COMPARISON OF ATTAINED KNOWLEDGE CONCERNING MANAGEMENT AND FOODSERVICE SYSTEMS AMONG THREE GROUPS OF STUDENTS

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CHAPTER I

INTRODUCTION

With the rapid increase of knowledge in today's world, educators continue to examine and evaluate the goals and content of the basic education being offered to college students. The basic education must meet the demands students will face as new professionals in their chosen career fields (1).

The education of the modern dietitian has traditionally taken place through undergraduate academic degree programs followed by successful completion of an internship. In the late 1960's the coordinated undergraduate program, which provided another educational route for professional preparation through incorporating the clinical experience into the academic program, was initiated. As the profession of dietetics continues to change to meet the growing demands of society, critical evaluation of the educational preparation continues to be a dynamic challenge to educators to offer sound programs preparing students for practice in the profession (2, 3).

"A profession has an obligation to society to provide qualified practitioners" (4, p. 510). The American Dietetic Association has accepted the responsibility of setting

educational standards for dietitians. This involves establishing a unified body of knowledge that sets forth academic requirements, educational goals, expected entry-level competencies, and administering a qualifying examination pertinent to the practice of dietetics (5, 6). These educational standards, designated as "Plan IV Minimum Academic Requirements," have become the recent guidelines for the educators of future dietitians in developing the basic education for the profession. This basic education serves as a foundation for generalist education, as well as for students who may eventually specialize in one of the three major areas of dietetic practice: clinical nutrition, food systems management, or community nutrition (7, 8).

The educational programs developed to meet Plan IV Minimum Academic Requirements, while meeting the course requirements and subject matter set by the American Dietetic Association, may or may not also provide the competencies required of practitioners. The question of how adequate the academic preparation is in preparing students for what the profession expects of them as entry-level practitioners must be considered by educators. As Light (9) states in his article on "Challenging Perceptions of the Health Team Members":

> The acquisition of the right number and kind of 'pieces of paper' automatically endows their possessor with competence, intelligence, authority, and responsibilities. In too many cases, the relationship between the pieces of paper and competence on the job is questionable (p. 15).

Purpose and Objectives

The purpose of this study was to assess the knowledge attained by students at Oklahoma State University in the specific fields of Food, Nutrition and Institution Administration and Hotel and Restaurant Administration, in management, foodservice operations and food science, after completion of subject matter designated by Plan IV Minimum Academic Requirements in the undergraduate program and when additional clinical experience has further been completed.

The process used to assess the adequacy was to compare the levels of knowledge concerning management, foodservice operations and food science, of three defined groups of students. Graduates (May and August, 1981) in Food, Nutrition and Institution Administration (FNIA) and Hotel and Restaurant Administration (HRAD), non-majors graduates (May and August, 1981), and the dietetic interns (1980-81) were the three defined groups of students who participated in the study.

Specific objectives in this study include:

1. To test the assumption that majors in FNIA-HRAD have acquired the basic competencies outlined in Plan IV Minimum Academic Requirements regarding the three defined areas of study: management, foodservice operations, and food science.

2. To compare the levels of knowledge of the FNIA-HRAD majors, dietetic interns, and non-majors.

3. To assess the attitude of FNIA and HRAD graduating students towards courses at Oklahoma State University in management, foodservice operations, and food science.

Hypotheses

For this study the following hypotheses were made:

H_1: There will be no significant differences in the knowledge attained as shown by the test scores between FNIA-HRAD majors and the non-majors.

H_2: There will be no significant differences in the knowledge attained as shown by the test scores between the FNIA-HRAD majors and the dietetic interns.

H_3: There will be no significant differences in the knowledge attained as shown by the test scores between the non-majors and the dietetic interns.

Assumptions and Limitations

The following assumptions were accepted as true in this study:

1. Graduates in FNIA-HRAD have successfully completed all required coursework for their major.

2. The subject matter in the three defined areas of this study were offered in comparable courses at Oklahoma State University or another university offering the Plan IV Minimum Academic Requirements.

3. The graduates in the non-major group have or have not been enrolled in any food-related course.

4. The FNIA-HRAD and Non-major groups had both attended Oklahoma State University for a comparable number of years.

The following limitations were recognized in this study:

1. The three groups involved in this study were from an intact population with the group being small in number and non-equivalent in size.

2. Two of the groups involved in the study, the FNIA-HRAD and non-major graduates consist of only students from Oklahoma State University.

Definitions

Entry-Level Competencies - Competencies which the individual should be able to perform independently, as well as those which require guidance from a specialist, at least in the first position or job (10).

Profession - A career requiring specialized knowledge and intensive preparation, including instruction in skills and methods, as well as scientific, historical, or scholarly principles underlying such skills and methods, maintaining by force or organization or concerted opinion high standards of achievement and conduct and committing its members to continued study and to a kind of work which has for its primary purpose the rendering of a public service (8).

Dietetic Intern - A person who has completed the academic requirements of professional education in dietetics and is enrolled in a dietetic internship approved by the American Dietetic Association to fulfill the didactic and

supervised clinical experience educational standards to become a practicing dietitian (11).

The American Dietetic Association (ADA) - A professional organization responsible for establishing educational and supervised experience requirements and standards of practice in the profession of dietetics (11).

Plan IV Minimum Academic Requirements - Academic standards approved by the ADA effective as of July, 1972, that express the academic requirements in terms of knowledge areas and basic competencies. 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 (12).

Registered Dietitian (RD) - A specialist educated for a profession responsible for the nutritional care of individuals and groups. This includes the application of the science and art of human nutrition in helping people select and obtain food for the primary purpose of nourishing their bodies in health or disease throughout the life cycle. This participation may be single or combined functions, in foodservice systems management; in extending knowledge of food and nutrition principles; in teaching these principles for application according to particular situations; or in dietary counseling. This dietitian has also successfully completed the examination for professional registration and maintains continuing education requirements (8).

Coordinated Undergraduate Program (CUP) - The undergraduate education of dietitians designed as a four year curriculum (resulting in a bachelor's degree) integrating clinical experience with didactic training to provide knowledge of principles of nutrition, communication skill, conceptual thinking, research orientation, and the sciences (13).

Attained Knowledge - A part or percentage of previously learned facts, truths, principles, and information gained by an individual (14).

CHAPTER II

REVIEW OF LITERATURE

Evolution of Dietetic Education

In becoming a profession, dietetics first had to establish and define a body of knowledge pertinent to its existence. With such a body of knowledge to support itself, the profession could set the parameters from which it would grow. Education of future practitioners in the profession would be set within these parameters. In order for the dietetic profession to escape obsolescence, these set standards had to be maintained and continuously improved through the profession's years of growth (6).

According to Hallahan (15):

> Change in the educational system for a profession requires thought, planning, and evaluation. They are best accomplished through evolution rather than revolution (p. 116).

The gradual evolution of dietetic education in the United States began with the cooking schools of the 1880's and 1890's. Graduates of these domestic science schools were limited in their influence, primarily to the feeding of the sick (16). In the early 1900s before the advent of the American Dietetic Association, there was no one organized set of educational standards or requirements for the dietetic profession. Efforts to set up

some type of educational standards were made by some professionals in the field who recognized a need to provide adequate training for the dietitian. Corbett, in 1903, established a three month course for "pupil dietitians" at the Department of Charities of New York (17). This three month course would eventually develop into the dietetic internship required by the American Dietetic Association for clinical experience. Chambers, in her discussion on dietetic education in the U.S., points out the attempts by McCullough in 1906 and Boos in 1909, to strengthen dietetic education by stressing the need for "adequate theoretical and technical training of dietitians" (12, p. 596). In 1910 Corbett outlined fundamental courses for the training of the institutional dietitian that would include "expert training founded on the exact and natural sciences, as well as the subjects of economics, social sciences, psychology, and education" (19, pp. 32, 33).

The founding of the American Dietetic Association (ADA) in 1917 laid the foundation for establishing one standard outline of education for the profession.

> Education for the profession is a stated commitment in the Association's Constitution. Through the development and support of educational requirements, as well as the creation of opportunities to meet these requirements, we can remain a viable, vibrant profession (5, p. 606).

With the First Annual Meeting of the ADA in 1918, four sections of interest within the organization were established: Dietotherapy, Social Welfare, Administration, and Teaching (later to be renamed the "Education Section").

The Teaching Section was concerned with defining the role of the dietitian and her educational needs and with developing educational standards for the profession. Emphasis was placed on dietetic education eventually consisting of a four year college degree and hospital experience from three to six months (18, 19).

At the Fourth Annual Meeting of the ADA in 1921, Marlatt presented a report from the subcommittee on collegiate training of dietitians. The study concerned the two year and the four year programs being offered and the recommended course content and number of hours per subject matter for each of the designated programs. The concluding recommendations were for the minimum training of a dietitian to consist of a four year college program plus 4 to 12 months of work experience beyond the Bachelor of Science degree (20). Johnson discusses Wheeler's attempts in 1924 to further the development of the educational standards by presenting a detailed outline recommending basis courses for the four year college curriculum of a dietetic student. The hospital experience was set at six months and was to include administrative, therapeutic, and social service work. Wheeler's "recommendations" became reality in 1927 when the ADA approved a single "Outline for Standard Course for Student Dietitians in Hospitals" (20, p. 505). The outline specified entrance requirements for the student dietitian, requirements for the organization of the hospital,

and a general summary of the course content for the student dietitian (22).

Changes in the role of the dietitian, in technology and in the availability of knowledge, have precipitated revisions in these basic educational standards. The original 1927 outline went through several revisions, as summarized by Chambers (12):

> . . . the 1934 revision delineated the course and semester hour requirements for food and nutrition majors, the 1940 revision required courses in biochemistry, quantity cooking, organizational management and additional courses above the minimum, the 1944 revision added an English composition requirements and more specific recommended subjects, the 1947 revision indicated courses required for graduates applying for internships . . . (p. 34).

These revisions have evolved into four major plans of academic standards that have been used by the Association. The 1947 revision was designated as Plan I and was to be in effect until October, 1962. An alternate plan of study was drawn up in 1955 with the course requirements arranged into four major subject areas. Requirements were for the student to complete a total of 60 semester hours from the four groups but not less than the minimum number of hours as indicated per group. This alternate plan of study was designated as Plan II in 1956 and was to be in effect until October, 1965 (23).

In November, 1958, Plan III went into effect. The academic requirements were no longer listed as course titles but rather as core subjects, emphases, and

concentrations. The student is required to complete all core subjects plus one emphases and one concentration according to his/her special career interests. Plan III was in effect until January, 1980 (24).

The most recent plan of study is Plan IV Minimum Academic Requirements, which was adopted by ADA in July, 1972. The minimum academic requirements are expressed as basic competencies and knowledge areas and not specific credit hours or courses. With the requirements stated in this manner, it allows each educational institution greater freedom in planning the dietetic curriculum (18, 25).

Future revisions in Plan IV Minimum Academic Requirements are already being considered by the Association. As the 1982 President of the ADA, Langholz (26), emphasizes:

> Dietetic education must adapt to changes in our society and in the economy if it is to remain viable. Roles in the profession are changing, and new roles are emerging. The role of supportive personnel is being clarified. Specifically, we must ask ourselves what revisions are needed in Plan IV Minimum Academic Requirements? Is a new plan needed? How can A.D.A. be structured to focus on education more effectively? . . . At what educational level is specialization appropriate? What is our commitment to standard setting and accreditation? (p. 60).

Answers to these questions may serve as a challenge and as guidelines for future revisions of the academic requirements to be approved by the ADA for dietetic students.

Dietetic Registration

Ferguson (6) points out the importance of "a profession protecting the public from the practice of those who

have not attained accepted standards or who disregard them" (6, p. 198). In 1961, tentative discussion began in the House of Delegates of the ADA concerning the issue of registration for the profession of dietetics. Eight years later, in June, 1969,

> . . . the American Dietetic Association became a pioneer among professional organizations when it launched a voluntary program of professional registration, designed to assure continuing competency of dietitians, guaranteed by evidence of self-improvement through continuing education. Thus, the concern of the profession for the health, safety, and the welfare of the public was evidenced by encouraging high standards of performance by dietetic practitioners (27, p. 351).

> This program provides the professional dietitian with the advantage of a legally protectable designation 'R.D.' (registered dietitian), which would supply a usable measure of professional qualification in legislative and administrative standard setting (28, p. 616).

Responsibility of administering the registration program was delegated to a standing Committee on Professional Registration. Five panels were formed within the Committee to help with the registration program:

> Panel 1 - to approve continuing education hours; Panel 2 - to review and evaluate the registration system; Panel 3 - to develop and review the examination program; Panel 4 - to review denied and revocation of registration; Panel 5 - to handle communications and publicity (28, pp. 616-617).

When the registration program began in 1969, the requirements to become registered were: 1) membership in the American Dietetic Association, 2) successful completion of a written examination, 3) annual payment of a registration fee, and 4) completion of 75 clock hours of continuing education every five years (28). In 1971, a

constitutional amendment was passed, making membership mandatory for persons who wanted to write the examination. When the ADA became an accrediting body in 1974, membership became optional to the registration process (19, 28).

Presently, the requirements for writing the registration examination are: 1) successful completion of the current minimum academic requirements (Plan IV) at an accredited college or university resulting in a degree, and 2) satisfactory completion of appropriate clinical experience, such as dietetic internship, clinical experience within a coordinated undergraduate program, or an advanced degree with experience and endorsement. To become and remain registered by the ADA, the person must satisfactorily pass the written examination and complete 75 hours of continuing education over a five year period (12, 30).

Once the ADA decided on a program of registration it was necessary to determine an objective way for testing the basic knowledge of qualified persons wishing to become registered. The Association turned to a professional testing organization, the Psychological Corporation of New York, to help develop an examination of the basic knowledge, principles, and applications involved in two major areas: nutrition and administration (28, 31).

After the registration program was instituted, the examination was developed according to a content outline prepared by Panel 2 of the Committee on Professional Registration. Each year new questions reflecting current

dietetic practice and education are submitted by college and university faculty, dietetic internship faculty, and other specialists for the purpose of updating the examination. The questions must reflect current dietetic practice and knowledge. These questions are then referred to the Psychological Corporation for classification into the general content areas of nutrition and administration and edited by testing specialists. An item writing and review workshop is held once a year during which a panel of registered dietitians review the test questions prepared by the Psychological Corporation (19, 32). The questions are reviewed for "appropriateness, accuracy, correctness of the designated right answers, and clarity of wording" (31, p. 542).

After being approved at the workshop, the new questions are then added to an item pool for future examinations. It is from this item pool that test questions are chosen for each new examination to comply with the Association's content outline.

Each edition of the examination then has half of the questions pertaining to administration and the other half pertaining to nutrition. The new drafts of the examination are then sent to a panel of experts composed of representatives of the Committee on Professional Registration, outside consultant dietitians, and representatives from the Psycnological Corporation. Their responsibilities are to review the examination for relevancy in the test questions,

as well as to check for the necessary content that reflects the basic knowledge of the profession. As stated, their responsibilities would also include:

> . . . determining the level of performance that will be required for passing each form of the examination, taking into account the content of the particular form, the panel's judgement of its difficulty, and the level at which a minimally competent registered dietitian should be able to perform (31, p. 542).

Even though the examination development processes allowed for the recent changes in the basic knowledge, principles, and practice to be taken into account, the basic structure of the examination never changed. Bogle, in her five year review of the registration program, noted that future focus and development of the program must continue in the diverse areas of dietetic interest that may effect the registration process (28).

In 1978, the Commission of Dietetic Registration (CDR) decided an in-depth study of the examination was required.

> The American Dietetic Association wisely recognized when the registration process was established that continuous review and improvements would be necessary. Time changes; the requirements for performance in the profession change; a registration program to be viable, must also change (32, p. 75).

Because of the time and expertise involved in such a study, a consultant team was retained to help the CDR. In the course of their research, three major problems were identified: 1) continuous assessment of the registration examination was needed as to its appropriateness and utility, 2) the issue of certifying specialists in the profession,

and 3) how well the examination measured the examinee's entry-level competence in actual practice. The following recommendations were made by the CDR in answer to the problems: 1) a content analysis be carried out as the first step towards establishing content validity on the subject matter areas covered in the examination, 2) the examination be revised according to the content analysis results, 3) a predictive validity study should be conducted on the examination, and 4) the CDR should continue their present process of updating the examination (32).

As of 1979, the content validity study has been completed. The major areas of content and the percentage emphasis for the registration examination derived from this study were: management - 20%, food science - 15%, normal nutrition - 20%, clinical nutrition - 20%, community nutrition - 15%, and foodservice systems - 15%. The actual weights of these areas were finally decided upon by the CDR (32).

As a result of the content validity study, the dietetic registration examination to be offered in the future (as of April, 1980) has been prepared according to this newly revised content outline. The results from the April, 1980, examination have been used in the first step of the predictive validity study that will progress over the next three years (33). Henry (31) summarizes the value of the registration examination:

> The registration exam is the means by which the A.D.A. seeks to determine whether candidates

> throughout the country have attained a basic level of competence in terms of significant and appropriate areas of basic knowledge. . . . If the examination reflects what the Association believes a registered dietitian must know, then candidates who answer correctly the questions on the registration examination will have shown that they are qualified to be registered representatives of the profession (p. 544).

The view of the Study Commission on Dietetics, 1972, towards registration, is stated in Recommendation IV:

> . . . the A.D.A. can assume responsibility for the registration and certification of dietitians based on an examination and review of the respective education and/or professional experience requirements, but it cannot assume responsibility for the 'warranty of the competence of professional dietitians' (13, p. 431).

CHAPTER III

METHOD AND PROCEDURES

Introduction

The purpose of this study was to evaluate the adequacy of academic preparation of students who have taken the courses designated to meet competencies specified in Plan IV of the American Dietetic Association; compared to dietetic interns who have completed Plan IV and additional clinical experience and a third group of students who have not participated in either experience.

Research Design

The research design used in this study was the static-group comparison. The comparison was made among three defined groups of students subjected to different treatments. The FNIA-HRAD majors had received their education almost entirely at Oklahoma State University. The dietetic interns had received their education either at Oklahoma State University or at different universities across the country. The non-majors had been educated at Oklahoma State University, but in different colleges at the university.

The FNIA-HRAD majors, being exposed to the seven designated courses of this study (see Appendix A), were

compared to the dietetic interns who also experienced these types of courses plus additional clinical experience and the non-majors who had not experienced either the courses or the clinical experience. Differences between the groups were assessed using the same test instrument (32).

Population and Sample

Students majoring in the FNIA and HRAD departments at Oklahoma State University were selected as subjects, since these two specific departments offered the courses and required subject matter. The groups were further defined to include only the students in FNIA-HRAD graduating in May or August of 1981. These students would have successfully completed all designated courses in which the academic areas to be tested are included. This group would be knowledgeable in the minimum academic subject matter under Plan IV Minimum Academic Requirements. Seventeen senior students from the HRAD department and 15 senior students from the FNIA department volunteered for this study.

The dietetic interns at Oklahoma State University comprised the second sample population used in this study. They had completed all requirements of the Plan IV Minimum Academic Requirements during completion of their Bachelor of Science degree at a university. The dietetic interns were also in the tenth month of a 12 month dietetic internship at Oklahoma State University. Three of the

eight interns were also graduates of the FNIA department at Oklahoma State University.

A group of 10 students majoring in subjects outside the College of Home Economics, graduating in May or August of 1981, was used as the third group in the study. Since this group of students did not meet the requirements set forth in the Plan IV Minimum Academic Requirements of the American Dietetic Association or have any clinical experience related to the profession of dietetics, they were used as a control group. These students were selected for their availability and willingness to participate in the study. A total number of 50 students at Oklahoma State University participated in the study.

Data Collection

Instrumentation

In 1969, in order to maintain high standards in the profession of dietetics, the American Dietetic Association established a program of registration. Part of this program was the development and use of an examination to identify basic knowledge related to the practice of dietetics. The two main areas of concentration in the profession of dietetics have been nutrition and administration. The Psychological Corporation of New York City, a professional testing organization, was asked to develop an examination along these basic areas of concentration (28).

> The registration examination is perceived as measuring the examinee's competence to enter the field as a professional dietitian. It addresses entry-level competencies and is meant to answer the question, 'Is the individual professionally qualified to begin employment?' (32, p. 76).

Since one of the major objectives in this study was to test the assumption that basic knowledge in certain defined areas was attained by graduating seniors in the FNIA-HRAD departments, use of this examination, or parts of it, would provide an accurate and valid measuring instrument. The examination itself is used for nationwide testing of professional dietitians' eligibility for registration.

A study guide developed by the ADA in 1980 for use with the registration examination, is divided into six areas of basic knowledge of the registration examination: normal nutrition, clinical nutrition, community nutrition, management, foodservice operations, and food science. Each of these sections were composed of a number of multiple-choice questions selected from the actual registration examination question pool. Subsequently, these questions have all been permanently deleted from the examination question pool. The correct answers for each multiple-choice question were listed immediately following the section in which the question was contained (35).

In April, 1981, consent was given by the American Dietetic Association to use the material in the study guide for this study. Three of the six sections in the study

guide were selected to be used in this study: management, foodservice operations, and food science.

Each of the three sections were divided into parts for this study: Part I - Management, Part II - Foodservice Operations, and Part III - Food Science. The number of multiple-choice questions per part was decided by the way the questions were weighted in the actual registration examination. The weights of these areas depended on the perceived emphasis as determined from the registration examination content validity study conducted by the Commission on Dietetic Registration. In the content validity study, management was weighted at 20%, foodservice operations at 15%, and food science at 15% (32). Using these percentages, Part I - Management, was composed of 20 questions, Part II - Foodservice Operations, and Part III - Food Science, were each composed of 15 questions. This made a total of 50 multiple-choice test questions.

The maximum number of questions per section in the ADA study guide was 47. The specific multiple-choice questions to be used from each of the sections were randomly selected without replacement.

As the test questions were selected, they were renumbered in sequential order regardless of the actual number of the examination question in the study guide. A separate list was kept to record the sequence of the chosen test question so that the correct response could be matched to

the appropriate test question. For each designated part of the test this selection process was started anew.

Each designated part of the test was separated and properly labeled. The numbers 1, 2, 3, and 4 for the responses of the test questions were changed to the letters a, b, c, and d, respectively. This was done for ease in taking the test, so the number of the response would not be confused with the numbered line on the answer sheet. The complete test was retyped and printed back-to-back to make a four page test. Instructions for taking the test were clearly printed at the top of the first page of the test (see Appendix C).

A separate answer sheet was constructed with the appropriate number of blanks for the number of answers per part. Each designated part of the test on the answer sheet was separated, properly labeled, and numbered accordingly.

A questionnaire for the FNIA-HRAD majors was designed containing demographic questions (see Appendix D). Questions pertaining to the attitudes of the FNIA-HRAD graduates toward the seven designated courses used in this study were also included at the end of the questionnaire. The seven courses were to be ranked as to how necessary and important they were to the students, as well as how adequate they were in presenting course material. A separate, similar questionnaire was designed for the non-major group of students (see Appendix E). This questionnaire contained

only questions pertaining to demographic information. Demographic information and attitudes toward courses were not considered important variables in the dietetic intern group and no questionnaire was developed for this group. The questionnaire was printed and then stapled to the front of the answer sheet for the FNIA-HRAD and non-major groups.

An answer key was developed and used for correcting all tests. The total number of questions on the test numbered 50 and a score of 100% was the maximum possible.

The test was administered during the last two weeks of April, 1981, and the first week of May, 1981. The time needed to complete the test varied from 30 minutes to an hour. It was administered to the non-major group of students by volunteers who had access to specific groups of graduating students in different majors. The test was administered to this group during the same time period as the FNIA-HRAD group of students. Special instructions were written and given to the test administrators to read to the students before they took the test.

The eight dietetic interns were given the test early in June, 1981. The test was administered by their dietetic internship director. No special instructions were given to the interns.

Data Analysis

The responses of all three groups on the answer sheets and the questionnaires were coded and keypunched onto

computer cards for compilation. The Statistical Analysis System (SAS) was used to perform an item analysis and to compute chi-squares and mean values (36).

Analysis of the test scores was facilitated by designating percentage categories. Specific percentage levels showing percentage of correct responses by group were arbitrarily assigned by the researcher. For instance, 50% and above level indicated better than average performance. Percentage values of less than 50% indicated below average performance. These two categories were used in the analysis of all parts of the test.

CHAPTER IV

RESULTS AND DISCUSSION

Knowledge attained in three specific subject matter areas by three groups of students at Oklahoma State University is discussed in this chapter. A survey of attitudes of the FNIA-HRAD students toward attainment and comprehension of the subject matter is presented along with demographic information concerning the FNIA-HRAD and NON-MAJOR groups.

Demographic Information About Respondents

A questionnaire pertaining to demographic information was completed by each of the respondents. Two different questionnaires were used in the collection of this information. The questionnaire given the FNIA-HRAD majors (n=32) contained basic questions pertaining to age, sex, marital status, initial exposure to food preparation, living situation, years spent at Oklahoma State University, number of specific food-related courses taken at Oklahoma State University, and type and length of any work experience related to food service. The questionnaire given to the NON-MAJOR group (n=10) covered the same basic

demographic questions except for those about living situation and specific food-related courses offered at Oklahoma State University. The demographic information of the INTERN group was not considered to be a major variable pertinent to this study. The seven courses included in the attitude survey were taken by the INTERN group (see Appendix C) at different universities, so their responses to these courses would not be applicable to this study. No questionnaire was given to this group because of these factors.

The information gained from the questionnaires was solicited to suggest explanations for differences, if any, in the test scores of the FNIA-HRAD and NON-MAJOR groups. The majority (58%) of all students were in the 18 to 22 year old age bracket. The HRAD students were, on the whole, older than the other students.

Female students (56%) participating in the study outnumbered the male students. Ninety-two percent of all respondents were single. The most frequent forms of living situation were (referencing the past two years), in descending order: living off campus with a roommate/spouse (61%), living in a residence hall (46%), and living in a fraternity/sorority house (22%).

The FNIA and HRAD majors were asked about their initial exposure to food preparation. Replies indicated this contact was: 34% at work, 28% in the home, 19% at school (high school or college), and 19% with no real exposure

to any food preparation. The group indicating no real exposure to any food preparation was unexplainable, considering these were fourth year students who had completed required food preparation courses. The majority of the FNIA and HRAD majors had attended Oklahoma State University for three or more years.

The designated courses in this study were offered at Oklahoma State University and were taken by 81% to 100% of the FNIA and HRAD groups. A course equivalent to the course, FNIA 2113 "Introduction to Food Preparation and Management," was taken at another institution by 19% of this same group. The course HRAD 1113, "Introduction to Professional Food Preparation" was taken by only the HRAD majors, or 53% of the FNIA-HRAD group. No respondents in the NON-MAJOR group had ever been enrolled in a food preparation course.

In all sample groups a total of 73% of the students have had some type of food-related work experience. Among the FNIA and HRAD students, 87% and 88%, respectively, had had food-related experience, while only 22% of the NON-MAJOR group had any comparable work experience.

The work experience of the FNIA students was predominantly as diet aides in hospital food service, while the HRAD students' work experience varied from short order cooking, general food preparation in restaurants, bartending and waiting on tables, to actual managing a commercial food service facility. The length of the work

experience for both groups was usually a summer or during the school year as part-time employment.

In the NON-MAJOR group, 3 of the 10 students had food-related work experience. Their work experience was short-term, part-time employment in a cafeteria or a fast-food operation.

Attitudinal Survey of Courses

A portion of the questionnaire given the FNIA-HRAD majors included questions pertaining to feelings of the students toward the designated courses in the study. The courses were felt to be very necessary by 50% of the students, just necessary by 47%, and slightly necessary by 3%. These same courses were judged as being very adequate by 6%, adequate by 91%, and inadequate by 3%. The importance of these courses to the students was viewed by 66% as very important and by 35% as being just important. How valuable these same courses were in teaching what may be needed on a first job was judged by 19% as being excellent, by 56% as being good, and 25% as being fair.

Overall, according to this survey, the general attitude was that the courses were needed in these specific areas, were adequate in presenting pertinent information, and would be needed in the students' future jobs. This type of knowledge was also felt to be frequently (66%) usable in an everyday work situation. Only 6% of the

FNIA-HRAD majors did not know if they would ever utilize the knowledge attained in these courses.

Of the designated courses, a least valuable course and a most valuable course concerning the students' specific major was selected (Table I.) According to this particular sample group, FNIA 2113, "Introduction to Food Preparation and Management" and HRAD/FNIA 3553, "Institutional Purchasing" were felt to be the least valuable to students concerning their specific major. Although the information was not specifically solicited, the reasons for this type of attitude toward these two particular courses could involve course material presentation, the instructor's attitude toward the course and/or the students, the student's attitude toward the course, and/or the failure of the student to understand or relate the value of the course with regard to their specific career or work environment.

The courses felt to be the most valuable to this sample group were HRAD/FNIA 4363, "Quantity Food Production Management" and HRAD/FNIA 4573, "Institution Organization and Management." The positive attitudes felt toward these two courses could have resulted from the same reasons previously discussed, as well as the students' understanding the value of the course towards their specific careers.

TABLE I

FNIA AND HRAD STUDENTS' SELECTION OF LEAST AND MOST VALUABLE COURSES*

Course	Least Valuable (%)	Most Valuable (%)
FNIA 2113	37.50	0.00
HRAD 1113	0.00	18.75
FNIA 3133	12.50	25.00
HRAD/FNIA 3213	18.75	9.38
HRAD/FNIA 3553	25.00	12.50
HRAD/FNIA 4363	0.00	59.38
HRAD/FNIA 4573	3.13	43.75

*Percentages do not add up to 100% because of multiple answers.

Note: See Appendix C for definitions of courses.

Comparison of Attained Knowledge Concerning Management and Foodservice Systems Among Three Groups of Students

Each part of the test was analyzed question by question using a chi-square test to determine differences in how each group responded to each question. Probability values less than 0.05 indicated a significant difference in the distribution of responses.

The percentage categories of below 50% and 50% and above, as previously discussed in Chapter III, are the same

for the tables referred to in the following discussions. The exception in the frequency analysis is that 80% or greater indicated a test question with an unusually high frequency of response.

Part I - Management

Twenty questions pertained to management and its function. Fourteen of the 20 questions were correctly answered by 50% or better of the total group. The remaining six questions were answered correctly by 10% to 44% of the total group (Table II).

The number of test questions correctly answered by each group varied according to the previously assigned percentage categories (Table III). The test performance of the FNIA, HRAD, and INTERN groups did not differ significantly. The total number of questions answered correctly by 50% or above of these three groups ranged from 14 to 16, out of the possible 20 questions. It can be assumed from this analysis of the test results, that the FNIA-HRAD and INTERN groups had attained the required knowledge in the area of management.

The NON-MAJOR groups' performance was evenly distributed. Half or better of the NON-MAJOR group responded correctly to half of the test questions. Since these test questions covered subject matter that was not food or foodservice related, but rather general aspects of management, it might be assumed that the NON-MAJOR group could

TABLE II

PART I(A) MANAGEMENT - FREQUENCY OF RESPONSES PER TEST QUESTION (n=50)

Number of Test Question	Response Choices in Percentages			
	1	2	3	4
1	34.00	4.00	6.00	56.00*
2	20.00	56.00	10.00	14.00
3	26.00	58.00*	8.00	8.00
4	8.00	8.00	74.00*	10.00
5	0.00	14.00	24.00	62.00*
6	50.00	12.00	10.00*	28.00
7	18.00	36.00*	40.00	6.00
8	30.00	10.00	2.00	58.00*
9	6.00	8.00	12.00	74.00*
10	8.00	44.00*	34.00	14.00
11	10.00	84.00*	2.00	4.00
12	40.00	12.00	4.00	44.00*
13	0.00	6.00	90.00*	4.00
14	72.00*	12.00	4.00	10.00
15	30.00	18.00	14.00	38.00*
16	68.00*	10.00	14.00	8.00
17	4.00	92.00*	4.00	0.00
18	2.00	34.00*	22.00	42.00
19	18.00	4.00	74.00*	4.00
20	50.00*	4.00	2.00	44.00

*Correct response.

TABLE III

NUMBER OF TEST QUESTIONS ANSWERED CORRECTLY IN PART I BY FNIA, HRAD, INTERN, AND NON-MAJOR GROUPS

Correct Response in Percentages	(Total of 20 Questions) Number of Test Questions			
	FNIA	HRAD	INTERN	NON-MAJOR
below 50%	6	5	4	10
50% and above	14	15	16	10

perform better in this area (in relation to the other two remaining parts of the test).

There were significant differences ($p<0.05$) in frequency of responses for the different groups on test questions 5, 12, and 17 (Table IV). These particular test questions covered subject matter pertaining to employee motivation, job specifications, and interviewing techniques. The significant difference in question 5 was due to the high percentages of correct responses of the FNIA-HRAD and INTERN groups in comparison with the correct responses made by the NON-MAJOR group. The NON-MAJOR groups' responses were evenly distributed among the response choices. When all the groups' percentages of correct responses to questions 12 were compared, FNIA-HRAD were above 50% and the INTERN and NON-MAJOR below 50%. A percentage of correct responses of 25% by the INTERN group was an unexpected outcome when compared to the percentages of the FNIA and HRAD groups (Table IV).

Frequency of responses for question 17 indicated that a very high percent of the total group responded correctly. The percentage of correct responses for each of the FNIA, HRAD, and INTERN groups was 100% and 60% for the NON-MAJOR group. This type of test question may be described as non-discriminatory or one which can be discerned easily with common knowledge.

Test questions 1, 10, and 16, although not significant at the 0.05 level, are significant at the .1 level. These

TABLE IV

PART I(A) MANAGEMENT - PERCENTAGE OF CORRECT RESPONSES BY EACH GROUP AND CHI-SQUARE VALUES

Number of Test Question	FNIA (n=15)	HRAD (n=17)	INTERN (n=8)	NON-MAJOR (n=10)	Chi-Square	df	Probability
1	73.33	58.82	62.50	20.00	14.916	9	.0933
2	60.00	52.94	62.50	50.00	10.858	9	.2856
3	53.33	58.82	75.00	50.00	10.261	9	.3298
4	73.33	76.47	75.00	70.00	8.728	9	.4628
5	86.67	58.82	75.00	20.00	15.070	6	.0197
6	6.67	23.53	0.00	0.00	16.893	9	.0504
7	46.67	17.65	37.50	50.00	12.838	9	.1701
8	40.00	70.59	87.50	40.00	11.890	9	.2196
9	86.67	76.47	87.50	40.00	12.646	9	.1793
10	60.00	35.29	50.00	30.00	15.240	9	.0846
11	86.67	88.24	87.50	70.00	9.105	9	.4276
12	53.33	64.71	25.00	10.00	20.492	9	.0151
13	93.33	100.00	87.50	70.00	10.519	6	.1044
14	80.00	70.59	87.50	50.00	7.458	9	.5896
15	26.67	35.29	75.00	30.00	16.883	9	.0506
16	66.67	76.47	100.00	30.00	15.183	9	.0860
17	100.00	100.00	100.00	60.00	17.391	6	.0079
18	13.33	41.18	62.50	30.00	13.964	9	.1236
19	80.00	76.47	75.00	60.00	7.458	9	.5896
20	40.00	64.71	37.50	50.00	7.935	9	.5407

questions covered job analysis, financial statements, and job training.

Comparison among groups revealed the percentage of correct responses of the FNIA, HRAD, and INTERN groups to questions 1 and 16 above 50% and those of the NON-MAJOR group below 50%. In question 10, the FNIA and INTERN groups were 50% and above in percentage of correct responses, compared to below 50% of the HRAD and NON-MAJOR groups.

Test questions 6, 7, 15, and 18 in Part I were answered incorrectly by a majority of the total group. Breakdown by group indicated differences as to how each group responded to these questions and which group had shown a lack of knowledge pertaining to that particular question (Table IV). Question 6, which dealt with the functions of management, indicated a general misunderstanding by more than 70% of the total group. The labor relation subject matter covered in question 7 was best understood by the NON-MAJOR than the remaining three groups, as indicated by 50% of the NON-MAJOR group responding correctly to the test question. Fifty percent and better of the INTERN group responded correctly to questions 15 and 18, which tested the attainment of higher level management concepts. The reverse is true for the three remaining groups (Table IV).

Part II - Foodservice Operations

Fifteen test questions covering the different aspects

of a foodservice operation were included in the second part of the test. For overall performance, 11 of the 15 test questions were answered correctly by 50% or better by the total group. The remaining four questions were answered correctly by either 8% or 42% of the total group (Table V).

TABLE V

PART II(B) FOODSERVICE OPERATIONS - FREQUENCY OF RESPONSES PER TEST QUESTION (n=50)

Number of Test Question	Response Choices in Percentages			
	1	2	3	4
1	42.00	12.00	42.00*	4.00
2	12.00	8.00	42.00*	38.00
3	0.00	52.00*	36.00	12.00
4	16.00	58.00*	4.00	22.00
5	80.00*	0.00	8.00	12.00
6	10.00	68.00*	6.00	16.00
7	8.00	24.00	54.00*	14.00
8	8.00*	52.00	8.00	32.00
9	84.00*	2.00	4.00	10.00
10	28.00	14.00	6.00	52.00*
11	14.00	74.00*	6.00	4.00
12	8.00	8.00	2.00	82.00*
13	10.00	64.00*	14.00	12.00
14	80.00*	6.00	10.00	4.00
15	42.00	34.00	16.00	8.00*

*Correct response.

Table V shows how the different groups differ in percentages of correct responses. Analyses of the data

indicated that a slightly higher total number of test questions were answered correctly by the INTERN and the HRAD groups as compared to the FNIA group.

Below 50% of the NON-MAJOR group responded correctly to 11 of the 15 test questions. In only four test questions was there a correct response of 50% and above. The subject matter covered in this part of the test was food-service related, hence the NON-MAJOR group performed as expected.

Overall, the FNIA, HRAD, and INTERN groups have attained the required knowledge covered in Part II of the test; however, there are slight differences in their correct responses, with the FNIA group receiving the lower number of correct responses (Table VI). In test questions 9, 12, and 15, covering the content areas of equipment and serving temperatures, there were significant differences ($p<0.05$) in the distribution of the frequency of respones. Eighty percent or better of the FNIA, HRAD, and INTERN groups had responded to questions 9 and 12 correctly. The high percentages of correct responses could mean that these questions were easily discernible, too simple, or the groups have attained knowledge of this subject matter.

In contrast, only 8% of the total group responded correctly to question 15, with none of the four groups responding correctly over 50% (Table VII). The test question covered subject matter pertaining to serving temperatures of hot beverages. The optimum temperature for

serving hot beverages could very well vary according to where and who taught the subject matter areas.

TABLE VI

NUMBER OF TEST QUESTIONS ANSWERED CORRECTLY IN PART II BY FNIA, HRAD, INTERN, AND NON-MAJOR GROUPS

Correct Response in Percentages	(Total of 15 Questions) Number of Test Questions			
	FNIA	HRAD	INTERN	NON-MAJOR
below 50%	6	4	2	11
50% and above	9	11	13	4

Questions 4, 11, and 14 were significant at the .1 level. These questions pertained to ice cream overrun, percentage of loss in raw meat, and inventory and storage controls. The FNIA, HRAD, and INTERN groups' percentage of correct responses for all three questions were all above 50%, as compared to the percentages of the NON-MAJOR group, which were below 50%.

A majority of the total group responded incorrectly to question 8 (Table VII). The purchasing information covered by this test question was evidently not known or misunderstood by the FNIA, HRAD, and INTERN groups. An

TABLE VII

PART II(B) FOODSERVICE OPERATIONS - PERCENTAGE OF CORRECT RESPONSES BY EACH GROUP AND CHI-SQUARE VALUES

Number of Test Questions	FNIA (n=15)	HRAD (n=17)	INTERN (n=8)	NON-MAJOR (n=10)	Chi-Square	df	Probability
1	46.67	52.94	50.00	10.00	9.605	9	.3834
2	46.67	41.18	50.00	30.00	13.397	9	.1454
3	46.67	64.71	50.00	40.00	5.264	6	.5104
4	66.67	64.71	75.00	20.00	16.396	9	.0591
5	80.00	94.12	75.00	60.00	7.239	6	.2993
6	86.67	64.71	75.00	40.00	9.732	9	.3726
7	40.00	70.59	75.00	30.00	9.067	9	.4311
8	0.00	11.76	0.00	20.00	11.185	9	.2632
9	100.00	82.35	100.00	50.00	18.377	9	.0310
10	66.67	47.06	75.00	20.00	10.361	9	.2644
11	86.67	76.47	87.50	40.00	17.500	9	.0711
12	93.33	94.12	100.00	30.00	24.220	9	.0040
13	73.33	58.83	62.50	60.00	7.132	9	.6234
14	86.67	82.35	100.00	50.00	16.777	9	.0523
15	0.00	17.65	12.50	0.00	18.273	9	.0321

unexpected 20% of the NON-MAJOR group answered question 8 correctly.

Part III - Food Science

The final part of the test covered food science subject matter. This part of the test was composed of 15 test questions. Eight test questions (1, 2, 6, 8, 10, 11, 14, 15) were answered correctly by a majority of the total group. The seven remaining test questions were correctly answered by 22% to 48% of the total group (Table VIII).

TABLE VIII

PART III(C) FOOD SCIENCE - FREQUENCY OF RESPONSES PER TEST QUESTION (n=50)

Number of Test Questions	Response Choices in Percentages			
	1	2	3	4
1	6.00	92.00*	2.00	0.00
2	14.00	2.00	80.00*	4.00
3	2.00	54.00	4.00	40.00*
4	48.00*	14.00	20.00	18.00
5	0.00	44.00*	20.00	36.00
6	16.00	16.00	50.00*	18.00
7	6.00	22.00	28.00	42.00*
8	6.00	52.00*	14.00	28.00
9	10.00	44.00	10.00	36.00*
10	6.00	0.00	90.00*	4.00
11	2.00	26.00	6.00	66.00*
12	26.00	32.00*	32.00	10.00
13	6.00	66.00	22.00*	6.00
14	82.00*	4.00	4.00	10.00
15	6.00	10.00	6.00	78.00*

*Correct responses.

The total number of test questions answered correctly by 50% and above of the FNIA, HRAD, and INTERN groups ranged from 9 to 12, with the INTERN group performing better than the other groups. The slight differences indicated no real significant difference, however, in the performance of each group.

In comparison to the FNIA, HRAD, and INTERN groups, only two questions were answered correctly by 50% and above of the NON-MAJOR group. These results indicated that food science was not understood or comprehended by a majority of the NON-MAJOR group (Table IX).

TABLE IX

NUMBER OF TEST QUESTIONS ANSWERED CORRECTLY IN PART III BY FNIA, HRAD, INTERN, AND NON-MAJOR GROUPS

Correct Response in Percentages	(Total of 15 Questions) Number of Test Questions			
	FNIA	HRAD	INTERN	NON-MAJOR
below 50%	5	6	3	13
50% and above	10	9	12	2

Nine questions (1, 2, 3, 6, 10, 11, 12, 13, 14) of the total 15 test questions were significant ($p<0.05$) in

frequency of responses per question by the different groups (Table X). Analyses of correct responses to questions 1, 10, and 14 revealed a very high percentage of correct responses per group. The percentage of correct response of the NON-MAJOR group to question 1 and 10 was 60%. These questions pertained to federal labeling requirements, food cooling procedures, and chemical characteristics of fat used in frying, and obviously did not discriminate very well between those students who knew the subject matter from those students who did not (Table X).

The significant difference in percentages of response to question 3, which covered USDA inspection of meat products, was due to no correct response from the NON-MAJOR group. A majority of both the FNIA and INTERN groups responded correctly to question 6, while the HRAD and NON-MAJOR groups had percentages of correct responses of 29% and 10%, respectively. The test question was about legal regulations of food on the market. Question 11, dealing with gelatin formation was answered correctly by 50% and above of the FNIA, HRAD, and INTERN groups. The percentage of correct responses of the FNIA and INTERN groups were 93% and 100%, respectively, while the HRAD group's response was only 53%.

The response of the HRAD to question 12 was the reason for the significant difference in the frequency of responses. Only 6% of the HRAD group responded correctly

TABLE X

PART III(C) FOOD SCIENCE - PERCENTAGE OF CORRECT RESPONSES BY EACH GROUP AND CHI-SQUARE VALUES

Number of Test Questions	FNIA (n=15)	HRAD (n=17)	INTERN (n=8)	NON-MAJOR (n=10)	Chi-Square	df	Probability
1	100.00	100.00	100.00	60.00	17.391	6	.0079
2	80.00	94.12	100.00	40.00	23.244	9	.0057
3	46.67	52.94	50.00	0.00	17.729	9	.0384
4	46.67	58.82	62.50	20.00	11.573	9	.2385
5	66.67	47.00	37.50	10.00	10.436	6	.1075
6	73.33	29.41	100.00	10.00	23.865	9	.0045
7	53.33	47.06	25.00	30.00	6.136	9	.7744
8	46.67	64.71	50.00	40.00	11.192	9	.2628
9	33.33	47.06	25.00	30.00	11.143	9	.2660
10	93.33	100.00	100.00	60.00	15.463	6	.0169
11	93.33	52.94	100.00	20.00	30.634	9	.0003
12	53.33	5.88	50.00	30.00	19.767	9	.0194
13	13.33	17.65	50.00	20.00	23.714	9	.0048
14	100.00	88.24	87.50	40.00	18.663	9	.0282
15	80.00	88.24	100.00	40.00	14.159	9	.1168

to this question which concerned the chemical composition of plant fiber. Fifty percent and above of the FNIA and INTERN groups responded correctly to this question.

Question 13, concerning cell diffusion, was the last test question that was significant as to how each group responded. The FNIA, HRAD, and NON-MAJOR groups had below 50%, as compared to the INTERN group's response of 50%. Questions 7 and 9, which concerned the chemical variations involved with food were answered slightly better or higher by the FNIA and HRAD group.

Evaluation of Hypothesis

H_1: There will be no significant difference in the knowledge attained as shown by the test scores between FNIA-HRAD majors and the NON-MAJORS.

The overall test scores of the NON-MAJOR group, compared to the combined test scores of the FNIA-HRAD majors, were substantially lower. The frequency of correct responses of the NON-MAJOR group on each part of the test was significantly lower than those of the FNIA-HRAD majors. Based on these results, H_1 was rejected.

H_2: There will be no significant difference in the knowledge attained as shown by the test scores between FNIA-HRAD majors and the dietetic interns.

Overall comparison of the test scores between the FNIA-HRAD majors and the INTERN group indicated no significant difference as to their performance on the test. The percentage of correct responses per test question of the

FNIA-HRAD majors were comparable, if not the same as the INTERN group's percentage values. Based on these results, H_2 would not be rejected.

H_3: There will be no significant difference in the knowledge attained as shown by the test scores between NON-MAJORS and the dietetic INTERNS.

H_3 was rejected, based on the test results of the INTERN group that were significantly different from the NON-MAJOR groups' test results. The INTERN group's frequency of correct responses on each part of the test was significantly higher than those of the NON-MAJORS.

Foodservice work experience collected from the demographic questionnaire appeared to be the most influencing variable upon the total groups' result. Those groups with food-related experience performed better than the group without the food-related experience. The HRAD group, with diversified types of food-related experience, scored higher than the FNIA group on Part I and II of the test. The INTERN group, with 10 months of supervised experience, performed somewhat better than the FNIA-HRAD group on overall performance. These assumptions are not conclusive, since part, if not all, of the test results can be attributed to education in the specific areas of this study. The education received by the FNIA-HRAD majors was attained almost entirely at Oklahoma State University, while some of the INTERNS came from other programs across the country.

CHAPTER V

SUMMARY AND RECOMMENDATIONS

The purpose of this study was to assess the knowledge attained by three defined groups of students at Oklahoma State University in three specific subject matter areas. Three hypotheses were formulated:

H_1: There will be no significant difference in the knowledge attained as shown by test scores between FNIA-HRAD majors and the non-majors.

H_2: There will be no significant difference in the knowledge attained as shown by test scores between the FNIA-HRAD majors and the dietetic interns.

H_3: There will be no significant difference in the knowledge attained as shown by test scores between the non-majors and the dietetic interns.

The future professional demands of students should be reflected in their basic education (1). The ADA, as the professional organization of dietetics, has committed itself to setting educational standards for the profession. The recent academic requirements approved by ADA, "Plan IV Minimum Academic Requirements," serves as a guideline for designing the basic educational programs for future dietitians (4, 7, 8). The educational programs instituted along these approved guidelines, may or may not provide the entry-level competencies required of beginning practitioners.

The continued evaluation of the educational preparation in essential to the viability of the profession (2, 3, 5, 9, 26).

The evolution of dietetic education has a lengthy history. The academic requirements for a competent practitioner have undergone several revisions since the cooking schools of the 1880's to the present ADA approved Plan IV Minimum Academic Requirements (12, 16, 17, 18, 19, 20, 21, 22). Plan IV, even now, is being reviewed for revisions so that it will accurately reflect current dietetic education and principles (26).

A profession has an obligation to the public to provide competent practitioners (6). The ADA, to insure the high standards of practitioners, instituted a program of registration (28, 31).

The objective way to determine qualified persons wishing to become registered was successful completion of an examination. The ADA, with the help of a professional testing organization, developed an examination covering the two basic areas of dietetics: nutrition and administration (27, 28, 31).

The registration examination, until 1979, was developed according to the original content outline prepared by one of the panels of the Committee on Professional Registration. The content validity study conducted in 1978 indicated a need for revisions in the original content outline. The present registration examination reflects these revisions (28, 31, 32, 33).

The process of updating and reviewing examination questions is still continued by the Committee on Dietetic Registration. Each question on the registration examination is reviewed by a panel of professionals. The question must reflect current dietetic practice and knowledge (19, 31, 32).

The present eligibility requirements to sit for the registration examination are: 1) successful completion of Plan IV at an accredited institution resulting in a Bachelor of Science degree, and 2) satisfactory completion of one of the several different appropriate clinical experiences (12, 30).

A predictive validity study is currently being conducted by the ADA and will progress over the next three years (33). Further studies are needed to determine: 1) the adequacy of other specific courses in teaching what is required of entry-level dietetic practitioners (per institution), 2) the adequacy of like courses by comparison among ADA accredited institutions, and 3) the construct validity of the ADA registration examination.

The static group comparison was the research design used in this study. This research design allowed the researcher to compare three different groups of students in regard to the attainment of basic knowledge in specific subject matter areas (34). The sample was composed of three different defined groups of students at Oklahoma State University. The method of comparison was a test

developed from ADA registration examination study guide material pertaining to three specific subject matter areas. An attitudinal survey was also conducted regarding specific courses offered at Oklahoma State University. The Statistical Analysis System (SAS) was used to generate chi-square and mean values (36).

Demographic Description of Sample

The majority of the participants in this study ranged in age from 18 to 22 years old. Participants were predominantly female and single.

The FNIA-HRAD students' initial exposure to food preparation was at a work situation. The work experiences for this group of students were foodservice-related. In contrast, only 2 of the 10 students in the NON-MAJOR group had any foodservice-related work experience.

Attitudinal Survey

The FNIA-HRAD majors felt that the courses specified in this survey were very important and necessary with regard to their future jobs. In the selection of a least and most valuable course, FNIA 2113, "Introduction to Food Preparation and Management" and HRAD/FNIA 3553, "Institutional Purchasing" were designated as being least valuable to the students, while HRAD/FNIA 4363, "Quantity Food Production Management" and HRAD/FNIA 4573, "Institutional Organization Management" were designated as being most valuable to the students.

Comparison of Attained Knowledge Concerning Management and Foodservice Systems Among Three Groups of Students

There was only a slight variation in the total number of test questions answered correctly by 50% or better of the FNIA, HRAD, and INTERN groups. Based on the similar test results of these groups, H_2 would not be rejected.

Slight variations were evident in the total number of correctly answered test questions when each group was compared to one another. Analysis of each groups' total number of correctly answered test questions revealed certain areas of strengths and weaknesses.

The INTERN group performed somewhat better than the FNIA and HRAD groups on all parts of the test. The HRAD group performed slightly better on Part I - Management and Part II - Foodservice Operation, when compared to the FNIA group's performance. The FNIA group, however, performed slightly better than the HRAD group on Part III - Food Science.

The NON-MAJOR group's performance on the entire test was significantly lower when compared to the other groups. H_1 and H_3 were rejected because of the low perfornance of the NON-MAJOR group on all parts of the test.

The majority of test questions on Part II - Foodservice Operations and Part III - Food Science, were answered

incorrectly by 50% or better of the NON-MAJOR group. On Part I - Management, because of the general subject matter involved, the NON-MAJOR group's performance was somewhat better than their performance on Parts II and III.

Analysis of the frequency of responses by test questions revealed that several questions in each part of the test were significantly ($p<0.05$) different as to the distribution of responses per response choice. Tables IV, VII, and X in Chapter IV illustrate how each group responded to the test questions that were significantly different in their distribution of responses. The significant differences were due to a high percentage of correct responses by the FNIA, HRAD, and INTERN groups, as compared to the NON-MAJOR groups or a low percentage of correct responses by two or more of these same groups. Other significant differences were also due to either a very high or a very low percentage of each of the groups FNIA, HRAD, INTERN, and NON-MAJOR responding correctly.

Summary

It can be stated that the FNIA-HRAD majors had attained the knowledge in the three specific areas of study: management, foodservice operations, and food science. There was no significant difference in the overall performance of the FNIA-HRAD majors and the dietetic INTERNS. When compared to each other, certain areas of strengths and weaknesses were exhibited by the FNIA and HRAD groups.

The overall performance of the NON-MAJOR group was significantly lower than the FNIA-HRAD majors and dietetic INTERNS. It was evident from the test results that the NON-MAJOR group did not know the subject matter in the three specific areas of this study.

Recommendations

The results of this study indicated that the dietetic INTERNS and FNIA-HRAD majors at Oklahoma State University had attained the knowledge in the three designated subject matter areas. The degree to which they had attained the knowledge differed slightly when compared to each other's performance. Each group exhibited different areas of strengths and weaknesses based on their individual performances on each part of the test. Based on these results, the following recommendations are made:

1. As the profession of dietetics changes to meet the growing demands of society, a periodic system of course evaluations should be developed and instituted in all institutions with approved Plan IV programs. Measuring the students' attained knowledge using test instruments that actually measure professional competence in dietetic practice would help determine the adequacy of the course(s) offered to meet the Plan IV competencies, not only in the area of foodservice management, but also in clinical dietetics and community nutrition.

2. Educators of dietetic practitioners must be committed to the challenge of continuous evaluation of the curriculum offered in the institutions. This is to insure that their graduates have acquired the academic requirements of professional education prior to the dietetic internship or other experience component undertaken to become eligible for dietetic registration.

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APPENDIXES

APPENDIX A

COURSE DESCRIPTIONS OF THE SEVEN DESIGNATED COURSES (AT OKLAHOMA STATE UNIVERSITY) INVOLVED IN THE STUDY

HRAD 1113 INTRODUCTION TO PROFESSIONAL FOOD PREPARATION - Techniques and theories of food preparation including use and selection of equipment, sanitation, and quality controls.

FNIA 2113 INTRODUCTORY FOOD PREPARATION AND MANAGEMENT - Selection, preparation, management, and service of food.

FNIA 3133 SCIENCE OF FOOD PREPARATION - Application of scientific principles to food preparation.

HRAD/FNIA 3213 INSTITUTION ORGANIZATION AND MANAGEMENT - Function and methods of management as related to the hospitality and food service industries.

HRAD/FNIA 3553 INSTITUTIONAL PURCHASING - Marketing conditions, with special emphasis upon purchasing discounts, coop buying, quality evaluation, consignments, paid advertising, product comparison, profits through purchasing food, linens, and supplies.

HRAD/FNIA 4363 QUANTITY FOOD PRODUCTION MANAGEMENT - Organization, purchasing, preparation, and service of food for large groups.

HRAD/FNIA 4573 INSTITUTION ORGANIZATION AND MANAGEMENT The organization of personnel and resources in a food service institution and the techniques required by the manager.

APPENDIX B

OUTLINE OF COURSES TO MEET PLAN IV MINIMUM ACADEMIC REQUIREMENTS (OKLAHOMA STATE UNIVERSITY)

BASIC REQUIREMENT COURSES

Inorganic Chemistry
Organic Chemistry
Microbiology
Human Physiology
Sociology or Psychology
Economics
Food
Nutrition
Management Theory and Principles
Communication
Mathematics[a]
Learning Theory

AREAS OF EMPHASIS IN DIETETICS

General

Biochemistry
Cultural Anthropology or Sociology
Food Service Systems Management
Nutrition in Disease
Data Processing[b]
Data Evaluation[b]

MANAGEMENT

Labor Economics or Relations
Food Service Systems Management
Principles of Business Organization
Financial Management
Data Processing or Data Evaluation

[a]May be acquired prior to college entrance.

[b]Recommended, not required.

APPENDIX C

SAMPLE OF TEST GIVEN TO TOTAL GROUP

Multiple Choice: Choose the letter of the answer which best completes the statement or answers the question. Write the chosen letter on the corresponding numbered line on the answer sheet.

MANAGEMENT - Part I

1. Which of the following employees should provide basic data for a job analyst?

   a. foodservice supervisor and manager
   b. foodservice workers and consultants
   c. supervisors and foodservice consultants
   d. foodservice workers and their supervisors

2. The best use of periodic evaluation of employees by their supervisors is:

   a. to document employee performance
   b. to improve the job performance of the employees
   c. to let the employee know that his performance is being judged
   d. to provide data for selection of employees for more responsible positions.

3. What is the planned process of locating and attracting the best qualified available persons for particular positions?

   a. placement
   b. recruitment
   c. job satisfaction
   d. manpower utilization

4. Which of the following is a significant feature of the management objectives technique?

   a. objectives of instruction set by top management
   b. emphasis on small group participation
   c. cooperative effort by subordinate and superior to determine performance objectives and criteria
   d. determination of departmental goals by superior

5. What approach would a traditionalist manager use if a substandard employee demanded to know why he failed to receive a promotion?

   a. he would ask the employee if there is anything he can do to help him improve
   b. he would suggest a transfer to a different job at the same pay rate which might better suit the employee's personality

c. he would tell the employee what he must do to be considered for promotion
d. he would tell the employee that his job performance is not good and that no promotion will occur until he becomes more productive

6. Which management functions should require the greatest allotment of time by a production manager?

a. planning and organizing
b. organizing and directing
c. directing and controlling
d. organizing and controlling

7. If an organization has a union contract in which the employer may hire as he likes, but the employee must then join the union, the organization has:

a. an open shop
b. a union shop
c. a closed shop
d. an agency shop

8. Negotiation between representatives of both management and employees regarding conditions of employment is known as:

a. mediation
b. job evaluation
c. check-off procedure
d. collective bargaining

9. Which of the following assumptions about people is made by the human relations approach to leadership?

a. they inherently dislike work and will avoid it if they can
b. they prefer to be directed and wish to avoid responsibility
c. the expenditure of physical and mental effort in work is not a source of satisfaction
d. they can exercise self-direction and self-control in the service objectives to which they are committed

10. What is the report which presents the financial condition of an organization as of a particular date?

a. budget
b. balance sheet
c. income statement
d. funds flow statement

11. Amounts owed by a business payable in money, goods, or services may be identified as:

    a. an asset
    b. a liability
    c. capital stock
    d. owner's equity

12. A job specification describes or lists the

    a. responsibilities of the position
    b. job relationships of the position to other jobs
    c. work schedule to be followed by employees
    d. minimum standards that must be met by the applicant

13. If one of the men working under a supervisor does an acceptable but not very good job on a particular assignment, it would be best for the supervisor to tell him:

    a. nothing
    b. that the job was satisfactory
    c. how to improve his performance
    d. that the job should have been done better

14. Which of the following would be best when preparing involved employees for a change from a pellet system to a rethermalization system?

    a. have employees included during all phases of the changeover
    b. direct employees to help with changeover and introduce change quickly
    c. announce to employees rethermalization is a betger system
    d. ask employees if they will go along with the decision

15. Which of the following managerial skills should comprise the largest component of the work of top management dietitians?

    a. human
    b. economic
    c. technical
    d. conceptual

16. Which of the following procedures should NOT be followed when making assignments for a new, complex job?

    a. teach a number of alternative methods for doing each task in the job

b. determine the possibility of combining closely related tasks
c. establish a definite line of work flow and responsibility
d. provide a job breakdown for performing each individual task

17. When interviewing a prospective employee, it is permissible to question the applicant about:

a. age
b. work experience
c. national origin
d. religious affiliation

18. PERT emphasizes the planning and control of:

a. financing
b. the time element
c. manpower requirements
d. organizational structure

19. Which of the following is MOST important as an incentive for the employee to increase productivity?

a. periodic raises in salary
b. emphasis on the necessity of cost reduction
c. developing a feeling of importance of the employee
d. an explanation to the employee that he is capable of more production

20. According to Herzberg's theory of motivation, which of the following most readily leads to job satisfaction?

a. responsibility
b. company policies
c. administrative practices
d. interpersonal relationships

FOODSERVICE OPERATIONS - Part II

1. What is the primary DISADVANTAGE of a conventional foodservice system?

a. limited menu
b. unequal supervision
c. uneven work distribution
d. poor microbiological quality

2. Which of the following is NOT a standard for materials management in a foodservice operation?

   a. specifications
   b. standardized recipes
   c. job description
   d. temperature and humidity controls

3. What is the desired temperature range for the wash cycle of a dish machine?

   a. 100° - 120°F
   b. 140° - 160°F
   c. 170° - 180°F
   d. 185° - 212°F

4. Which of the following is a good method of checking that the amount of overrun in ice cream is as specified?

   a. check for air holes
   b. weigh the gallon on receipt
   c. taste for richness of flavor
   d. count the number of servings per gallon

5. Which of the following should NOT be included when preparing specifications for the purchase of electrically operated equipment?

   a. psi
   b. voltage
   c. wattage
   d. type of current

6. What is the purpose of using a wetting agent in a dishwashing machine?

   a. to kill harmful organisms
   b. to prevent spotting of dishes
   c. to decrease bacterial plate count
   d. to minimize loss of glaze on china

7. Which of the following factors would specify metal weight?

   a. ply
   b. alloy
   c. gauge
   d. malleability

8. What specification indicates size when ordering canned peas?

   a. grade

b. sieve size
c. number in a can
d. number of servings in a can

9. The benefit of a convection oven is:

a. even heat distribution and decreased cooking time
b. the rotation of trays to insure even heat distribution
c. decreased cooking time through the use of microwaves
d. decreased cooking temperature

10. Which of the following methods would be MOST effective to purchase foods by formal competitive bidding?

a. call vendors, indicate specifications, ask for prices, and record for later decision
b. call vendors and request bids that are submitted in writing as soon as possible
c. notify vendors of the quantity and price that can be afforded for foods needed
d. send a written notice of food specifications to vendors inciting them to submit prices by a certain date

11. If the percentage of loss in preparation is 30% and the standard portion size is five ounces, approximately how many servable portions can be obtained from a raw piece of meat weighing nine pounds?

a. 14
b. 20
c. 29
d. 37

12. What is the desirable material used for most food-service work tables?

a. laminated plastic
b. monel metal
c. galvanized iron
d. stainless steel

13. Which scoop size provides a one-half cup serving?

a. 6
b. 8
c. 10
d. 12

14. In planning a new facility, which of the following would be the best way to assure storage, inventory, and production control?

    a. have a centralized ingredient control unit
    b. have easy access to the storeroom
    c. provide an office for the storeroom man
    d. include adequate portable shelving in storeroom

15. The usual standard for the temperature of hot beverages when served is:

    a. 120° - 130°F
    b. 140° - 150°F
    c. 160° - 170°F
    d. 180° - 190°F

FOOD SCIENCE - Part III

1. Which of the following is essential on the label of a can of peas to meet federal labeling requirements?

    a. the brand name
    b. the weight of the contents
    c. the place where the peas were grown
    d. a recipe telling how to use the contents of the can

2. Foods originally approved for enrichment were those which:

    a. had high energy value
    b. could be transported easily
    c. had lost nutritive value in processing
    d. were being distributed by relief agencies

3. Which of the following is indicated by the USDA inpection stamp on meat products?

    a. price
    b. grade
    c. palatability
    d. wholesomeness

4. Which of the following heat transfer mechanisms are appropriate to describe browning meat in a steam-jacketed kettle?

    a. conduction and radiation
    b. radiation and convection
    c. convection and vaporization
    d. evaporation and vaporization

5. For good conduction in pots and pans the preferred material is:

   a. glass
   b. aluminum
   c. black cast iron
   d. stainless steel

6. Which of the following was established by the Delaney Clause?

   a. the right of all individuals to hazard-free working conditions
   b. the right of unannounced entrance into private establishments by federal inspectors
   c. the need to remove a food item from the market if any amount is found to cause cancer in animals
   d. the need to remove a food item from the market if it is likely that consumers will eat enough of it to get cancer

7. For what reason should most vegetables be blanched prior to freezing?

   a. to kill all pathogenic mold spores
   b. to inactivate spores of harmful bacteria
   c. to destroy all pathogenic microorganizsms
   d. to destroy enzymes involved in maturation

8. Which of the following USDA grades of beef would have the MOST marbling?

   a. good
   b. prime
   c. choice
   d. standard

9. Egg yolk has more thickening ability than egg white because it has a higher:

   a. pH
   b. coagulation temperature
   c. percentage of iron content
   d. percentage of protein content

10. Which of the following containers would allow the most rapid cooling for five gallons of a stirred custard?

    a. a 6-gallon stock pot
    b. two 3-gallon stock pots
    c. two 3-gallon shallow pans
    d. a 6-gallon glass container

11. Which of the following will interfere with gelatin of a gelatin fruit salad?

    a. raw apple
    b. lemon juice
    c. orange peel
    d. fresh pineapple

12. Which of the following is a non-carbohydrate component of plant fiber?

    a. pectin
    b. lignin
    c. cellulose
    d. hemicellulose

13. What is the process by which the water content of a vegetable is replaced by a concentrated salt solution?

    a. gelling
    b. osmosis
    c. diffusion
    d. enzymatic browning

14. What is the most important characteristic to be considered in selecting fats for use in frying?

    a. smoke point
    b. melting point
    c. congealing point
    d. number of fatty acids present

15. Which of the following procedures will most likely prevent the spread of salmonella infection from uncooked meats to cooked meats?

    a. refrigerate the cutting board
    b. rinsing the cutting board frequently
    c. cutting meats on a stainless steel surface
    d. using separate sanitized boards for cooked and uncooked meats

APPENDIX D

QUESTIONNAIRE FOR FNIA-HRAD MAJORS

College_____ Major_____

Age ___ 18-22 Sex ___M Marital Status ___ Single
___ 23-27
___ 28-32 ___F ___ Married
___ 33 & over

Initial exposure to food preparation. How? When? (be brief)

Living situation (past two years - check as many as applicable):

___ off-campus living by yourself
___ off-campus living with a roommate/spouse
___ at home with parents
___ in a residence hall
___ in a fraternity/sorority house
___ other _____

Years at Oklahoma State University _____
If transferred; previous institution_____
Year transferred: So___ Jr___ Sr___

Courses taken at O.S.U.:	Yes	No
FNIA 2113 Introduction to Food Preparation and Management	___	___
FNIA 3113 Science of Food Preparation	___	___
HRAD/FNIA 3213 Institution Organization and Management	___	___
HRAD/FNIA 3553 Institutional Purchasing	___	___
HRAD/FNIA 4363 Quantity Food Production Management	___	___
HRAD/FNIA 4573 Institution Organization and Management	___	___
HRAD 1113 Introduction to Professional Food Preparation	___	___

Work experience related to food service (past three years)

Type of Work	Length of Time

Complete the following survey with regards to the preceding list of courses (i.e., those you have taken):

1. How necessary are these courses in regards to your chosen field of study?

Very Necessary___ Necessary___ Slightly Necessary___
Not Applicable___

2. How adequate are these courses in presenting the specific course material?

Inadequate___ Barely Adequate___ Adequate___
Very Adequate___

3. How important to you is it to acquire knowledge in these areas?

Very Important___ Important___ Slightly Important___
Not Important___

4. How good are these courses in teaching what may be needed in your first job?

Poor___ Fair___ Good___ Excellent___

5. Which course has been the least valuable to you concerning your specific major?

___ FNIA 2113
___ FNIA 3133
___ HRAD/FNIA 3213
___ HRAD/FNIA 3553
___ HRAD/FNIA 4363
___ HRAD/FNIA 4573
___ HRAD 1113

6. Which course has been the most valuable to you concerning your specific major?

___ FNIA 2113
___ FNIA 3133
___ HRAD/FNIA 3213
___ HRAD/FNIA 3553
___ HRAD/FNIA 4363
___ HRAD/FNIA 4573
___ HRAD 1113

7. Do you think you will ever use the information gained from these courses?

Yes___ No___ Don't Know___

8. If yes, how often do you think you will use the information in an everyday work situation?

Frequently___ Occasionally___ Seldom___ Rarely___

APPENDIX E

QUESTIONNAIRE FOR NON-MAJORS

College_____ Major_____

Age ___18-22 Sex ___M Marital Status ___Single
___23-27
___28-32 ___F ___Married
___33 & over

Living situation (past two years - check as many as applicable)

___off-campus living by yourself
___off-campus living with a roommate/spouse
___at home with parents
___in a residence hall
___in a fraternity/sorority house
___other _____

Have you ever enrolled/taken a food preparation, purchasing, or food service management course at Oklahoma State University or other university/college?

___Yes ___No

If yes, please specify course and university/college:

Have you ever worked in a food service-related job?

___Yes ___No

If Yes, please specify:

Type of Work	Length of Time

VITA

Celine M. Wuellner

Candidate for the Degree of

Master of Science

Thesis: COMPARISON OF ATTAINED KNOWLEDGE CONCERNING MANAGEMENT AND FOODSERVICE SYSTEMS AMONG THREE GROUPS OF STUDENTS

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