THE EFFECTIVENESS OF A LABORATORY-BASED FOOD PROTECTION TRAINING PROGRAM

By

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CHAPTER I

INTRODUCTION

The foodservice industry has become one of the four largest industries in the United States with the largest number of establishments - "535,000 commercial and institutional serving units" - and accounting for "more than 36 percent of all food expenditures in this country" (Gottlieb, 1978, p. 69). The industry is made up of not only restaurants, hotel foodservices and institutional cafeterias, but also includes the national school foodservice program which serves 81 percent of the nation's school children (White, 1978, p. 40).

The president of Technomic Research Associates estimates the number of meals eaten outside the home to be "close to one out of five depending on how one defines meals" (Paul, 1978, p. 32). The people eating at these institutions should be guaranteed protection from foodborne illnesses caused by unsanitary food handling methods practiced by foodservice personnel. To date, clientele of foodservice establishments have no assurance that the food they consume will be free of disease, even though the establishments may be inspected regularly by the health departments.

The Center for Disease Control (1977) reports that in 1976 there has been a 12 percent reduction in foodborne disease outbreaks from the preceding year. However, 41 percent of the 438 outbreaks

reported in 1976 have occurred in restaurants (Center for Disease Control, 1977, p. 5), an increase from the 39 percent reported in 1975 (Center for Disease Control, 1976, p. 6). The report for 1976 identifies mishandling of food as responsible for 376 outbreaks and restaurants as responsible for 78 percent of the food mishandling incidents.

Foodservice personnel many times begin their jobs with no prior training, especially in the area of food sanitation. Usually, the employer, or the supervisory staff, is responsible for training the new employee. This training involves time, money, qualified instructors, and proper facilities and equipment (Rinke, 1973), any one of which may not be available to the foodservice supervisor. These factors must be considered when developing a training program in addition to the factors directly affecting knowledge gain.

A large number of training programs has been developed for the foodservice employee (Bower and Davis, 1976; NIFI, 1974; Hinckley, 1974; Rinke, 1973; National Restaurant Association, 1972; Acacio, 1971; Army Quartermaster School, 1971; and Carter, 1963), beginning as early as 1943 (Hinckley, 1974) to fulfill the need for effective training for foodservice personnel. Many of these programs consider only food sanitation; others include different subject areas related to foodservice (Acacio, 1971). No single program, however, has been found to be effective and acceptable for the nearly eight million employees of the foodservice industry. The wide spectrum of establishments making up the foodservice industry may necessitate an equal diversity in training programs. It may prove advantageous

to provide a variety of training programs from which individual establishments may choose.

Regardless of the training method used, knowledge gain was significant in nearly all subjects used in past studies. It was noted, however, that knowledge retention was not tested after the previous training programs were completed. Knowledge retention would seem to be an important factor when selecting the most suitable training program.

Purpose and Objectives

This study was undertaken to develop an effective food protection training program (hereafter referred to as the "program"), to test for information retained after an eight-week interval, and to examine on-the-job sanitation practices after the training program. The program focused on bacteriology as related to food protection and safety. Laboratory experiences were used to supplement information presented in film strips and discussions. The people involved in the program were supervisory and non-supervisory foodservice personnel.

The objectives for this study were:

1. To assess if a significant difference exists between food protection knowledge before and after the food protection training program, and to assess if there is significant knowledge retention eight weeks after completion of the training program.
2. To determine if an association exists between selected personal characteristics of the foodservice personnel

and the effectiveness of the program.

3. To assess the relationship between retention of knowledge and application of sanitation practices on-the-job and between net gain and application.
4. To determine if an association exists between knowledge gained from the course and knowledge retained after an eight-week interval.
5. To make suggestions for future research in the area of food protection training.

Hypotheses

The following hypotheses guided the development of this research. They were:

Hypothesis 1: There will be a significant difference between knowledge of food protection before and after the program, and a significant retention of material learned from the program.

Hypothesis 2: There will be an association between selected personal characteristics of the foodservice personnel and the effectiveness of the program.

Hypothesis 3: There will be a relationship between retention of knowledge and application of sanitation practices, and between sanitation principles learned and application of sanitation principles.

Hypothesis 4: There will be an association between knowledge gained and knowledge retained.

Assumptions and Limitations

In order to utilize the data obtained from the food protection training program, it was assumed that the participants in the study would attend all training sessions and participate in the activities of the program. It was also assumed that the participants would be honest when taking the pretest, the posttest, and the retest, and that the person evaluating the employees' practices would be thorough.

The participants in the study were limited to personnel in a single program - the school foodservice program of Stillwater, Oklahoma. This limitation was due to the lack of cooperation from, and availability of personnel of other foodservice institutions.

Definitions

Terms used in this study were defined as follows:

Foodservice personnel or food handler: "a person who handles food in the foodservice establishment regardless of whether he actually prepares or serves food" (Longree and Blaker, 1971, p. 17). Foodservice personnel are supervisory and non-supervisory foodhandlers who are employeed in a foodservice establishment.

Supervisor: an individual in management who "makes decisions, controls work, interprets policy, and generally is the key man in the process of accomplishing work" (Davis,

1972, p. 114). Davis regards the supervisor as the keystone in the whole organization.

Food protection: "preventive measures that seek to keep disease agents from getting into food, and corrective measures that destroy, or stop the multiplication of, those that do get in" (NIFI, 1974, p. 82).

Foodservice: "an industry term denoting commercial and institutional food preparation and service or the establishments so engaged" (NIFI, 1974, p. 215).

Food protection training program: a training program employing concepts of food protection. In this study, the training program consisted of four, one-hour lessons in the areas of microbiology, personal hygiene, food safety, and establishment and equipment sanitation. The material was presented in film strips, discussions, and laboratory experiences.

Knowledge: defined by Bloom (1969, p. 28) as "little more than the remembering of the idea or phenomenon in a form very close to that in which it was originally encountered." "By knowledge we mean that the student can give evidence that he remembers, either by recalling or by recognizing, some idea or phenomenon with which he has had experience in the educational process."

Knowledge gain: referred to by Acacio, McKinley, and Scruggs (1974, p. 41) as "gain in job knowledge."

Course gain: the difference between posttest and pretest scores.

Net gain: the difference between retest and pretest scores.

Retention: the difference between retest and posttest scores.

Application: scores received on the performance evaluation.

Effectiveness: evaluation of curriculum dependent on the achievement of the students (Sax, 1974, p. 13).

Evaluation: "a process through which a value judgment or decision is made from a variety of observations and from the background and training of the evaluator" (Sax, 1974, p. 3).

CHAPTER II

REVIEW OF LITERATURE

The area of food protection in foodservice systems received much attention in the past few years, basically due to the large number of food poisoning outbreaks and the publicity they received. The problem of poor food sanitation, and the need for training, however, were identified many years ago (ben Meyr, 1973). Becker and Shiffman (1970, p. 285) identified poor health of the food handler as a problem causing disease outbreaks, and suggested that "the education and training of foodservice personnel would have more benefit and impact on the health of the public than the annual repetition of medical and laboratory tests (required by some states)."

Courses were offered as early as 1943 (Hinckley, 1974) to train foodservice personnel in the area of food sanitation, and many courses were developed in the past 15 years (Bower and Davis, 1976; Hinckley, 1974; NIFI, 1974; Rinke, 1973; National Restaurant Association, 1972; Acacio, 1971; Army Quartermaster School, 1971; and Carter, 1963). These courses were not intended for the entire foodservice industry, although most were effective for the group on which they were tested.

The programs developed used a variety of educational methods including programmed instruction (Rinke, 1973; Acacio, 1971; and

Carter, 1963), lecture and discussions (Bower and Davis, 1976; Hinckley, 1974; Rinke, 1973; and Acacio, 1971), film strips and discussion (National Restaurant Association, 1972), and correspondence courses (Army Quartermaster School, 1971). Each of these methods posed certain problems for individual areas of the foodservice industry. A number of the problems cited (ben Meyr, 1973; Rinke, 1973) was common to most all foodservice establishments when trying to provide a training program.

Need for Training Foodservice Employees

Background

In 1945, the National Association of Sanitarians at its Ninth Annual Conference, passed a resolution advocating an examination of food handlers to test their knowledge in the area of food sanitation. Over 30 years ago, it was noted that the major problem causing food poisoning was that the retailers would not accept their obligation to the public to provide safe food (ben Meyr, 1973). Beginning in 1943, the New York Health Department, together with the New York City Board of Education, offered evening training courses, taught by Health Department sanitarians, free to food handlers, to combat the food poisoning problem (Hinckley, 1974). Even with such an opportunity available to them, very few foodservice managers took advantage of this program. Thus, even though the effort was being made to train employees, sanitation problems still existed in many foodservice establishments (Bower and Davis, 1976).

Incidence of Foodborne Disease Outbreaks

The inability of previous courses to adequately train food-service employees was evidenced in the astounding number of food-related outbreaks that occurred in the past few years. The outbreaks did not only occur in restaurants; sources in reported outbreaks also included community picnics (McCormick, Kay, Hayes, and Feldman, 1976), hospitals (Meyers, Romm, Tihen, and Bryan, 1975), camps, church functions, bakeries (Schoenbaum, Baker, and Jezek, 1976), schools, and even private homes. Those occurring in homes were mostly due to home canned foods or to bad food purchased in stores (Bradshaw, Peeler, and Twedt, 1975).

In 1976, the Center for Disease Control (1977) reported that 41 percent of the reported food-related outbreaks occurred in restaurants, 24 percent in homes, five percent in schools, and the remaining 29 percent in various other places. The percentage of outbreaks occurring in restaurants appeared to be rising. This seemed to be evidence that sanitation control in restaurants was breaking down. The inadequacy of control could have been a result of problems in the inspection system (Hinckley, 1974, p. 450), or may have been attributed to the lack of sanitation knowledge found in foodservice managers. This rise in numbers of reported cases may have also been the result of the improved methods for detection of the source of an outbreak; thus, fewer outbreaks were going unreported.

Educational Approaches

A general agreement was found in all literature reviewed that there was a definite need for training of foodservice personnel. A number of foodservice employee training courses was developed in various areas of the United States, each using different methods of instruction and a variety of materials; but most of the courses focused on the same basic principles of food sanitation.

Comparison of Training Methods

Rinke, Brown, and McKinley (1975) compared two methods of training personnel in foodservice systems focusing on food sanitation. The first method (live instruction) consisted of 35 mm slides plus commentary and questions provided by an instructor. The other method (taped instruction) utilized the same slides with the same commentary and questions delivered in a synchronized slide-tape program. A slide program with commentary developed by the Iowa Dietetic Association was used as a basis for this training program (Rinke, Brown, and McKinley, 1975, p. 365). The 60 participants in this study were foodservice workers in the residence halls at Iowa State University. The group consisted of cooks, bakers, and employees working in salad preparation.

The experiment included pretest, training, and posttest sessions. The instrument used for pretest and posttest evaluation contained 53 objective test items which were either true-false, cluster true-false, fill-in, or multiple choice. Knowledge gain was represented as the differences between mean scores on the pretests and posttests.

Pearson's product-moment correlation coefficient was used to estimate relationships between variables and the praticipants' scores on the pretests and posttests. No significant difference was found in pretraining knowledge between supervisors and non-supervisors, or between live and taped instruction groups. Employees with grade 12 or more education possessed significantly higher pretraining sanitation knowledge than those with grade 11 or less education (Rinke, Brown, and McKinley, 1975, p. 365). No significant difference was found in gain in sanitation knowledge between supervisors and non-supervisors, live and taped instruction groups, or employees with grade 12 or more education and those with grade 11 or less education. Multiple classification analysis of variance performed on the pretest and posttest scores showed that variation in job, education, and instruction, and their interaction had no significant effects on test scores.

Acacio, McKinley, and Scruggs (1972) compared the effectiveness of programmed instruction with that of group training. Three groups of school foodservice managers participated in the study. One group received training by programmed instruction in a home-study course. This course contained sections on basic nutrition, type-A lunch, and menu making. The short course group attended three 5-day short courses on the Iowa State University campus (Acacio, McKinley, and Scruggs, 1972, p. 40). The curriculum for this course was similar to that of the home-study course. The control group received no training during the experiment. The participants were further divided into categories according to length of experience in foodservice (seven years or less, and eight

years or more), and level of education (grade 11 or less, and grade 12 or more).

The training experiment was conducted in three phases: 1) pretest, 2) training, and 3) posttest. The pretest and posttest sessions were standardized for both training programs. The pretest and posttest were made up of 11 subject-matter evaluation instruments. Five subtests of the General Aptitude Test Battery were given to obtain scores for intelligence, clerical perception, and numerical, verbal, and spatial aptitude (Acacio, McKinley, and Scruggs, 1972, p. 41).

Pretraining job knowledge was determined by pretest scores. Differences between pretest and posttest scores were interpreted as job knowledge gain as a result of training. Relationships between two variables were estimated by Pearson product-moment correlations. Differences in pretest scores were determined by multiple classification analyses of variance. No significant difference was found in pretraining job knowledge among self-instructional, short-course, and control groups, or between employees who had seven years' or less foodservice experience and employees who had eight years' or more experience. Employees who had grade 12 or more education had significantly higher pretraining knowledge than employees who had grade 11 or less education (Acacio, McKinley, and Scruggs, 1972, p. 42). There was no significant difference in gain in job knowledge between the self-instruction and the short-course groups, but both trained groups were significantly higher than the control group. Level of education and length of foodservice experience had no significant effect on gain in job knowledge.

Carter, Moore, and Gregory (1964) developed a sanitation training program using the method of programmed instruction. The 145-frame course was divided into four lessons: Bacteriology, Transmission of Disease, Food-borne Diseases, and Personal Hygiene and Sanitary Food Handling. All full-time, unskilled foodservice employees below the supervisory level at the University of Missouri Medical Center were randomly assigned to either the experimental or the control group. The employees in the experimental group completed the food sanitation course on a teaching machine. An objective test consisting of 50 true-false and 50 multiple choice questions was given to both groups to test existing sanitation knowledge. A personal history questionnaire was administered to all participants to determine comparability of the two groups. The Gates Reading Survey was given to the participants to determine their reading ability (Carter, Moore, and Gregory, 1964, p. 272). One week after the experimental group completed the programmed instructional material, both groups were given the posttest, which included the same questions as the pretest.

No significant difference was found between groups in reading ability as determined by mean scores on the Gates Reading Survey. Mean scores for the pretest also showed no significant difference between groups. The personal history data provided evidence that the two groups were essentially alike.

Effectiveness of the training program was determined in two ways: 1) the mean pretest and posttest scores were compared within the control and experimental groups, and 2) the mean posttest scores of the two groups were compared. No significant difference was

seen between the pretest and posttest scores for the control group, but the pretest and posttest scores were significantly different for the experimental group. The mean score on the posttest for the experimental group was significantly higher than that for the control group, indicating that learning occurred as a result of completing the sanitation course for the experimental group (Carter, Moore, and Gregory, 1964).

Current Training Programs

An Owner/Operator/Manager Food Service Training Program was developed by the Ohio Department of Health for the Food and Drug Administration (FDA) between 1973 and 1975 (Bower and Davis, 1976). The course consisted of discussions in biology bacteriology, the causes and spread of disease through food, foodservice regulations, insect and rodent control, environmental health principles, food-service plans and equipment review, personnel training, and industry self-inspection. Over 750 people successfully completed the course, and were registered as "certified food service managers" (p. 129) in Ohio.

Colorado and Virginia were contracted to test the same training program used in Ohio. After evaluation of the final reports from the three states, the FDA hoped to develop a uniform certification program for foodservice operators which all states will adopt. The FDA also hoped to make it manditory for anyone who wished to open a foodservice operation to complete the training program the state will offer. The manager, in turn had the obligation to train his or her employees. Bower and Davis (1976) cautioned against

any official certification until a model program and uniform certification become available.

The New York City Health Department updated the 1943 education program used previously by their department and required foodservice managers with uncorrected inspection violations to attend the food protection course (Hinckley, 1974, p. 458). The course, taught by Health Department sanitarians and others, was scheduled at a time convenient for most managers to encourage attendance. The Health Department also arranged to provide the course in Chinese, Greek and Spanish for those in the industry who did not speak English. The course was taught in three-hour periods for five consecutive days. The main portion of the course consisted of lectures and discussions which were supplemented by movies, slides, posters, demonstrations, charts, and leaflets.

The course was aimed at teaching rules and regulations of the Health Code, personal hygiene requirements, fundamentals of food microbiology, food-borne disease and prevention, proper food handling and storage practices, cleaning and sanitizing procedures, rodent and insect control, maintenance and cleaning scheduling, and self-inspection procedures (Hinckley, 1974, p. 460). Each person attending the course was given a pretest and a posttest so that they could more clearly realize how much they had learned. The review of pretest and posttest provided a means for evaluation of the effectiveness of the course content.

To assure that at least one supervisor of a foodservice system was trained in the area of food sanitation, the New York City Health Department required all people applying for a permit to

operate an eating establishment to complete the course of food protection. In addition to those applying for a permit and those with inspection violations, any manager or supervisor of a food-service establishment involved in a food poisoning incident was required to enroll at once in the Department's course. The Department believed that its education program was meeting its goals; this was evidenced by the fact that in 1973, during the period of August through October, there were only 40 food poisoning cases and 89 people ill compared to 56 food poisonings and 124 persons ill during the same period in 1972 (Hinckley, 1974, p. 461).

The National Institute for the Foodservice Industry (NIFI, 1974) developed a text on foodservice sanitation entitled, Applied Foodservice Sanitation. This book contained a complete course on food sanitation which was useful to both foodservice managers and to their employees. The five-part course included sections on sanitation and health, sanitary food and food handling, the safe food environment, sanitation and the customer, and sanitation management. In addition to the course, the appendix of the book contained a self-inspection program which managers used to direct them to problem areas in their establishments. Students who completed the NIFI course and passed the examination, received a NIFI Certificate of Completion. Over 25,000 certificates were awarded by May, 1978 (Sandler, 1978, p. 25).

The National Restaurant Association (NRA, 1972) also developed a foodservice training course which was used widely by the food-service industry. The program included a set of film strips on areas important to the foodservice industry: Protecting the Public,

The Smart Waitress, The Unwanted Four, The Freeloaders, The Angry Flame, and Work Smart - Stay Safe. A trainers guide was also developed to accompany the film strips, and to serve as a guide for discussions. Achievement tests were prepared as a part of the program. They were to be administered to employees following each lesson.

The Oklahoma Restaurant Association (ORA, 1978) developed a certification and training program which used five of the film strips from the National Restaurant Association. Employees were shown each of the five film strips: The Personal Side, Food Protection, Establishment and Equipment Sanitation, The Unwanted Four, and The Freeloaders. After each film, they were given a 20-question, true-false test. Thirty and 60 days after the course, the employees were evaluated on-the-job by their supervisors. When the employees had completed the training program, including the on-the-job evaluation, they were certified as registered foodservice technicians. Childress (1977, p. 46) examined the effectiveness of the ORA program and determined it to be "very elementary and basic."

The Army Quartermaster School (1971) produced a single lesson, four-hour correspondence subcourse on the prevention of food poisoning. Areas covered in the course included 1) definition of food poisoning, 2) chemical food poisoning, 3) biological food poisoning, 4) causes and prevention of trichinosis, 5) six factors controlling bacterial growth, and others. This program was a self-teaching medium which contained all information needed to complete the course. This program was used for foodservice workers in the quartermaster school.

Restrictions

While training programs in food protection were necessary, a number of problems arose in providing these courses. According to Rinke (1973, p. 9), these problems included: 1) lack of qualified instructors, 2) lack of time for the trainer to prepare materials and for repetitive teaching, 3) difficulty in gathering enough employees to justify cost of the program, 4) difficulty in finding a central location when employees were scattered, 5) lack of proper facilities and equipment, 6) lack of funds, 7) shift work preventing all employees from being available at one time, and 8) low educational level of employees. Lack of funds was also identified by ben Meyr (1973, p. 262) as a limiting factor, however, the remainder of his list included improper organization, lack of persons who want to and know how to teach, inadequacy of direction from health officers, rapid turnover rate, and lack of uniformity in sanitary requirements. These problems were considered in the development of most training programs, but many were not overcome. Foodservice establishments considered these factors when studying the feasibility of providing a training program. Those establishments confronted with few of the above problems provided programs; for others, the costs out-weighed the benefits.

CHAPTER III

METHOD

The training program designed for this research was developed with the non-professional foodservice personnel in mind. Ideally, the program should have been tested on a random sample of personnel from a number of different types of foodservice establishments. However, managers were reluctant to send only one employee, and many establishments had so few employees that it was difficult for them to have any of their personnel absent, even for a short time. The program, therefore, was presented to a group of foodservice personnel from a single establishment.

The training program was a modified version of the program developed by the National Restaurant Association, and used by the Oklahoma Restaurant Association for training and certification of Registered Foodservice Technicians (Oklahoma Restaurant Association, 1978). The evaluation of the effectiveness of this program included an objective test (used for pretest, posttest, and retest) over the material presented in the program, and a performance evaluation form, completed by the researcher for a random sample of the participating employees.

Analysis included comparison of pretest and posttest scores, pretest and retest scores, and posttest and retest scores. Other statistical tests used included tests for relationships between

age group and foodservice experience, and course gain, net gain, retention, and application; between retention and application; between net gain and application; and between net gain and course gain.

Research Design

Type of Design

The pre-experimental design was chosen for this research. The experiment was a modified one group, pretest - posttest design

$$O_1 \ X \ O_2 \ O_3$$

(Best, 1977, p. 103), which included a retest and a performance evaluation.

Population

The population in this study was composed of school foodservice personnel at the six Stillwater, Oklahoma, public schools during the school year 1978-1979. Purposive sampling describes the procedure used in selecting the participants for this study which included six supervisory and 27 non-supervisory personnel. An intact group was used because the pilot study indicated the difficulty in securing a true random sample from personnel in the foodservice industry.

In-service training for Stillwater school foodservice personnel is provided every six months; therefore, arrangements were made to present the program during one of these periods. The fact that some of these personnel had received previous training had to be taken into consideration for this study.

Procedure

Planning and Development

The research procedure began with structuring the training program, developing the personal data sheet and the objective test, and selecting the performance evaluation form and the items to be used from it. The sample was then selected and arrangements were made for presenting the training program, for administering the posttest and retest, and for evaluating employee job performance.

The researcher attended and completed the Sanitation Training and Certification Program of the Oklahoma Restaurant Association during the summer of 1978. This program became the basis for the training program in this study.

Pilot Study

A pilot study, utilizing a random sample of one employee from several restaurants in Oklahoma City was completed during the summer of 1978. The study as planned at that time did not prove to be feasible, due to a number of factors:

1. Of the 350 restaurants invited to participate in the study, only 18 were willing to send employees.
2. Some establishments sent more than one employee to the program.
3. Supervisors and owners, rather than the requested non-supervisory employee, attended the program.
4. Those employees who did attend, did not complete the course.

5. With a sample of this nature, attendance was difficult to control.

The pilot study indicated the difficulty in obtaining a randomly selected sample of foodservice personnel required in a true experimental design.

Data Collection

Instrumentation. The training program utilized four of the five film strips used by the Oklahoma Restaurant Association in their training and certification program (Oklahoma Restaurant Association, 1978), and included a discussion section and a laboratory section, lead by the researcher. The selected film strips, developed by the National Restaurant Association, included "The Unwanted Four", "The Personal Side", "Food Protection", and "Establishment and Equipment Sanitation" (National Restaurant Association, 1972). The length of the film strips was from 12 to 14 minutes. Each film was accompanied by a 33 rpm record which explained the film.

Each session began with a short introduction by the researcher followed by the film strip and accompanying record, and a discussion involving the entire class. The discussions included topics from the film strips and information from various publications on food protection (Foster, 1978; NIFI, 1972; Longree and Blaker, 1971; and Frazier, 1967), plus any questions from the participants. Appendix A includes outlines for each discussion.

The laboratory followed each lesson. It was designed to allow the personnel to observe bacteria grown on nutrient agar and to identify the components necessary for bacterial growth, to

help them identify the places which harbor bacteria, and to impress upon them the need for practicing proper sanitation methods. For this section, sterile cotton swabs were used to collect bacteria from various surfaces, and to transfer them, aseptically, to trypticase soy agar in sterile Petri plates. The plates were then incubated, upside-down to prevent water from collecting on the agar, at room temperature until the next session (NIFI, 1974, p. 34). The plates were labeled according to the surface sampled for that plate. A variety of surfaces were sampled (Appendix B), according to the topic being discussed.

A personal data sheet (Appendix C) was completed by each participant. This provided information such as age, sex, years of education, previous work experience, previous food protection training, years employeed in present position, and present job title. The personal data sheet was used in the pilot study, and was found to be effective in collecting data needed. The personal characteristics were related to course gain, net gain, retention, and application scores to determine if any relationships existed.

The objective test (Appendix D), which was used for the pretest, posttest, and retest, was developed according to course content. The test included 40 multiple choice questions, 10 questions from each lesson. For each of the three different tests, the questions were randomly arranged. The questions covered the cognative domain, and examined knowledge, comprehension, and application levels of knowledge (Bloom, 1969). This evaluation instrument was validated by a panel of three experts in the areas of food and nutrition, institution administration, and food microbiology.

For reliability, the instrument was tested on a group of foodservice personnel at a Stillwater delicatessen.

The performance evaluation form (Appendix E) utilized was a standard instrument used by the Oklahoma Restaurant Association for evaluations of on-the-job practices 30 and 60 days after completion of their training and certification course. In this study, the evaluation form was completed after an eight-week interval prior to the retest. Twenty-five of the items on the standard instrument which were pertinent and applicable to the sample were selected and used for all personnel evaluated.

The Study. The procedural sequence of events for the study was as follows:

Session 1: Introduction to Program
Personal Data Sheet
Pretest
Introduction to Laboratory

Session 2: Introduction to Lesson 1
Film - "The Unwanted Four"
Discussion
Laboratory - Prepare agar plates from body surfaces, surfaces touched.

Session 3: Introduction to Lesson 2
Film - "The Personal Side"
Discussion
Laboratory - Show plates of body surfaces, surfaces touched. Prepare agar plates from various foods.

Session 4: Introduction to Lesson 3

Film - "Food Protection"

Discussion

Laboratory - Show plates of various foods.

Prepare agar plates from various working, cutting, and storing surfaces.

Session 5: Introduction to Lesson 4

Film - "Establishment and Equipment Sanitation"

Discussion

Laboratory - Show plates of surfaces.

Posttest

Session 6: Retest

Note: The performance evaluation form was completed during the same week as, but prior to, the retest.

A total of six sessions were held, and attendance was taken at each session. Session one served as an introduction to the program. The participants were given a brief overview of the program: what topics would be discussed and what was expected of them. At this session, they were asked to complete the confidential personal data sheet and were then given the pretest. After the test was completed, an introduction to the laboratory was presented.

The food protection training program was presented during the next four sessions with one topic presented at each session. The researcher served as the instructor for the training program. A film was shown at the beginning of each session, preceded by a short introduction and followed by a discussion of material presented

in the film. The laboratory was begun by showing agar plates that had been prepared the previous week by the participants. The various plates, the surfaces used, and the resulting microorganisms were then discussed. The final portion of the laboratory provided time for the participants to prepare agar plates from surfaces to be discussed at the next session.

The posttest was given at the end of the fifth session, after all four topics had been completed. After an interval of eight weeks, the same participants were given the retest. During the same week that the retest was given, a random sample of 12 of the 19 participants was evaluated by direct observation by the researcher for on-the-job application of sanitary techniques.

Data Analysis

The mean scores for the pretest, posttest, retest, and performance evaluation were computed and a t test was performed for the significance of the differences between pretest and posttest scores (course gain), pretest and retest scores (net gain), and posttest and retest scores (retention) (Best, 1977, p. 276). To determine if age group or years in foodservice jobs had an effect on scores received, analysis of variance was performed for course gain, net gain, retention, and application by age group and years in foodservice jobs (Steel and Torrie, 1960, p. 112). To establish if certain relationships existed, linear regression analysis was performed for retention versus application, net gain versus application, and net gain versus course gain (Steel and Torrie, 1960, p. 161).

CHAPTER IV

RESULTS AND DISCUSSION

Introduction

This study was undertaken to determine the effectiveness of a food protection training program which included a supplemental laboratory. In the study, special emphasis was placed on knowledge retention and application of sanitation practices to on-the-job situations. The effectiveness of the program was determined by comparing pretest, posttest, and retest scores for a single group of foodservice personnel. Application of knowledge was determined by direct observation of participants by the researcher.

An in-tact group of foodservice personnel was selected to participate in this study. This group was made up of both supervisory and non-supervisory cooks employeed by the Stillwater, Oklahoma public schools. Of the 33 cooks employeed by the school system at the time of this study, 19 completed the entire program. Because the supervisors were similar in personal characteristics with the non-supervisory personnel, and because only three of the six supervisors completed the program, the 19 participants were treated as a single group, without distinction of position.

A biographical questionnaire was completed by each participant. This data sheet included the demographic information: age, sex,

education level, years employeed in foodservice jobs, number of previous jobs, location of previous foodservice jobs, present job title, and number of previous sanitation training programs attended. The group was generally homogeneous for most of the personal characteristics. All of the participants were women with at least nine years of education and 85 percent having finished high school. All but two had attended at least one sanitation training program. All had been employeed in foodservice jobs for at least one year with 79 percent having been in foodservice jobs for over five years. Only one of the participants was employeed at her present job for less than one year, and 58 percent of the 19 participants were employeed at their present job for over five years.

For purpose of analysis, the participants were divided into three age categories. Group I included those participants less than 40 years of age; group II included those between the ages of 40 and 50 years of age; and group III consisted of those over the age of 50. Age was found to be the least homogeneous characteristic with six participants in group I, five in group II, and eight in group III. The participants were also divided according to years in foodservice jobs. There were four cooks in group I (those with less than five years of foodservice experience), and 15 cooks in group II (those with five or more years of foodservice experience).

Data were collected at four times during the course of the study. At the first of the six group sessions, the participants each completed the confidential personal data sheet. At this session, the pretest was also administered. The training program was presented at the next four sessions and was followed by the

posttest at the end of the fifth session. The sixth session was held for the purpose of administering the retest. This session was held eight weeks after the completion of the training program. During the same week that the retest was given, a random sample of 12 of the 19 participants was observed by the researcher and each person was scored for on-the-job application of sanitation techniques.

After all data were collected, the following comparisons and associations were made:

1. the differences in pretest and posttest scores to indicate knowledge gained from participation in the program (course gain)
2. the differences in pretest and retest scores to indicate net knowledge gained from the program following an eight-week interval (net gain)
3. the differences in posttest and retest scores to determine amount of knowledge lost or retained during the eight-week interval (retention)
4. the relationship between age and scores for course gain, net gain, retention, and application to determine if age played a role in scores received
5. the relationship between years in foodservice jobs and scores for course gain, net gain, retention, and application to determine if years in foodservice jobs influenced scores received
6. the association between net gain and application to determine if higher net gain scores could be directly

related to better application of sanitation techniques

7. the association between retention and application to determine if a greater loss of knowledge was related to less satisfactory application of sanitation practices
8. the association between net gain and course gain to predict how much knowledge would be retained by knowing how much was learned from the course.

Data for each participant was organized and keypunched for computer analysis. SAS (Barr, Goodnight, Sall and Helwig) was used for computer analysis including analysis of variance and linear regression. Values for t tests were computed.

Results

The purpose of the three tests (pretest, posttest, and retest) was to provide a means of evaluating food protection knowledge of each participant at various time intervals in the study. The pretest was administered at the first session, before any information was given to the participants, to determine levels of pre-study knowledge. The group then participated in four food protection training lessons consisting of an introduction, a film strip, a discussion, and a laboratory. One lesson was presented each week for four weeks. Comparisons of the differences in test scores provided an indication of the effectiveness of the program and length of time the information would be retained.

On-the-job performance evaluation forms were used so that all employees evaluated would be scored on the same practices.

The personal data sheet served to classify the participants so that differences or similarities in personal characteristics could be related to scores for course gain, net gain, retention, and application. A summary of selected personal characteristics for the participants is given in Table I.

Scores received by each participant for pretest, posttest, retest, and on-the-job application are shown in Table II. Pretest, posttest, and retest scores were based on a possible maximum score of 40 points, and a maximum of 125 points were possible for application scores.

The mean scores for pretest, posttest, retest, and application, and the percentages of possible points were also determined (Table III). The mean pretest score was lower than mean posttest score, which indicated a general increase in knowledge following the program. Retest mean score was lower than mean posttest score but higher than mean pretest score indicating that, although there was a loss in knowledge between posttest and retest, there was an overall knowledge gain. Mean application score was 96.92 points out of a possible 125 points, or 77.5 percent of total possible points. In comparing the percentages, application scores after the eight-week interval were more closely related to the scores for the posttest immediately following the program. Mean percentage for retest was midway between mean percentage for pretest and mean percentage for posttest.

Scores for course gain, net gain, and retention for individual participants are presented in Table IV. All participants had positive course gain scores. Three participants had net gain

TABLE I

SELECTED PERSONAL CHARACTERISTICS FOR PARTICIPANTS COMPLETING THE FOOD PROTECTION TRAINING PROGRAM

Employee Number	Age Group	Years in Foodservice	Years in Present Job	Sanitation Programs
1	2	5+	5+	1-2
2	1	5+	1	5+
3	3	5+	5+	1-2
4	1	5+	3-4	1-2
5	3	5+	5+	1-2
6	2	1-2	1-2	0
7	3	5+	5+	0
8	2	5+	3-4	1-2
9	3	5+	5+	1-2
10	3	5+	5+	1-2
11	1	1-2	1-2	1-2
12	3	5+	5+	1-2
13	2	5+	5+	1-2
14	1	5+	3-4	1-2
15	1	3-4	3-4	1-2
16	3	5+	5+	1-2
17	1	3-4	3-4	1-2
18	2	5+	5+	1-2
19	3	5+	5+	1-2

TABLE II

INDIVIDUAL SCORES FOR PRETEST, POSTTEST, RETEST, AND APPLICATION

Employee Number	Pretest	Posttest	Retest	Application
1	24	28	31	99
2	21	31	30	--
3	23	28	27	97
4	25	28	25	--
5	29	34	32	--
6	27	34	32	--
7	21	34	32	95
8	30	33	30	96
9	23	30	24	--
10	24	26	24	98
11	26	34	30	99
12	23	25	28	95
13	26	35	29	--
14	27	34	28	95
15	24	29	20	93
16	21	28	24	99
17	25	30	24	98
18	29	35	31	--
19	25	31	26	99

scores of zero while two had negative net gain scores. Retention scores are given as the difference between posttest and retest scores with a positive number indicating a loss of knowledge. All but two participants had a loss of knowledge from posttest to retest.

TABLE III

MEAN SCORES AND MEAN PERCENTAGES FOR PRETEST, POSTTEST, RETEST, AND APPLICATION

Variable	N	Mean	Percent of Possible Points
Pretest	19	24.89	62.2
Posttest	19	30.89	77.2
Retest	19	27.74	69.4
Application	19	96.92	77.5

Values for t tests are given in Table V for mean scores for course gain, net gain, and retention. Average knowledge gained from the course (course gain) was significant at $p < .01$. This indicates that the food protection training program was effective in teaching sanitation techniques. Even though loss in knowledge from posttest to retest (retention) was significant at $p < .01$, overall agin in knowledge (net gain) was also significant at $p < .01$. Although there was a significant loss of knowledge during

TABLE IV

INDIVIDUAL SCORES FOR COURSE GAIN, NET GAIN, AND RETENTION

Employee Number	Course Gain[1]	Net Gain[2]	Retention[3]
1	4	7	-3
2	10	9	1
3	5	4	1
4	3	0	3
5	5	3	2
6	7	5	2
7	13	11	2
8	3	0	3
9	7	1	6
10	2	0	2
11	8	4	4
12	2	5	-3
13	9	3	6
14	7	1	6
15	5	-4	9
16	7	3	4
17	5	-1	6
18	6	2	4
19	6	1	5

[1] posttest minus pretest
[2] retest minus pretest
[3] retest minus posttest

the eight-week interval, the program appeared to be an effective way of training foodservice personnel in food protection techniques. The loss of knowledge may be an indication of the need for providing training programs at regular intervals.

TABLE V

T TEST VALUES FOR MEAN SCORES FOR COURSE GAIN, NET GAIN, AND RETENTION

Variable	N	Mean	t
Course gain	19	6.00	9.38**
Net gain	19	2.84	3.46**
Retention	19	3.16	4.58**

*p < .05
**p < .01

Table VI lists mean scores for course gain, net gain, retention, and application according to age group. The group for course gain, net gain, and retention included 19 participants while the group for application included 12 participants. Slight differences in means for all variables were seen between group I and groups II and III.

TABLE VI

MEAN SCORES FOR COURSE GAIN, NET GAIN, RETENTION, AND APPLICATION ACCORDING TO AGE GROUP

Age Group	n_1	Course Gain	Net Gain	Retention	n_2	Application
		N=19				N=19
I	6	6.3	1.5	4.8	4	96.3
II	5	5.8	3.4	2.4	2	97.5
III	8	5.9	3.5	2.4	6	97.2

Maximum (Course gain, Net gain, Retention) = 40.
Maximum (Application) = 125.

Analysis of variance was performed to determine if relationships existed between course gain, net gain, retention, and application and age groups. According to probability, retention scores were slightly related to age group, but none of the relationships were significant at the .05 level. Age group was not found to be a significant variable in affecting scores for any tests (Table VII).

Participants were divided into two groups with group I having one to five years experience in foodservice jobs and group II having over five years experience in foodservice jobs. The greatest differences in mean scores were seen for net gain and for retention, with group II having the highest overall knowledge gain (net gain) and the greatest retention of material (lowest retention score) (Table VIII).

TABLE VII

F TEST VALUES FOR COURSE GAIN, NET GAIN, RETENTION, AND APPLICATION ACCORDING TO AGE GROUP

Variable	F	P > F
Course gain	0.06	0.9447
Net gain	0.59	0.5661
Retention	1.43	0.2687
Application	0.29	0.7555

*p < .05
**p < .01

TABLE VIII

MEAN SCORES FOR COURSE GAIN, NET GAIN, RETENTION, AND APPLICATION ACCORDING TO YEARS IN FOODSERVICE JOBS

Years in Foodservice	n_1	Course Gain	Net Gain	Retention	n_2	Application
		N=19				N=12
1-5	4	6.25	1.00	5.25	3	96.67
5+	15	5.93	3.33	2.60	9	97.00

Maximum (Course gain, Net gain, Retention) = 40.
Maximum (Application) = 125.

Analysis of variance was also used to determine if relationships between number of years in foodservice jobs and scores received on tests and evaluations were present. Table IX gives F test values and probability for mean course gain, net gain, retention, and application scores according to years in foodservice jobs. Although net gain and retention showed some relationship to years of foodservice experience, none of the relationships were significant at the .05 level.

TABLE IX

F TEST VALUES FOR MEAN COURSE GAIN, NET GAIN, RETENTION, AND APPLICATION SCORES ACCORDING TO YEARS IN FOODSERVICE JOBS

Variable	F	P > F
Course gain	0.04	0.8467
Net gain	1.37	0.2579
Retention	2.69	0.1196
Application	0.05	0.8216

*p < .05
**p < .01

To determine if net gain and/or retention scores could be directly related to on-the-job application of sanitation practices,

linear regression analysis was performed for net gain versus application, and for retention versus application. F test values for these two relationships are given in Table X. Even though retention scores show more relationship to application than net gain scores, neither relationship was significant at the .05 level.

TABLE X

F TEST VALUES FOR REGRESSION ANALYSIS FOR NET GAIN VERSUS APPLICATION AND RETENTION VERSUS APPLICATION

Comparison	F	P > F
Net gain vs Application	0.23	0.6418
Retention vs Application	0.53	0.4846

*p < .05
**p < .01

The linear regression for net gain (Y) versus course gain (X) is shown in the equation:

$$Y_{(X)} = -1.62 + (.74)\ X.$$

This relationship was significant at the .01 level. From this equation it is estimated that each participant will retain .74 points for each point gained from pretest to posttest (course gain). That is, if a score of 10 is received for course gain, the net gain

score is estimated to be 5.78, and if a course gain score of nine is received, the net gain score is estimated to be 5.04, a difference of .74 points. However, this relationship is not perfectly linear because some limitations exist with extreme scores. For instance, a course gain score of zero would result in a negative net gain score, a result which would not be expected (Table XI).

TABLE XI

F TEST VALUE FOR REGRESSION ANALYSIS FOR NET GAIN VERSUS COURSE GAIN

Comparison	F	P > F
Net gain vs Course gain	8.57	0.0094**

*p < .05
**p < .01

CHAPTER V

SUMMARY AND RECOMMENDATIONS

The purpose of this study was to determine the effectiveness of a food protection training program - specifically, to determine the extent to which knowledge gained from the program was retained, and to observe if sanitation principles learned were practiced on-the-job. The program was presented to a single group of school foodservice personnel at six, one-hour weekly sessions. The food protection training program was designed to instruct the foodservice personnel on proper food handling and sanitation techniques.

The first of the sessions served as an introduction to the program. The training program was presented at the next four sessions with one lesson being presented at each meeting. Topics for the lessons included "The Unwanted Four", "The Personal Side", "Food Protection", and "Establishment and Equipment Sanitation."

Each lesson began with an introduction, followed by a film strip developed by the National Restaurant Association, covering the topic for that lesson. The material presented in the film was then discussed by the entire class. The discussion was followed by a laboratory where the participants were shown microorganisms growing on nutrient agar. Agar plates for the next laboratory were then prepared by the participants assisted by the researcher.

Three evaluation tests were administered to the participants. The pretest was given at the first meeting, prior to the four lessons. Following the fourth lesson, at session five, the participants took the posttest. The retest was given eight weeks after the posttest. All tests utilized the same questions, but the order of presentation was varied by random assignment.

During the week in which the retest was administered, a random sample of 12 of the participants were evaluated for on-the-job performance. A performance evaluation form was completed by the researcher for each participant observed.

The group of participants was composed of 19 personnel of the Stillwater school foodservice, including three supervisors. All participants were women who had been employeed in foodservice jobs for at least one year. Seventy-nine percent of the participants had over five years of foodservice experience. Most of the participants (85 percent) had completed high school and all but two had attended at least one sanitation training course. Of all the personal characteristics considered, age was found to be the least homogeneous. Six participants were less than 40 years of age, five were between the ages of 40 and 50, and eight were over 50 years old.

A t test was performed for course gain (posttest minus pretest), for net gain (retest minus pretest), and for retention (posttest minus retest) to determine the effectiveness of the program. Analysis of variance was performed for course gain, net gain, retention, and application by age group and years of foodservice experience, to determine if these personal characteristics affected test scores.

Linear regression analysis was performed to establish if relationships existed between retention and application, between net gain and application, or between net gain and course gain.

Summary of Results

Data analysis provided the following results:

1. There was a significant gain in knowledge from pretest to posttest and from pretest to retest. There was also a significant loss of knowledge during the eight-week interval between posttest and retest.
2. There was no significant association between selected personal characteristics (age group and foodservice experience) of the foodservice personnel and the effectiveness of the program.
3. There was no significant relationship between retention of knowledge and application of sanitation practices, or between sanitation practices learned and application of sanitation practices.
4. There was a significant association between knowledge gained and knowledge retained.

The food protection training program utilized in this study was found to be an effective method of teaching sanitation principles. The special feature of this particular program, the laboratory, was thought to be especially helpful in emphasizing the importance of proper food handling.

Although course gain and net gain was significant for the entire group, the knowledge lost from posttest to retest was also signifi-

cant. This indicates that teaching should be a continuous process. Training programs such as the one in this study should be presented at regular intervals.

Many times foodservice personnel are promoted on the basis of seniority or as a result of number of years of experience, not on the basis of extensive training. Personal characteristics alone were not found to be an important factor in influencing individual scores for course gain, net gain, retention, and application. As a result of these findings, all personnel, suprevisory as well as non-supervisory, should be included in training programs presented.

Recommendations

1. A larger rendom sample of personnel from various areas of the foodservice industry (school foodservice, restaurants, hospitals and nursing homes) and in various positions within an establishment should be utilized in a repetition of this study or in similar studies.
2. Various methods of instruction should be compared to determine which would be the most effective. Three different methods could be compared: 1) a control (film only), 2) film and discussion, and 3) film, discussion, and laboratory.
3. To determine the true effectiveness of a program. a control group which had no previous training in sanitation techniques should be compared to a group which had previous training.

4. To assist in determining appropriate intervals at which training programs should be presented, another retest, and possibly two, at six month intervals should be administered. When mean retention falls below the mean pretest knowledge level, another program should be presented.
5. Due to the fact that few foodservice employees receive voluntary training in the area of food sanitation, the Food and Drug Administration should make such training manditory.
6. After a suitable training program has been adopted by the FDA, several methods of presentation of the program should be developed so that individual institutions could choose the method best suited to their situation.

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APPENDIXES

APPENDIX A

OUTLINES FOR DISCUSSIONS

THE PERSONAL SIDE

I. Practice personal hygiene

   A. Come to work clean

      1. Wear hair net or cap
      2. Clean uniform

   B. Stay clean at work

      1. Do not comb hair around food
      2. Wash hands after touching contaminated surfaces
      3. Do not wear jewelry
      4. Keep clothing clean

   C. Use tasting spoon

   D. Do not smoke in food preparation areas

   E. Do not touch food contact surfaces

   F. Handle clean and soiled dishes properly

II. Prevent spread of disease

   A. Do not work when ill

   B. Keep infections or sores away from food

   C. Healthy people also carry bacteria

   D. Diseases that can be spread through food

UNWANTED FOUR

I. Pathogenic organisms

   A. Salmonella

      1. Raw food
      2. Dairy products

   B. Staphylococcus

      1. Produces toxin
      2. Cuts and infections

   C. *Clostridium perfringens*

      1. Large quantities of food
      2. Produces spores

   D. Streptococcus

      1. Oral and nasal discharges
      2. Human intestinal tract

II. Bacterial needs

   A. Food, water, warmth and time

   B. Prevent growth and spread of bacteria

III. Sources of bacteria

   A. Man

   B. Animals used for food

   C. Improperly cooked food

   D. Contaminated food

IV. Bacterial spores

V. Bacterial toxins

FOOD PROTECTION

I. Begin with wholesome food

   A. Watch for spoiled food

   B. Rotate perishable food

II. Wash food thoroughly before using

III. Protect food from contamination

   A. Keep cleaning compounds and pesticides away from food

   B. Store food in covered containers

      1. Contamination from other contaminated food
      2. Bacteria carried by air currents

   C. Use clean equipment

   D. Keep food away from contaminated persons

IV. Properly cook and reheat food

   A. Internal temperature of 165^{o} F

   B. Spores not killed at normal cooking temperatures

V. Prevent multiplication of microorganisms

   A. Cool as quickly as possible

      1. Use shallow, small containers
      2. Do not stack containers

   B. Keep refrigerator below 45^{o} F

   C. Never store or thaw food at room temperature

   D. Hold hot foods above 140^{o} F

   E. Temperature affects bacteria in different ways

      1. 0^{o} - 32^{o} F - Bacteria will not grow, but will survive
      2. 32^{o} - 45^{o} F - Bacteria multiply slowly
      3. 45^{o} - 140^{o} F - Danger Zone - Bacteria multiply quickly
      4. 140^{o} - 165^{o} F - Bacteria will not multiply
      5. 165^{o} - 212^{o} F - Bacterial cells are killed

ESTABLISHMENT AND EQUIPMENT SANITATION

I. Clean establishment and equipment

A. Cleaning refers to removing soil

1. Hand washing water 110^{o} to 120^{o} F
2. Machine washing water 130^{o} to 140^{o} F

B. Sanitizing means reducing number of bacteria to a safe level

1. Chemical agent for one minute
2. Water at 170^{o} F for 30 seconds or 180^{o} F for 15 seconds

C. Inspect areas regularly

II. Prevent contamination from equipment

A. Prevent cross-contamination

1. Clean equipment before and after use
2. Properly sanitize and clean equipment
3. Do not use wooden cutting boards

B. Do not store highly acidic foods in containers made of harmful metals

III. Keep all surfaces and equipment clean

A. Follow cleaning schedule and use proper cleaning methods

1. Store dishes in closed shelves, bottom up
2. Store dishes and utensils away from sink and floor splash
3. Do not use dish towels
4. Store cleaning compounds away from food
5. Follow directions for cleaning compounds
6. Clean and sanitize restrooms

B. All employees are responsible for keeping the establishment and equipment clean

V. Keep flies and pests out of establishment

A. Pests carry disease

B. Need food, water, warmth, shelter and usually darkness

C. Enter the establishment in many ways

APPENDIX B

EXAMPLES FOR LABORATORY

EXAMPLES FOR LABORATORY

Laboratory

1. Explain Petri plate and nutrient agar.

   Let participants see and touch agar.

   Show how bacteria are transferred aseptically from surfaces to agar via sterile cotton swabs.

   Have participants select and sample various surfaces (for example, clean silverware, hair, table, cup).

2. Show plates from previous laboratory.

   Explain bacterial colonies.

   Prepare plates for next laboratory (face, air, uniform, fingernail, ring, sore, cough, mouth, cup).

3. Show plates from previous laborabory.

   Prepare plates for next laboratory (soup, potato, casserole, milk, lettuce, chili, corned beef, hot dog, raw chicken, egg).

4. Show plates from previous laboratory.

   Prepare plates for next laboratory (sauce pan, slicer, bathroom door knob, wooden chopping block, air, sink handle, steam table, mixer, rubber glove, french whip).

5. Show plates from previous laboratory.

   Review.

APPENDIX C

PERSONAL DATA SHEET

FOOD PROTECTION PROGRAM
FNIA, Oklahoma State University
Spring, 1979

PERSONAL DATA SHEET

Name: _____ School: _____

DIRECTIONS: Please circle the number in front of the answer which applies to you.

A. Sex: 1. Female
2. Male

B. Age:
1. Under 21
2. 21-30
3. 31-40
4. 41-50
5. 51-60
6. 61 or over

C. Education
1. 8 years or less
2. 9-10 years
3. 11-12 years
4. 13-15 years

D. How long have you been employed in present job?
1. less than a year
2. 1-2 years
3. 3-4 years
4. 5 years or more

E. How long have you worked in foodservice jobs including the time on your present job?
1. less than a year
2. 1-2 years
3. 3-4 years
4. 5 years or more

F. How many foodservice jobs have you had before you worked for your current employer?
1. none
2. 1-2
3. 3-4
4. 5 or more

G. Where were these foodservice jobs? (Circle as many as apply).
1. School Foodservice
2. College Foodservice
3. Restaurant
4. Hospital
5. Nursing Home
6. Other (Please specify)
_____

H. Which best describes your present job?
1. Cook
2. Assistant Cook
3. Baker
4. Vegetable Preparation
5. Salad Preparation
6. Serving Line
7. Dishroom/Pots and Pans
8. Other (Please specify)
_____

I. How many sanitation training programs have you attended?
1. none
2. 1-2
3. 3-4
4. 5 or more

APPENDIX D

EVALUATION TEST

FOOD PROTECTION PROGRAM
FNIA, Oklahoma State University
Spring, 1979

EXAMINATION

Name: _____ School: _____

DIRECTIONS: Please circle the letter of the best answer for each question.

1. Which of the following is not one of the "Unwanted Four"?
   a. Clostridium perfringens
   b. Trichinella
   c. Staphylococcus
   d. Salmonella
   e. Streptococcus

2. Which of the following is not needed for bacteria to grow?
   a. light
   b. food
   c. water
   d. time
   e. warmth

3. To prevent growth of bacteria in foods, you would:
   a. keep foods between 45^{o} - 140^{o} F
   b. serve leftover foods without heating them
   c. work when you are ill
   d. follow strict rules of personal hygiene
   e. store food uncovered to bring temperature down

4. The source of microorganisms that most often causes foodborne illness is:
   a. animals
   b. dirt
   c. man
   d. grease
   e. food

5. Bacterial spores are killed by:
   a. cooking food
   b. drying food
   c. freezing food
   d. washing raw food
   e. none of the above

6. Salmonella usually enter the foodservice establishment by way of:
   a. people
   b. raw food
   c. packing crates
   d. dirty dishes
   e. dust

7. The bacteria that produces a toxin that is not destroyed by cooking is:
   a. Staphylococcus
   b. Shigella
   c. Clostridium perfringens
   d. Streptococcus
   e. Salmonella

8. Which of the following bacteria produce heat-resistant spores?
   a. Shigella
   b. Streptococcus
   c. Salmonella
   d. Staphylococcus
   e. Clostridium perfringens

9. Streptococcus is usually spread by:
   a. a sneeze
   b. spoiled food
   c. dirt
   d. employees' hands
   e. a & d

10. Microorganisms that cause disease are called:
    a. bacteria
    b. viruses
    c. spores
    d. pathogens
    e. parasites

11. Coming to work clean involves:
    a. bathing daily and wearing clean clothes
    b. washing hair regularly
    c. keeping fingernails clean, neat and well trimmed
    d. a & b
    e. all of the above

12. You can stay clean at work by:
    a. keeping your hair combed in the working area
    b. wearing an apron
    c. washing your hands every time they get dirty
    d. b & c
    e. a & b

13. Your hands should be washed after:
    a. working with raw food
    b. handling garbage
    c. coughing or sneezing
    d. visiting the toilet
    e. all of the above

14. If food must be tasted, you should do this by:
    a. tasting from the stirring spoon
    b. using a tasting spoon
    c. using your fingers
    d. dipping a small bowl into the food
    e. The food should not be tasted.

15. Smoking is not permitted in food preparation areas because:
    a. it spreads bacteria
    b. ashes fall into food
    c. it contaminates the utensils
    d. b & c
    e. all of the above

16. Which of these items would not have high number of bacteria?
    a. jewelry
    b. clean clothes
    c. sanitized equipment
    d. money
    e. apron

17. The rim of a glass, the top of a plate, the inside of a pan, and the bowl of a spoon are called:
    a. food contact surfaces
    b. working surfaces
    c. eating surfaces
    d. sterilized surfaces
    e. cooking surfaces

18. An indication of a clean work area is:
    a. properly stored utensils
    b. well kept counters
    c. food particles on counters
    d. standing water in sinks
    e. presence of used rags and towels

19. The standard procedure to follow when you become ill at work is to:
    a. notify the supervisor
    b. take medicine and continue working
    c. a & b
    d. avoid working with food
    e. a & d

20. Which of the following is a carrier of bacteria?
    a. a sick person
    b. a healthy employee
    c. a person with a sore
    d. all of the above carry bacteria
    e. none of the above carry bacteria

21. Food protection is dependent upon which condition?
    a. keeping food warm
    b. sanitary handling of food
    c. cooking food slowly
    d. cooling food slowly
    e. cooking food

22. Wholesome food is whose responsibility?
    a. the food buyer
    b. the cooks
    c. all employees
    d. food suppliers
    e. foodservice managers

23. Food can be contaminated during:
    a. processing
    b. shipping and storing
    c. cooking
    d. none of the above
    e. all of the above

24. Food should be cooked to an internal temperature of at least:
    a. 165^{o} F
    b. 145^{o} F
    c. 100^{o} F
    d. 185^{o} F
    e. 212^{o} F

25. Bacteria multiply between:
    a. 0^{o} - 32^{o} F
    b. 38^{o} - 45^{o} F
    c. 45^{o} - 140^{o} F
    d. 140^{o} - 165^{o} F
    e. 165^{0} - 212^{o} F

26. At what temperature are bacterial cells killed?
    a. above 165^{o} F
    b. between 32^{o} F and 45^{o} F
    c. below freezing
    d. in the Danger Zone
    e. above 212^{o} F

27. To keep food out of the Danger Zone it should be:
    a. cooled in large pans
    b. cooked in large pans
    c. stored in the refrigerator in shallow pans
    d. stacked in large containers in the refrigerator
    e. covered

28. The refrigerator temperature should be kept at:
    a. above 45^{o} F
    b. 32^{o} to 45^{o} F
    c. 32^{o} F
    d. 0^{o} to 10^{o} F
    e. 0^{o} F

29. When food is kept hot for customers it should be:
    a. above 100^{o} F
    b. below 100^{o} F
    c. below 140^{o} F
    d. above 140^{o} F
    e. at 180^{o} F

30. How should food be thawed?
    a. at room temperature
    b. in warm water
    c. in the refrigerator
    d. in a warm oven
    e. in a sink

31. Which of the following best describes the term <u>cleaning</u>?
    a. killing all bacteria
    b. removing soil
    c. a & b
    d. washing at 120^{o} to 140^{o} F
    e. b & d

32. Which of the following conditions best describes the term <u>sanitizing</u>?
    a. killing all bacteria
    b. rinsing at 140^{o} F
    c. reducing the number of bacteria to a safe level
    d. removing soil
    e. a & d

33. Responsibility for a clean establishment belongs to:
    a. the sanitary inspector
    b. the supervisor
    c. custodians
    d. each employee
    e. no one

34. Cutting both raw and cooked food on the same cutting surface is an example of:
    a. work efficiency
    b. cross-contamination
    c. cutting labor cost
    d. minimizing dirty utensils
    e. spoilage

35. Maintaining a cleaning schedule is whose responsibility?
    a. yourself
    b. the cook
    c. the manager
    d. the sanitary inspector
    e. the foodservice consultant

36. How should cleaning compounds, pesticides, and other poisonous chemicals be stored?
    a. near where they are used
    b. away from food
    c. in well labeled containers
    d. a & b
    e. b & c

37. Which food item should not be stored in certain metal containers?
    a. meat
    b. orange juice
    c. milk
    d. green beans
    e. sugar

38. Pests, such as flies, cockroaches and ants need which conditions to survive?
    a. dry areas
    b. cool temperatures
    c. light
    d. shelter
    e. clean areas

39. In what way do pests enter the establishment?
    a. in packing cases
    b. through broken windows
    c. through torn screens
    d. through holes in walls
    e. all of the above

40. Which of the following is an improper way to store dishes?
    a. on open shelves
    b. close to the serving area
    c. in closed shelves
    d. bottom up
    e. in self-leveling dispensers

APPENDIX E

PERFORMANCE EVALUATION FORM

FOODSERVICE CERTIFICATION SOCIETY

SANITATION TRAINING AND CERTIFICATION PROGRAM

On-the-Job- Performance Evaluation

PART "A"
(For All FOODHANDLERS)

Employee Name_____ Business Name_____ Date_____ Evaluator_____
(Please Print)

	THE FOODHANDLER	ALWAYS meets requirements 5 points		MOST ALWAYS meets requirements 4 points		FAIR occasional failure 3 points		CARELESS frequent failures 2 points		UNSATISFACTORY very frequent failures 1 point	
		30 day Eval.	60 day Eval.	30 day Eval.	60 day Eval.	30 day Eval.	60 day Eval.	30 day Eval.	60 day Eval.	30 day Eval.	60 day Eval.
*	Comes to work well groomed, with clean outer garments free of offensive body odors, with fingernails clean and trim, and with shoes and hose clean and neat.										
*	Wears hat, cap, hair net, or other effective hair restraint.										
	Reports to manager when ill, has a cold or other infections before going on duty.										
	Washes hands before going on duty.										
*	Stays reasonably clean on the job.										
	Exhibits interest in protecting own health as well as others.										
*	Follows prescribed sanitary standards while on the job with regard to: Wearing of Jewelry Smoking Eating & Drinking										
*	Practices good housekeeping procedures in all assigned responsibilities.										
	Follows the assigned side work and cleaning schedules.										
	Reports to the manager any situation or condition that may contribute to unsanitary conditions.										
	Shows interest and concern by making suggestions on how to improve procedures.										
	Washes hands carefully before handling clean dishes or food after Smoking										
*	Going to the toilet										
*	Coughing or sneezing into hands										
*	Scratching body or head, picking nose, etc.										
*	Handling soiled dishes, mop or counter towels.										
	Blowing nose										
*	Wiping perspiration from face with face towel.										
*	Putting fingers in the mouth.										
*	Picking of teeth.										
*	Fixing or combing the hair.										
*	Demonstrates a good attitude and a spirit of cooperation.										

* Items used in this study

PART "B" WAITRESS - WAITER	ALWAYS meets requirements 5 points		MOST ALWAYS meets requirements 4 points		FAIR occasional failure 3 points		CARELESS frequent failures 2 points		UNSATISFACTORY very frequent failures 1 point	
	30 day Eval.	60 day Eval.	30 day Eval.	60 day Eval.	30 day Eval.	60 day Eval.	30 day Eval.	60 day Eval.	30 day Eval.	60 day Eval.
Handling clean dishes, glasses, cups, silverware, single-service paper goods, and other service equipment.										
Refraining from touching food unless absolutely necessary by using the proper tongs, spatulas, or scoops, etc.										
Being careful not to use soiled, cracked, or chipped china or glassware in serving guests.										
* Keeping all perishable foods below 45 degrees F or above 140 degrees F while holding to be served, such as Salad Materials, Cream Filled Pastry, Custards, milk, Soups, Chili, etc.										
* Getting spilled food and/or drinks cleaned up promptly and safely.										
Keeping the waitress service station or side table neat, clean and orderly.										
Keeping equipment clean and/or sanitized, such as tables, chairs, booths, ash trays, condiment and sauce bottles, salt, pepper, and sugar dispensers, napkin holders, menus, drink dispensers, coffee machine, coffee decanters, syrup pitchers, malt mixers, pie cases, food display equipment, ice machines, etc.										
Using care in the use of all cleaning and sanitizing chemicals and compounds. Follows instructions to use correct type and amount.										
PART "C" - COOK Vegetable Prep. - Back up										
Handling clean dishes, glasses, silverware, etc.										
* Refraining from touching food unless absolutely necessary by using the proper tongs, Spatulas, scoops, or clean plastic gloves.										
Keeping all prepared foods below 45 degrees F or above 140 degrees F while holding to be served.										
Cooking "hot" foods to 165 degrees F or above.										
Reheating prepared "hot" foods that have been refrigerated quickly to 165 degrees F before serving.										
Cleaning, slicing, and preparing of fruits and fresh vegetables.										
The thawing of frozen foods.										
Promptly working out leftovers while they are a desirable food product.										
PART "D" LINE SERVER										
* Handling clean glasses, dishes, cups, silverware, single-service paper goods, pans and service equipment.										
Refraining from touching food unless absolutely necessary by using the proper tongs, spatulas, scoops, forks or ladles.										
* Being careful not to use soiled, cracked, or chipped china or glassware in serving guests.										

PART "D" (Continued)

PART "D" (Continued) LINE SERVER	ALWAYS meets requirements 5 points		MOST ALWAYS meets requirements 4 points		FAIR occasional failure 3 points		CARELESS frequent failures 2 points		UNSATISFACTORY very frequent failures 1 point	
	30 day eval.	60 day eval.	30 day eval.	60 day eval.	30 day eval.	60 day eval.	30 day eval.	60 day eval.	30 day eval.	60 day eval.
Keeping all prepared foods below 45 degrees F or above 140 degrees F when serving.										
★ Keeping foods on the serving line rotated so as to insure maximum freshness.										
★ Keeping spills, drippings, and food particles wiped clean from the hot food line and other serving areas.										
★ Keeping equipment clean and/or sanitized such as Sneeze Guards, Serving Counters, Hot Food Wells, Shelves, Roll Warmers, Drink Stations, Drink Dispensers, Coffee and Tea Equipments, Ice Bins, Sinks, Freezers, Displays, etc.										
Using care in the use of all cleaning and sanitizing chemicals and compounds. Follows instructions to use correct types and amounts.										
PART "E" FLOOR PEOPLE Dishwashers - Pot Washing										
Handling clean dishes, silverware, cups, glasses, single-service paper goods, pots, pans, and service equipment.										
★ Handling of soiled dishes, silverware, glasses, cups, pots, pans, and service equipment.										
Keeping equipment clean and or sanitized such as tables, chairs, booths, ash trays, condiment and sauce bottles, salt, pepper and sugar dispensers, napkin holders, bus cart, and related equipment. Swipe towels, mopping equipment, dish machines, dish tables, food disposals, dish racks, sink										
★ Washing hands frequently for own health protection as well as that of other people.										
★ Disposing of all garbage and waste materials and the care of the waste receptacles and containers.										
Using care in the use of all cleaning and sanitizing chemicals and compounds. Follows instructions to use the correct amounts and types.										
Getting spilled foods and or drinks cleaned up promptly and safely.										
Keeping all supplies, (as assigned) such as food, cleaning paper goods, etc., stored and arranged in a clean and orderly manner.										

Total Point Score _____

Possible Raw Score 150 Points
Minimum Passing Grade 112 Points Raw Score
Raw Score _____ x .667 = Percentage Score

I certify that _____ has been trained in accordance with the standards set by the FCS and has made a minimum score of 75% on all tests and evaluations.

_____
Supervised RFM= (Manager)

VITA[2]

Julia Ann Wilczek Huber

Candidate for the Degree of

Master of Science

Thesis: THE EFFECTIVENESS OF A LABORATORY-BASED FOOD PROTECTION TRAINING PROGRAM

Major Field: Food, Nutrition and Institution Administration

Biographical:

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Education: Graduated from Kingfisher High School, Kingfisher, Oklahoma, May, 1974; received a Bachelor of Science degree in Zoology at Oklahoma State University, Stillwater, May, 1978; completed requirements for a Master of Science degree with a major in Food, Nutrition and Institution Administration from Oklahoma State University, December, 1979.

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