	1	165
2	1	11	9	9	1	0	30
TOTAL	.	126	47	19	2	1	195

CHI-SQUARE 21.751 DF= 4 PROB=0.0002

TABLE OF SEX BY B17

SEX B17

FREQUENCY	.	1	2	3	4	TOTAL
.	0	3	1	2	0	.
1	4	54	68	34	7	163
2	1	5	10	13	2	30
TOTAL	.	59	78	47	9	193

CHI-SQUARE 8.248 DF= 3 PROB=0.0412

TABLE OF SEX BY B21

SEX B21

FREQUENCY	.	1	2	3	4	TOTAL
.	0	1	4	1	0	.
1	2	52	74	37	2	165
2	1	6	16	4	4	30
TOTAL	.	58	90	41	6	195

CHI-SQUARE 14 647 DF= 3 PROB=0.0021

TABLE OF CLASS BY B1

CLASS B1

FREQUENCY	.	1	2	3	4	TOTAL
.	0	1	0	0	0	.
1	0	4	0	1	0	5
2	1	67	6	0	1	74
3	2	96	9	0	0	105
4	0	11	4	1	0	16
TOTAL	.	178	19	2	1	200

CHI-SQUARE 31.592 DF= 9 PROB=0.0002

TABLE OF CLASS BY B7

CLASS B7

FREQUENCY	.	1	2	3	4	TOTAL
.	0	1	0	0	0	.
1	0	4	1	0	0	5
2	1	62	12	0	0	74
3	2	83	21	1	0	105
4	0	12	2	1	1	16
TOTAL	.	161	36	2	1	200

CHI-SQUARE 17.533 DF= 9 PROB=0.0410

TABLE OF CLASS BY B14

CLASS B14

FREQUENCY	.	1	2	3	4	5	TOTAL
.	0	1	0	0	0	0	.
1	0	3	0	2	0	0	5
2	1	42	23	7	2	0	74
3	2	76	22	6	0	1	105
4	0	7	4	5	0	0	16
TOTAL	.	128	49	20	2	1	200

CHI-SQUARE 23.856 DF= 12 PROB=0.0213

TABLE OF CLASS BY B15

CLASS B15

FREQUENCY	.	1	2	3	5	TOTAL
.	0	1	0	0	0	.
1	0	1	2	2	0	5
2	1	35	30	9	0	74
3	2	47	39	19	0	105
4	0	10	4	1	1	16
TOTAL	.	93	75	31	1	200

CHI-SQUARE 17.883 DF= 9 PROB=0.0366

TABLE OF CLASS BY C1

CLASS C1

FREQUENCY	.	1	2	3	4	TOTAL
.	0	0	1	0	0	.
1	0	0	1	4	0	5
2	1	26	33	13	2	74
3	2	42	46	17	0	105
4	0	6	7	1	2	16
TOTAL	.	74	87	35	4	200

CHI-SQUARE 26.457 DF= 9 PROB=0.0017

TABLE OF CLASS BY C3

CLASS C3

FREQUENCY	.	1	2	3	4	5	TOTAL
.	0	0	1	0	0	0	.
1	0	0	2	1	2	0	5
2	2	27	31	13	1	1	73
3	2	33	52	17	3	0	105
4	0	6	8	2	0	0	16
TOTAL	.	66	93	33	6	1	199

CHI-SQUARE 28.539 DF= 12 PROB=0.0046

TABLE OF CLASS BY C9

CLASS / FREQUENCY	.	1	2	3	4	5	TOTAL
.	0	0	0	1	0	0	.
1	0	0	0	2	3	0	5
2	2	9	33	18	11	2	73
3	2	9	31	38	23	4	105
4	0	3	1	3	8	1	16
TOTAL	.	21	65	61	45	7	199

CHI-SQUARE 24.752 DF= 12 PROB=0.0160

TABLE OF WKEXP BY B2

WKEXP / FREQUENCY	.	1	2	3	4	TOTAL
.	0	1	0	0	0	.
1	1	67	52	6	0	125
2	1	17	18	2	1	38
3	0	15	5	5	0	25
4	1	8	1	3	0	12
TOTAL	.	107	76	16	1	200

CHI-SQUARE 22.401 DF= 9 PROB=0.0077

TABLE OF WKEXP BY B7

WKEXP / FREQUENCY	.	1	2	3	4	TOTAL
.	0	1	0	0	0	.
1	1	98	25	2	0	125
2	1	34	4	0	0	38
3	0	19	6	0	0	25
4	1	10	1	0	1	12
TOTAL	.	161	36	2	1	200

CHI-SQUARE 19.970 DF= 9 PROB=0.0181

TABLE OF WKEXP BY B15

WKEXP B15

FREQUENCY	.	1	2	3	5	TOTAL
.	0	1	0	0	0	.
1	1	52	51	22	0	125
2	1	18	16	4	0	38
3	0	15	7	3	0	25
4	1	8	1	2	1	12
TOTAL	.	93	75	31	1	200

CHI-SQUARE 23.420 DF= 9 PROB=0.0053

TABLE OF WKEXP BY C2

WKEXP C2

FREQUENCY	.	1	2	3	4	5	TOTAL
.	0	0	1	0	0	0	.
1	1	18	42	56	8	1	125
2	1	12	12	13	0	1	38
3	0	2	14	6	2	1	25
4	1	1	4	4	3	0	12
TOTAL	.	33	72	79	13	3	200

CHI-SQUARE 23.984 DF= 12 PROB=0.0204

TABLE OF WKEXP BY C9

WKEXP C9

FREQUENCY	.	1	2	3	4	5	TOTAL
.	0	0	0	1	0	0	.
1	1	4	44	44	29	4	125
2	1	8	12	10	8	0	38
3	0	5	6	5	7	2	25
4	2	4	3	2	1	1	11
TOTAL	.	21	65	61	45	7	199

CHI-SQUARE 27.967 DF= 12 PROB=0.0056

TABLE OF WKEXP BY C15

WKEXP C15

FREQUENCY	.	1	2	3	4	TOTAL
.	0	1	0	0	0	.
1	1	42	53	23	7	125
2	1	19	15	4	0	38
3	0	11	9	4	1	25
4	1	9	1	0	2	12
TOTAL	.	81	78	31	10	200

CHI-SQUARE 17.698 DF= 9 PROB=0.0388

TABLE OF WKEXP BY C17

WKEXP C17

FREQUENCY	.	1	2	3	4	5	TOTAL
.	0	0	1	0	0	0	.
1	1	15	47	43	15	5	125
2	1	7	13	13	5	0	38
3	0	5	6	10	4	0	25
4	1	7	2	0	3	0	12
TOTAL	.	34	68	66	27	5	200

CHI-SQUARE 25.273 DF= 12 PROB=0.0136

TABLE OF WKEXP BY C21

WKEXP C21

FREQUENCY	.	1	2	3	4	5	TOTAL
.	0	0	0	1	0	0	.
1	2	28	43	45	6	2	124
2	1	14	18	4	2	0	38
3	0	7	9	7	2	0	25
4	1	2	7	0	2	1	12
TOTAL	.	51	77	56	12	3	199

CHI-SQUARE 23.146 DF= 12 PROB=0.0265

TABLE OF AREA BY C2

AREA	C2						
FREQUENCY	.	1	2	3	4	5	TOTAL
1	0	4	8	19	0	0	31
2	0	6	16	19	2	1	44
3	0	3	5	3	0	0	11
4	1	4	6	12	6	0	28
5	0	6	12	12	1	0	31
6	2	10	16	6	4	1	37
7	0	0	10	8	0	1	19
TOTAL	.	33	73	79	13	3	201

CHI-SQUARE 40.826 DF= 24 PROB=0.0174

TABLE OF AREA BY C4

AREA	C4						
FREQUENCY	.	1	2	3	4	5	TOTAL
1	0	2	9	15	4	1	31
2	1	6	8	13	10	6	43
3	0	5	1	5	0	0	11
4	1	1	5	10	9	3	28
5	0	1	10	9	6	5	31
6	3	5	6	12	9	4	36
7	1	0	4	6	4	4	18
TOTAL	.	20	43	70	42	23	198

CHI-SQUARE 37.099 DF= 24 PROB=0.0428

TABLE OF AREA BY C5

AREA	C5						
FREQUENCY	.	1	2	3	4	5	TOTAL
1	0	13	14	4	0	0	31
2	0	21	16	5	1	1	44
3	0	9	2	0	0	0	11
4	1	6	11	8	1	2	28
5	0	6	16	7	1	1	31
6	2	18	12	4	2	1	37
7	0	2	10	7	0	0	19
TOTAL	.	75	81	35	5	5	201

CHI-SQUARE 38.516 DF= 24 PROB=0.0307

TABLE OF AREA BY C12

AREA	C12						
FREQUENCY	.	1	2	3	4	5	TOTAL
1	0	3	11	10	7	0	31
2	2	6	9	12	7	8	42
3	0	3	4	1	2	1	11
4	1	2	10	10	5	1	28
5	0	8	4	14	5	0	31
6	3	7	14	11	4	0	36
7	0	2	5	4	3	5	19
TOTAL	.	31	57	62	33	15	198

CHI-SQUARE 41.770 DF= 24 PROB=0.0137

TABLE OF AREA BY C13

AREA	C13						
FREQUENCY	.	1	2	3	4	5	TOTAL
1	0	12	10	8	1	0	31
2	0	16	18	9	1	0	44
3	0	7	4	0	0	0	11
4	1	4	13	10	1	0	28
5	0	9	13	8	1	0	31
6	2	8	21	5	3	0	37
7	0	3	5	9	1	1	19
TOTAL	.	59	84	49	8	1	201

CHI-SQUARE 36.653 DF= 24 PROB=0.0474

TABLE OF AREA BY C19

AREA	C19						
FREQUENCY	.	1	2	3	4	5	TOTAL
1	0	4	7	10	8	2	31
2	0	4	12	17	9	2	44
3	0	4	2	4	1	0	11
4	1	2	7	10	8	1	28
5	0	2	10	16	3	0	31
6	2	12	12	8	5	0	37
7	0	0	2	11	5	1	19
TOTAL	.	28	52	76	39	6	201

CHI-SQUARE 37.821 DF= 24 PROB=0.0362

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TABLE OF AGE BY B12

AGE	B12						
FREQUENCY	.	1	2	3	4	5	TOTAL
1	0	7	13	3	2	0	25
2	1	53	76	46	5	0	180
3	0	4	4	2	0	1	11
4	0	2	0	2	0	0	4
5	0	1	0	0	0	0	1
TOTAL	.	67	93	53	7	1	221

CHI-SQUARE 29.843 DF= 16 PROB=0.0188

TABLE OF AGE BY B18

AGE	B18						
FREQUENCY	.	1	2	3	4	5	TOTAL
1	1	6	13	5	0	0	24
2	2	47	69	55	8	0	179
3	0	1	8	1	0	1	11
4	0	1	3	0	0	0	4
5	0	0	1	0	0	0	1
TOTAL	.	55	94	61	8	1	219

CHI-SQUARE 31.403 DF= 16 PROB=0.0119

TABLE OF SEX BY C4

SEX	C4						
FREQUENCY	.	1	2	3	4	5	TOTAL
	1	0	3	3	1	0	.
1	3	24	46	65	49	19	203
2	0	3	1	1	0	3	8
TOTAL	.	27	47	66	49	22	211

CHI-SQUARE 13.037 DF= 4 PROB=0.0111

TABLE OF CLASS BY B4

CLASS B4

FREQUENCY	.	1	2	3	4	5	TOTAL
2	5	23	54	18	4	2	101
3	1	42	43	24	2	0	111
4	0	1	0	3	0	0	4
TOTAL	.	66	97	45	6	2	216

CHI-SQUARE 17.737 DF= 8 PROB=0.0233

TABLE OF CLASS BY B9

CLASS B9

FREQUENCY	.	1	2	3	4	TOTAL
2	1	27	38	36	4	105
3	0	32	60	20	0	112
4	0	2	0	1	1	4
TOTAL	.	61	98	57	5	221

CHI-SQUARE 24.856 DF= 6 PROB=0.0004

TABLE OF CLASS BY B12

CLASS B12

FREQUENCY	.	1	2	3	4	5	TOTAL
2	1	26	41	32	5	1	105
3	0	39	52	20	1	0	112
4	0	2	0	1	1	0	4
TOTAL	.	67	93	53	7	1	221

CHI-SQUARE 18.142 DF= 8 PROB=0.0202

TABLE OF CLASS BY C20

CLASS C20

FREQUENCY	.	1	2	3	4	5	TOTAL
2	3	29	29	29	14	2	103
3	2	36	38	31	4	1	110
4	0	2	0	1	0	1	4
TOTAL	.	67	67	61	18	4	217

CHI-SQUARE 21.675 DF= 8 PROB=0.0056

TABLE OF AREA BY B4

AREA	B4						
FREQUENCY	.	1	2	3	4	5	TOTAL
.	0	5	5	5	0	0	.
1	2	15	23	3	1	0	42
2	1	12	36	15	1	0	64
3	1	1	3	3	0	2	9
4	0	12	6	5	2	0	25
5	1	3	9	6	1	0	19
6	1	9	9	7	1	0	26
7	0	9	6	1	0	0	16
TOTAL	.	61	92	40	6	2	201

CHI-SQUARE 72.544 DF= 24 PROB=0.0001

TABLE OF AREA BY B5

AREA	B5				
FREQUENCY	.	1	2	3	TOTAL
.	0	11	4	0	.
1	0	25	15	4	44
2	1	45	18	1	64
3	1	2	5	2	9
4	1	19	3	2	24
5	0	8	10	2	20
6	0	12	13	2	27
7	1	9	5	1	15
TOTAL	.	120	69	14	203

CHI-SQUARE 21.940 DF= 12 PROB=0.0382

TABLE OF AREA BY B15

AREA B15

FREQUENCY	.	1	2	3	4	TOTAL
.	0	6	8	1	0	.
1	0	25	14	5	0	44
2	2	35	25	2	1	63
3	1	6	2	1	0	9
4	0	15	8	2	0	25
5	0	7	5	8	0	20
6	0	18	7	1	1	27
7	0	13	2	1	0	16
TOTAL	.	119	63	20	2	204

CHI-SQUARE 34.119 DF= 18 PROB=0.0122

TABLE OF AREA BY B23

AREA B23

FREQUENCY	.	1	2	3	4	TOTAL
.	0	9	4	2	0	.
1	0	36	5	3	0	44
2	0	49	16	0	0	65
3	1	6	3	0	0	9
4	0	19	5	1	0	25
5	0	9	7	4	0	20
6	0	22	3	1	1	27
7	0	11	3	2	0	16
TOTAL	.	152	42	11	1	206

CHI-SQUARE 29.894 DF= 18 PROB=0.0385

TABLE OF AREA BY C4

AREA C4

FREQUENCY	.	1	2	3	4	5	TOTAL
.	0	1	8	4	2	0	.
1	1	4	4	14	17	4	43
2	1	8	17	22	11	6	64
3	1	0	0	1	5	3	9
4	0	4	7	5	5	4	25
5	1	0	4	6	6	3	19
6	0	6	5	12	2	2	27
7	0	4	5	5	2	0	16
TOTAL	.	26	42	65	48	22	203

CHI-SQUARE 40.488 DF= 24 PROB=0.0189

TABLE OF AREA BY C5

AREA C5

FREQUENCY	.	1	2	3	4	5	TOTAL
.	0	2	9	4	0	0	.
1	0	11	18	12	2	1	44
2	1	26	24	13	1	0	64
3	1	0	3	3	2	1	9
4	0	15	8	0	1	1	25
5	1	6	7	4	2	0	19
6	0	10	10	6	1	0	27
7	1	10	2	3	0	0	15
TOTAL	.	78	72	41	9	3	203

CHI-SQUARE 40.278 DF= 24 PROB=0.0200

TABLE OF AREA BY C7

AREA C7

FREQUENCY	.	1	2	3	4	5	TOTAL
.	0	5	5	5	0	0	.
1	2	7	16	13	6	0	42
2	1	26	25	10	3	0	64
3	1	2	2	4	0	1	9
4	0	9	8	5	3	0	25
5	0	3	8	7	2	0	20
6	0	13	6	6	2	0	27
7	0	5	7	3	1	0	16
TOTAL	.	65.	72	48	17	1	203

CHI-SQUARE 43.002 DF= 24 PROB=0.0099

TABLE OF AREA BY C16

AREA C16

FREQUENCY	.	1	2	3	4	5	TOTAL
.	0	3	8	4	0	0	.
1	1	7	17	11	6	2	43
2	1	17	22	20	5	0	64
3	1	1	2	6	0	0	9
4	0	7	9	6	3	0	25
5	0	2	5	4	7	2	20
6	1	8	10	7	1	0	26
7	0	5	5	6	0	0	16
TOTAL	.	47	70	60	22	4	203

CHI-SQUARE 38.283 DF= 24 PROB=0.0324

TABLE OF AREA BY C17

AREA C17

FREQUENCY	.	1	2	3	4	5	TOTAL
.	1	4	8	2	0	0	.
1	1	3	14	17	8	1	43
2	2	14	18	24	7	0	63
3	1	0	1	8	0	0	9
4	1	7	10	4	3	0	24
5	0	4	5	5	2	4	20
6	0	10	9	7	0	1	27
7	0	5	5	5	1	0	16
TOTAL	.	43	62	70	21	6	202

CHI-SQUARE 54.637 DF= 24 PROB=0.0003

TABLE OF AREA BY C20

AREA C20

FREQUENCY	.	1	2	3	4	5	TOTAL
.	0	5	4	5	1	0	.
1	2	8	9	12	10	3	42
2	2	19	17	23	4	0	63
3	1	2	4	3	0	0	9
4	0	9	8	5	2	1	25
5	0	7	8	4	1	0	20
6	0	8	16	3	0	0	27
7	0	9	1	6	0	0	16
TOTAL	.	62	63	56	17	4	202

CHI-SQUARE 50.219 DF= 24 PROB=0.0013

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TABLE OF AGE BY C1

AGE C1

FREQUENCY	.	1	2	3	4	5	TOTAL
1	0	12	9	8	0	1	30
2	1	73	69	32	2	1	177
3	0	1	1	2	1	0	5
4	1	0	0	0	0	0	0
TOTAL	.	86	79	42	3	2	212

CHI-SQUARE 18.380 DF= 8 PROB=0.0186

TABLE OF AGE BY C12

AGE C12

FREQUENCY	.	1	2	3	4	5	TOTAL
1	0	11	11	5	2	1	30
2	2	34	71	47	20	4	176
3	0	0	0	4	0	1	5
4	1	0	0	0	0	0	0
TOTAL	.	45	82	56	22	6	211

CHI-SQUARE 19.755 DF= 8 PROB=0.0113

TABLE OF AGE BY C17

AGE C17

FREQUENCY	.	1	2	3	4	5	TOTAL
1	1	9	2	15	3	0	29
2	2	40	41	62	26	7	176
3	0	0	1	1	3	0	5
4	1	0	0	0	0	0	0
TOTAL	.	49	44	78	32	7	210

CHI-SQUARE 15.766 DF= 8 PROB=0.0459

TABLE OF SEX BY B8

SEX B8

FREQUENCY	.	1	2	3	4	5	TOTAL
.	0	4	2	0	0	0	
1	0	99	19	0	1	1	120
2	2	53	29	3	1	0	86
TOTAL	.	152	48	3	2	1	206

CHI-SQUARE 14.796 DF= 4 PROB=0.0051

TABLE OF SEX BY B21

SEX B21

FREQUENCY	.	1	2	3	4	5	TOTAL
.	0	0	4	2	0	0	.
1	2	26	58	29	5	0	118
2	2	17	26	35	5	3	86
TOTAL	.	43	84	64	10	3	204

CHI-SQUARE 12.935 DF= 4 PROB=0.0116

TABLE OF SEX BY C8

SEX C8

FREQUENCY	.	1	2	3	4	5	TOTAL
.	0	2	1	3	0	0	.
1	2	58	44	11	3	2	118
2	1	24	46	15	2	0	87
TOTAL	.	82	90	26	5	2	205

CHI-SQUARE 12.557 DF= 4 PROB=0.0137

TABLE OF CLASS BY B16

CLASS B16

FREQUENCY	.	1	2	3	4	5	TOTAL
1	0	5	0	0	0	0	5
2	1	28	17	2	1	0	48
3	2	59	51	31	5	1	147
4	1	3	6	0	1	0	10
TOTAL	.	95	74	33	7	1	210

CHI-SQUARE 21.296 DF= 12 PROB=0.0462

TABLE OF CLASS BY C4

CLASS C4

FREQUENCY	.	1	2	3	4	5	TOTAL
1	0	0	1	3	1	0	5
2	0	11	11	12	9	6	49
3	6	14	37	42	36	14	143
4	0	0	1	3	1	6	11
TOTAL	.	25	50	60	47	26	208

CHI-SQUARE 29.021 DF= 12 PROB=0.0039

TABLE OF CLASS BY C6

CLASS C6

FREQUENCY	.	1	2	3	4	5	TOTAL
1	0	0	2	3	0	0	5
2	0	15	14	14	3	3	49
3	3	38	54	39	11	4	146
4	0	1	1	5	4	0	11
TOTAL	.	54	71	61	18	7	211

CHI-SQUARE 21.551 DF= 12 PROB=0.0429

TABLE OF CLASS BY C7

CLASS C7

FREQUENCY	.	1	2	3	4	5	TOTAL
1	0	0	0	4	1	0	5
2	0	26	15	7	1	0	49
3	2	59	55	24	4	5	147
4	0	2	2	6	0	1	11
TOTAL	.	87	72	41	6	6	212

CHI-SQUARE 35.145 DF= 12 PROB=0.0004

TABLE OF CLASS BY C8

CLASS C8

FREQUENCY	.	1	2	3	4	5	TOTAL
1	0	1	3	0	1	0	5
2	0	33	13	2	0	1	49
3	3	44	71	27	3	1	146
4	0	6	4	0	1	0	11
TOTAL	.	84	91	29	5	2	211

CHI-SQUARE 37.136 DF= 12 PROB=0.0002

TABLE OF CLASS BY C11

CLASS C11

FREQUENCY	.	1	2	3	4	5	TOTAL
1	1	0	1	2	0	1	4
2	0	7	11	15	11	5	49
3	4	8	33	48	37	19	145
4	0	1	2	0	2	6	11
TOTAL	.	16	47	65	50	31	209

CHI-SQUARE 22.475 DF= 12 PROB=0.0325

TABLE OF CLASS BY C16

CLASS C16

FREQUENCY	.	1	2	3	4	5	TOTAL
1	0	4	0	1	0	0	5
2	1	10	26	7	4	1	48
3	5	28	49	55	9	3	144
4	0	3	3	2	3	0	11
TOTAL	.	45	78	65	16	4	208

CHI-SQUARE 28.476 DF= 12 PROB=0.0047

TABLE OF WKEXP BY B15

WKEXP B15

FREQUENCY	.	1	2	3	4	TOTAL
1	0	35	12	9	0	56
2	0	27	29	6	0	62
3	2	24	25	9	2	60
4	0	13	16	3	2	34
TOTAL	.	99	82	27	4	212

CHI-SQUARE 17.702 DF= 9 PROB=0.0388

TABLE OF WKEXP BY B16

WKEXP B16

FREQUENCY	.	1	2	3	4	5	TOTAL
1	0	35	17	3	1	0	56
2	1	26	26	6	3	0	61
3	3	22	22	14	1	0	59
4	0	12	9	10	2	1	34
TOTAL	.	95	74	33	7	1	210

CHI-SQUARE 26.294 DF= 12 PROB=0.0097

TABLE OF WKEXP BY C13

WKEXP C13

FREQUENCY	.	1	2	3	4	5	TOTAL
1	2	18	19	16	1	0	54
2	0	29	15	16	2	0	62
3	2	28	19	8	4	1	60
4	1	7	8	11	4	3	33
TOTAL	.	82	61	51	11	4	209

CHI-SQUARE 27.276 DF= 12 PROB=0.0071

TABLE OF WKEXP BY C16

WKEXP C16

FREQUENCY	.	1	2	3	4	5	TOTAL
1	1	11	22	17	4	1	55
2	2	18	17	19	5	1	60
3	3	11	31	14	1	2	59
4	0	5	8	15	6	0	34
TOTAL	.	45	78	65	16	4	208

CHI-SQUARE 21.169 DF= 12 PROB=0.0480

TABLE OF AREA BY B10

AREA B10

FREQUENCY	.	1	2	3	4	5	TOTAL
1	0	3	3	3	0	0	9
2	0	4	11	16	8	1	40
3	0	0	4	1	1	0	6
4	1	4	10	12	3	0	29
5	1	5	5	4	7	0	21
6	3	8	23	30	6	0	67
7	5	2	20	10	0	0	32
TOTAL	.	26	76	76	25	1	204

CHI-SQUARE 39.891 DF= 24 PROB=0.0220

TABLE OF AREA BY B14

AREA B14

FREQUENCY	.	1	2	3	4	5	TOTAL
1	0	4	1	4	0	0	9
2	0	23	13	3	1	0	40
3	0	1	5	0	0	0	6
4	0	14	8	7	1	0	30
5	2	9	4	3	4	0	20
6	1	15	26	23	3	2	69
7	0	17	14	4	2	0	37
TOTAL	.	83	71	44	11	2	211

CHI-SQUARE 47.048 DF= 24 PROB=0.0033

TABLE OF AREA BY C4

AREA	C4						
FREQUENCY	.	1	2	3	4	5	TOTAL
1	1	2	3	3	0	0	8
2	1	3	5	6	9	16	39
3	1	1	0	3	1	0	5
4	0	4	5	8	10	3	30
5	1	3	6	8	2	2	21
6	0	5	23	19	22	1	70
7	2	7	8	13	3	4	35
TOTAL	.	25	50	60	47	26	208

CHI-SQUARE 62.890 DF= 24 PROB=0.0001

TABLE OF AREA BY C6

AREA	C6						
FREQUENCY	.	1	2	3	4	5	TOTAL
1	0	4	3	2	0	0	9
2	1	10	9	8	9	3	39
3	0	3	0	3	0	0	6
4	1	7	8	12	2	0	29
5	1	1	14	4	1	1	21
6	0	17	25	21	5	2	70
7	0	12	12	11	1	1	37
TOTAL	.	54	71	61	18	7	211

CHI-SQUARE 38.764 DF= 24 PROB=0.0289

TABLE OF AREA BY C7

AREA C7

FREQUENCY	.	1	2	3	4	5	TOTAL
1	0	1	7	1	0	0	9
2	1	16	8	9	1	5	39
3	0	5	1	0	0	0	6
4	0	12	11	7	0	0	30
5	1	2	13	5	1	0	21
6	0	29	22	14	4	1	70
7	0	22	10	5	0	0	37
TOTAL	.	87	72	41	6	6	212

CHI-SQUARE 50.680 DF= 24 PROB=0.0012

TABLE OF AREA BY C8

AREA C8

FREQUENCY	.	1	2	3	4	5	TOTAL
1	0	1	4	4	0	0	9
2	1	24	11	4	0	0	39
3	0	5	1	0	0	0	6
4	0	12	9	8	0	1	30
5	1	5	13	0	3	0	21
6	1	18	40	9	2	0	69
7	0	19	13	4	0	1	37
TOTAL	.	84	91	29	5	2	211

CHI-SQUARE 59.204 DF= 24 PROB=0.0001

TABLE OF AREA BY C9

AREA C9

FREQUENCY	.	1	2	3	4	5	TOTAL
1	0	2	3	2	1	1	9
2	1	1	10	17	8	3	39
3	0	3	3	0	0	0	6
4	0	2	12	8	5	3	30
5	2	1	11	6	2	0	20
6	1	19	23	18	9	0	69
7	0	8	10	12	5	2	37
TOTAL	.	36	72	63	30	9	210

CHI-SQUARE 37.695 DF= 24 PROB=0.0373

TABLE OF AREA BY C10

AREA C10

FREQUENCY	.	1	2	3	4	5	TOTAL
1	0	3	1	1	3	1	9
2	1	2	8	12	7	10	39
3	0	1	3	0	2	0	6
4	1	2	4	14	6	3	29
5	1	5	6	4	6	0	21
6	2	5	17	25	18	3	68
7	3	3	9	16	5	1	34
TOTAL	.	21	48	72	47	18	206

CHI-SQUARE 43.961 DF= 24 PROB=0.0077

TABLE OF AREA BY C11

AREA C11

FREQUENCY	.	1	2	3	4	5	TOTAL
1	0	1	1	4	2	1	9
2	1	1	7	7	15	9	39
3	0	0	4	1	1	0	6
4	1	2	4	8	6	9	29
5	2	0	4	12	4	0	20
6	1	7	18	21	15	8	69
7	0	5	9	12	7	4	37
TOTAL	.	16	47	65	50	31	209

CHI-SQUARE 37.979 DF= 24 PROB=0.0348

TABLE OF AREA BY C12

AREA C12

FREQUENCY	.	1	2	3	4	5	TOTAL
1	0	1	1	4	3	0	9
2	1	6	12	12	5	4	39
3	0	2	2	2	0	0	6
4	0	5	8	12	3	2	30
5	1	1	13	5	2	0	21
6	1	18	30	15	6	0	69
7	0	12	16	6	3	0	37
TOTAL	.	45	82	56	22	6	211

CHI-SQUARE 38.980 DF= 24 PROB=0.0274

TABLE OF AREA BY C18

AREA	C18						
FREQUENCY	.	1	2	3	4	5	TOTAL
1	0	1	1	2	4	1	9
2	1	8	9	14	5	3	39
3	0	2	1	1	1	1	6
4	1	3	4	9	6	7	29
5	2	1	11	7	0	1	20
6	3	7	23	22	13	2	67
7	0	4	13	13	5	2	37
TOTAL	.	26	62	68	34	17	207

CHI-SQUARE 37.107 DF= 24 PROB=0.0427

TABLE OF AREA BY C19

AREA	C19						
FREQUENCY	.	1	2	3	4	5	TOTAL
1	0	0	3	1	4	1	9
2	1	5	12	16	4	2	39
3	0	2	0	2	2	0	6
4	0	2	8	10	6	4	30
5	2	0	12	6	1	1	20
6	2	17	27	14	10	0	68
7	0	13	10	10	3	1	37
TOTAL	.	39	72	59	30	9	209

CHI-SQUARE 49.302 DF= 24 PROB=0.0017

TABLE OF AREA BY C23

AREA	C23						
FREQUENCY	.	1	2	3	4	5	TOTAL
1	1	2	1	4	0	1	8
2	1	20	13	6	0	0	39
3	0	3	1	2	0	0	6
4	0	18	8	2	1	1	30
5	1	5	8	6	2	0	21
6	1	32	21	14	0	2	69
7	0	25	9	3	0	0	37
TOTAL	.	105	61	37	3	4	210

CHI-SQUARE 40.642 DF= 24 PROB=0.0182

TABLE OF AREA BY C24

AREA	C24						
FREQUENCY	.	1	2	3	4	5	TOTAL
1	0	1	0	3	4	1	9
2	1	13	13	9	4	0	39
3	0	1	1	3	0	1	6
4	1	6	9	7	2	5	29
5	1	4	7	5	5	0	21
6	2	13	17	27	8	3	68
7	0	10	13	6	4	4	37
TOTAL	.	48	60	60	27	14	209

CHI-SQUARE 36.645 DF= 24 PROB=0.0475

VITA

Gretchen E. Blackwell

Candidate for the Degree of

Doctor of Philosophy

Thesis: QUALITY ATTRIBUTES OF FOOD PREPARED IN QUANTITY: AN EXAMINATION OF ITS EMPHASIS IN THE FOODSERVICE COURSES AS PERCEIVED BY STUDENTS

Major Field: Home Economics - Food, Nutrition and Institution Administration

Biographical:

Personal Data: Born in Greensburg, Pennsylvania, October 28, 1952, the daughter of Ernest and Eloise Furstenau. Married David S. Blackwell, July 27, 1985.

Education: Earned Associate in Applied Science Degree in Culinary Arts from Joliet Junior College in January, 1975; received Bachelor of Science degree in Home Economics Education at University of Wisconsin-Stout in December, 1976; earned Master of Science degree in Home Economics Education - Foodservice Management in May, 1978; completed requirements for Doctor of Philosophy degree in Food, Nutrition, and Institution Administration at Oklahoma State University in December, 1985.

Professional Experience: Foodservice Supervisor, Marshall Field and Company, Chicago, Illinois, 1975; High School Student Teacher in Foodservice at West Bend High School, West Bend, Wisconsin, 1976; Food Production Manager, Marriott Corporation, Newport Beach, California, 1978; Instructor of Foods, Santa Ana College, Santa Ana, California, and Chaffey College, Alta Loma, California, 1979-1981; Hospitality (Catering) Manager, Santa Ana College, Santa Ana, California, 1979-1981; Instructor of Foodservice and Restaurant Management, Mt. San Antonio College, Walnut, California, and Community Services Instructor (Cake Decorating), Santa Ana College, Santa Ana, California, 1981-1982; Teaching Associate, Department of Food, Nutrition, and Institution Administration, Oklahoma State University, 1984-1985.

Memberships: Phi Upsilon Omicron; Foodservice Systems Management Education Council; American Home Economics Association.