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To the Graduate Council:

I am submitting herewith a thesis written by Vivian B. Beard entitled "Work Sampling as a Method of Evaluating a School Food Service Training Program." I recommend that it be accepted for nine quarter hours of credit in partial fulfillment of the requirements for the degree of Master of Science, with a major in Institution Administration.

Mary Jo Hitchcock
Major Professor

We have read this thesis
and recommend its acceptance:

Grayce E. Searby

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Accepted for the Council:

Vice Chancellor for
Graduate Studies and Research

WORK SAMPLING AS A METHOD OF EVALUATING A SCHOOL FOOD SERVICE TRAINING PROGRAM

A Thesis

Presented to

the Graduate Council of

The University of Tennessee

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

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by

Vivian B. Beard

June 1970

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ABSTRACT

Feasible use of work sampling as a method of evaluating school food service employees' performance before and after training sessions on work simplification was studied. Random observations of employees' activities throughout two nine day periods resulted in 1,163 observations the first period and 1,110 the second period. Comparisons of the two periods on the basis of percent of time spent in three work functions and in each of 18 activities showed greatest changes in processing activities, with 2.2 percent more time during the second period; transportation activities, with 2.0 percent less time; cleaning activities, with 1.3 percent more time; and personal delays, with 1.4 percent more time. The general decrease in time spent in transportation and redistribution of the processing activities might be an indication of positive results of the training on work simplification.

Comparison of activities by individual workers indicated that those with fewer years experience in school food service who attended training sessions spent less time in transportation activities after training. Employees with many years experience, regardless of their attendance of the training sessions, did not show these changes.

Work sampling might be used to indicate the effects of training by comparison of employees' use of time before and after training.

Although this work sampling was not specific enough to indicate the actual time of the individual's activity, it could be used to indicate problem areas for further study.

TABLE OF CONTENTS

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Rising labor costs and the trend toward investment of public monies in school food service have necessitated more efficient use of food service employees' time (Whitman, 1967; Martin, 1968). Increases in employee efficiency have been sought through instruction in work simplification and work organization. These subjects generally have been included in training programs in conjunction with other subjects pertaining to school food service (Young, 1966; Swearingen, 1967; Anon, 1966; Anon, 1968; Lamsen, 1966).

Studies have indicated that methods of evaluating the effectiveness of school food service training programs have included the use of questionnaires (Ford, 1958) and written tests (Knauf, 1967). Young, 1966, in surveying training evaluation procedures in a sampling of Massachusetts and New York State school food service systems found the use of objective methods of evaluating training programs to be limited. Objective measures most often used by those in the study were merit ratings, absenteeism rate, man hours per meal, number of meals per employee and dollar income per employee. Objective evaluation of training programs on the basis of worker performance on the job has not been widely used in school food service. The Southeast Area Evaluation Project Committee sponsored by the USDA in 1961 indicated that for effective

evaluation of any school food service training program, the evaluation would need to determine if changes had occurred in the participant's behavior.

Objective measures of employee's performance would entail observation of the employee over a period of time (Southeast Area Evaluation Project Committee, 1961). Measurement of performance before and after training would be needed to form a valid basis for evaluation.

One method for measuring employees' performance on the job is through work sampling, an industrial engineering technique which is based upon random observations of workers' activities over a period of time. Hospital dietary departments have used work sampling successfully in evaluating and determining training needs (Bonini, et al., 1967; Schell, et al., 1964; Wise, et al., 1961). Use of work sampling in hospital dietary departments suggests that school food services might adapt similar studies for evaluation purposes.

The objective of this research was to study the feasibility of the use of work sampling as a method for evaluating school food service employees' performance before and after a training program.

A work sampling study of the activities of 14 school food service employees was conducted in a Knoxville, Tennessee, high school to evaluate the results of a training program based on work simplification principles. Two periods of work sampling were used, one before two 30-minute training sessions and one after training.

A pilot study was conducted prior to the first work sampling period. Comparison of the percent changes in the amount of time spent by employees in work activities between the two work sampling periods was used as an indication of the feasibility of work sampling as a training evaluation tool.

CHAPTER II

REVIEW OF LITERATURE

The ultimate goal of all employee training is to develop the abilities of the work force so that the functions of the organization are performed skillfully and at minimum cost (Rose, 1968). Employee training has been a means of improving employee efficiency through training in work methods, job skills and work simplification. Evaluation of such training should determine whether or not training objectives have been reached and should result in assessment and comparison of employee competence before and after training. One method of comparing employee performance before and after training is through the use of work sampling.

I. THE USE OF EVALUATION IN SCHOOL FOOD SYSTEMS

Evaluation of school lunch training was cited as a necessary tool for improving effectiveness of training by the Southeast Area Evaluation Project Committee (1961). Five basic purposes of evaluation given by the committee were: (1) to determine progress with any given activity or job; (2) to discover if goals have been achieved; (3) to learn the effectiveness of certain methods or techniques; (4) to obtain information for dissemination to the public; (5) to see results that produce a certain job satisfaction and build job morale.

Steps in developing a program of evaluation were outlined by the committee. These in the proper sequence were: (1) deciding what to evaluate; (2) formulating the objectives of the evaluation; (3) determining what evidence of success or failure to look for; (4) deciding from whom evidences are to come; (5) collecting evidence of evaluation; (6) knowing how to analyze, use and report the information once it has been gathered.

For effective evaluation of any school food service training program, the evaluation would need to determine if changes had occurred in the participants behavior (Southeast Area Evaluation Project Committee, 1961). Three kinds of behavioral changes usually evaluated are attitudes, knowledge and skills. To determine changes in behavior, evaluation should be made before, during and after a training program.

Methods of evaluating change in attitude listed by the Evaluation Project Committee were end of meeting reactions, attitude scales, projective techniques and stimulus pictures. Ways of evaluating changes in knowledge were noted as being subjective and objective content tests, administrative reviews, and records and reports. Evaluation techniques for measuring changes in skills were indicated by the Committee as planned performance rating, rating scale, score cards, planned observations of overt behavior, records and reports, administrative review and recognition of behavior changes by the administrator.

Young, et al. (1966) conducted a study of non-supervisory school food service employee training in Massachusetts and in

New York. Training program evaluation procedures were included in a questionnaire sent to directors of one-fourth of the total population of public school food service systems participating in the national school lunch program. One hundred twenty-five directors, 43 percent of the sample, participated in the study. Other parts of the questionnaire requested general information about the school food service system including personnel, and organization and administration of non-supervisory training.

Eighty respondents to the questionnaire used administrative records for the purpose of evaluating training programs. More than one-half of the respondents indicated maintaining absenteeism rate and man hours per meal as typical records. Other records used for evaluation of training, listed in declining order of frequency from 47 to 19 percent, were: accident rate or frequency; number of meals produced per employee; training time; wastage; labor turnover rate or frequency; dollar income per employee; and breakage (Young, et al., 1966).

Methods of objectively measuring the effectiveness of training were cited by Young, et al., (1966) as more reliable than subjective measures. Twenty-five respondents reported using merit ratings, some of which were discussed with employees.

Among other conclusions and recommendations regarding employee training in school food service, Young et al., (1966) suggested that management be encouraged to utilize objective methods of determining training needs and evaluating training results.

II. WORK SAMPLING METHOD

Krick (1966) defined work sampling as the estimation of the proportion of time devoted to activities within a certain period of time by means of intermittent, randomly spaced, spontaneous observations. Based on the theory of probability, a random number of observations of activities would have the same pattern of distribution as the larger number of total activities a worker would perform in a defined work period.

Basic work sampling procedures outlined by Krick (1966) included preliminary steps, data collecting, processing of data, and presentation of results. Preliminary steps required: (1) a definition of objectives, including specifications of the categories of activities to be observed; (2) the design of the sampling procedure which involved the estimation of a satisfactory number of observations to be made; (3) selection of the length of study; (4) determination of sampling procedure details, such as the schedule of observations, exact method of observing, design of observation sheet and route to follow. Data collection was the execution of the sampling plan. Krick's (1966) processing of data included the computation of the proportion of the observations in the sample that were of a certain activity.

Work sampling has been used by industry in this country since 1940 (Barnes, 1968). Three main uses of work sampling have been: (1) to measure the activities and delays of men or machines; (2) to measure working time and non-working time of a

person on a manual task and using this to establish a performance index or performance level for a person; (3) to measure time and motion in manual tasks as a basis for establishing time standards for an operation. Work sampling has been used in place of continuous time studies to conserve time and cost and gives comparable results (Barnes, 1968).

III. APPLICATIONS OF WORK SAMPLING IN FOOD SYSTEMS

Work sampling has been used in hospital dietary departments for various purposes. The method was tested extensively in the development of a methodology manual for work sampling productivity of dietary personnel by the Institution Management Laboratory, Department of Foods and Nutrition, University of Wisconsin, in 1967 as part of a National Institute of Health research study.

A work sampling study was conducted by Wise, et al. (1961) as part of the above Institute of Health Study establishing a procedure that could be used for analyzing the work activities of hospital food service employees. Nine categories of employees' activities were classified after a one day continuous time study. These categories were supervision, clerical, food preparation, food service, food distribution and transportation, cleaning, washing pans and dishes, training and attending classes and meetings, and personal time.

The study was performed in a 475-bed hospital in which the food service was decentralized with individual serving kitchens

located on each floor. Observations of employees using the work sampling technique for a two month period resulted in an effective classification and scheduling of employees after an analysis of the percentages of time each employee spent in each of the nine categories (Wise, et al. 1961).

In two work sampling studies by Schell, et al. (1964) activities of food service workers were observed and recorded in two Veterans Administration hospitals of similar size. The hospital layouts were studied and divided into geographic areas to provide a means to observe groups of employees at randomly selected times. A "matrix," a chart of time-place units, was used to determine time and place of work sampling.

Eighteen hundred observations in the Schell, et al. (1964) studies were collected at each hospital during a three week period. Five major categories of activities used were preparation, distribution, service, dishwashing, and cleaning. An additional category, "other," was used for related activities. From the total observations, percent of time spent in each category was determined. Conclusions from the studies indicated that it was possible to measure the work of food service personnel in hospitals; and that data collected could provide the dietitian with information needed for efficient scheduling, controlling, and forecasting manpower and work load requirements.

Activities of three food service managers in a college food service were observed and recorded by means of work sampling to provide information for identifying the proportion of time spent

in various categories of work (Sanford, et al., 1964). Results of the sampling indicated the possibilities of redefining job descriptions, developing educational and training programs, reassigning tasks for better personnel utilization and establishing reasonable standards of performance by comparing amounts and kinds of work. Sanford, et al. (1964) indicated that information from the study could serve as a guide in selecting and training managerial personnel.

Productivity relationships of ten hospital dietary departments were compared by Kent, et al. (1965) using data obtained from work sampling. The hospitals selected were general, short term, non-federal Wisconsin hospitals in which 750 to 1,350 meals were prepared and served daily from one autonomous area under the direction of a qualified dietitian.

Analysis of data by Kent, et al. (1965) included calculating the mean percentage of activity time, sampling error, and the mean minutes per meal devoted to each work function category. Duncan's new multiple range test indicated similarities among hospitals in minutes per meal utilized in total, direct, indirect and delay work functions. Simple correlations indicated functional relationships between work categories. Productivity relationships were similar in the hospital dietary departments studied. Kent, et al. (1965) concluded that mean minutes utilized per meal as determined by the study could be used as comparative bases for evaluation and control of productivity and/or allocation of labor hours.

Dayton, et al. (1965) conducted a case study of the use of labor time in a centralized school food production unit in Wayzata, Minnesota. The number of five minute intervals each employee spent in defined work activities were tabulated for the central production and serving unit in the farthest school. Work activities were categorized as 11 activities and 19 sub-activities. Mean minutes per day utilized by each work activity and the percentage of the total minutes were used in comparing the two school food service units. Percent of time spent in production in the central unit was 39.12 and in the serving unit, 34.08. Personnel in the central unit used 6.62 percent time in preparation for production which was not a factor in the serving unit. Time spent in non-productive work was 54.36 percent in the central production and serving unit and 65.92 in the serving unit alone. Non-productive work included such activities as putting away supplies and equipment, rest, cleaning, business procedures and loading carts.

In the Dayton, et al. (1965) study, rest time was analyzed in more detail since it was unexpectedly high (30.19 percent in the serving unit and 22.46 in the production serving unit). Greater time was spent in rest activities at the beginning and end of the week at the production services unit than during the middle of the week. Analysis of rest time per time of day revealed that the greatest expenditure of time occurred during the scheduled serving periods in the production serving unit.

This was attributed to administration problems in scheduling of lunch periods to make better use of employee's time.

Production time was found to vary daily in the Dayton, et al. (1965) study. Analysis of labor time by menu showed an apparent influence of the menu on production needs. The greatest deviation in labor time in the production serving unit occurred in the pre-preparation and preparation activities.

Upon completion of the study, changes were made in the handling of food and scheduling of personnel within the food service system. Labor hours were cut 24 percent. A 50 percent increase in productivity in the form of ratio of meals to labor hours was noted.

Bonini, et al. (1967) conducted a work sampling study designed to assist a hospital dietary department in evaluation of labor costs. The activities of a group of workers in a small production unit were analyzed. The number and percentage of observations in each of three categories were calculated for each worker by the hour, by the day and for a seven-day period. Differences between each worker and pre-established standards were determined. Number of workers and hour of the day were analyzed as they affected the expenditure of time in productive, non-productive and personal time categories.

Analysis of the total 1,163 observations showed an average production time of 65 percent, non-productive time 14 percent, and personal time 21 percent. Time of day was an important

factor in the amount of time spent in productive and personal categories. Analysis by the number of workers on duty revealed that the mean production time was higher with four workers than with five. Information about the amount of productive, non-productive and personal time of each worker was indicated. This study could be used as a standard for evaluation of similar situations in which training needs were determined.

CHAPTER III

PROCEDURE

A work sampling study of the activities of 14 school food service employees was conducted in a Knoxville, Tennessee, high school. The purpose was to evaluate the effect of two training sessions in which work simplification principles were explained and demonstrated. The study was conducted in three parts: (1) a pilot study of work sampling to test feasibility of the project, (2) a period of work sampling before the training sessions, and (3) a period of work sampling after the training sessions.

Procedures for the pilot study and the two work sampling periods were similar to those described in the methodology manual developed by the Institution Management Laboratory, University of Wisconsin (1967).

I. WORK SAMPLING PROCEDURE

Classifications and descriptions of work functions and activities as used in the manual published by the Institution Management Laboratory (Appendix A) were used in the survey with the exception of transportation of trays to and from patients. Activities of the employees were subdivided into 18 categories. These activities made up three major work functions: direct work functions, indirect work functions, and delays. Eleven activities were classified as direct, four as indirect and

three as delays. Work functions with definitions and activities were as follows:

DIRECT WORK FUNCTIONS: any essential activity which contributed directly to the production of the end product (Institution Management Laboratory, 1967). End product was the total number of meals served daily. Included in the major activities of this function were processing, service, transportation, clerical routine, cleaning, and receiving.

INDIRECT WORK FUNCTIONS: any catalytic activity which contributed to production of the end product (Institution Management Laboratory, 1967). Activities in this function were instruction or teaching, appraisal, conference and clerical (original and non-delegable).

DELAYS. All the time that an employee was scheduled to be working and was not engaged in either a direct or an indirect work function (Institution Management Laboratory, 1967). Categories included forced delays, personal delays and idle time.

Observations of the activities of employees were made at random times during the entire work day of employees, from 7:30 a.m. to 2:30 p.m. Part-time employees were included in the random observations during the time of day they were on duty. Lunch breaks and other personal breaks were not scheduled for a specific time each day; therefore, observations included these activities.

Each of the 14 employees (ten full time, four part time) was assigned a number. Using a table of random numbers, the number of an employee to be observed and the time the observation was to be made were determined (Appendix B). Observations were arranged in sequential order (Appendix B).

The number of observations of employees' activities made per day depended upon the total number of observations required per work sampling period to produce a 95 (± 5) percent probability that the observations of the activities classified under direct work functions were representative of the real situation. The number of observations needed per work sampling period was calculated by a formula from Krick (1966):

$$N = \frac{4a^2 \bar{P}i\ (1-\bar{P}i)}{I}$$

where $\bar{P}i$ equals estimate of total activities, expressed as a decimal, devoted to direct work functions.

I = confidence interval (± .05 for this study)

a = factor obtained from a table of probabilities for the normal distribution for the value chosen for C, the confidence interval.

If C = .95, a = 1.96

N = number of readings required

The number of observations required was recalculated daily during each work sampling period. The number of observations in each activity was summarized daily and accumulative observations were used to derive the percentage of total

observations in direct work functions. The number of daily observations required was derived from dividing the number of additional observations required in the study by the number of days remaining in test period. A summarization form (Appendix B) was used for this procedure.

Daily basic information recorded included a listing of menu items, number of meals served and the total labor hours of personnel. Menus for the two periods of work sampling were similar (Appendix C).

Orientation of employees included a general briefing on the observation and recording procedures following a guide by the Institution Management Laboratory, (1967).

II. PILOT STUDY

The purpose of the pilot study was to assay the feasibility of the work sampling procedure and to provide information upon which the number of observations and the length of study could be determined and to orient the observer to the work situation.

Seventy observations of the activities of all personnel in the selected school cafeteria during a full work day were made to estimate the percentage of observations in direct work functions (Institution Management Laboratory, 1967). This information, expressed as a percentage of total activities devoted to the direct work function, was used in the formula from Krick (1966) to estimate the number of observations

required in the first work sampling period. Preliminary calculations showed 1,290 observations were required and that 74.6 percent of activities were classified under direct work function.

III. FIRST WORK SAMPLING PERIOD

One thousand, one hundred and sixty-three observations of employees' activities were made over a nine day period. For the nine day period 6,982 meal equivalents were served. The number of labor hours was 694. Meal equivalents per man hour were 10.8.

IV. TRAINING PERIOD

Training in work simplification was included in a course for managerial and non-supervisory food service employees in the Knoxville city schools as part of an annually scheduled 20 hour training series. Training was conducted by supervisory school food services personnel. The attendance to any or all training sessions was voluntary and on employee's own time.

Principles of work simplification were presented to two groups of approximately one hundred participants during an alloted 30-minute period on two different days. Visual aids in the form of charts were used to introduce the subject of work simplification. Hand-out material consisted of information concerning work simplification principles and a suggested format that participants could use to analyze some

aspect of their job (Appendix D). Anecdotes were used to illustrate work simplification procedures. The second training session one week later followed the same format as the first except that the anecdotes were replaced with a demonstration by two workers on the applications of work simplification principles.

V. SECOND WORK SAMPLING PERIOD

The second period of work sampling followed one week after the completed training sessions with identical procedures as those used for the first period. No intentional reference to the training program or to work simplification principles was made to the employees. The initial number of observations for the second period was based on the percentage of observations of activities in the direct work function during the first work sampling period.

The second nine-day period corresponded in days of the week to the first period. The number of observations recorded for this period was 1110. Meal equivalents equaled 6,412; labor hour, 640; meal equivalent per man hours 10.01.

CHAPTER IV

RESULTS AND DISCUSSION

A work sampling study of the activities of 14 school food service employees was conducted in a Knoxville, Tennessee, high school to evaluate the results of a training program based on work simplification principles. Two periods of work sampling were used, one before two 30-minute training sessions and one after the training. Seven of the fourteen employees attended one or more of the sessions. Comparison of the percent changes in the amount of time spent by employees in work activities between the two work sampling periods was used as an indication of the feasibility of work sampling as a training evaluation tool.

The two work sampling periods in this study were each nine days in length. Menus were similar for both periods (Appendix C). The number of observations made during the first period, before the training session, was 1,163 as compared to 1,110 observations made during the second work sampling period. From the observations the percentages of time spent in the various activities were determined.

From the analysis between the first and second work sampling period, comparisons were made between the percent changes in time spent by individual employees in the various activities. Effects of time of day on the number of observations in various activities were compared.

I. COMPARISON OF PERCENTAGE CHANGES IN MAJOR WORK FUNCTIONS

A summary of percent observations in work functions and activities for two work sampling periods is given in Table 1. The activities were divided into three major work functions, direct work functions, indirect work functions and delays (Appendix A).

Changes in the three major work functions during the two periods included 0.8 percent increase in activities of direct work functions, 1.9 percent decrease in activities of indirect work functions and 1.1 percent increase in delay activities.

A possible explanation for the decrease in the indirect work function in the second period might be related to the time in the school year. The second work sampling period was near the end of the school year and there was a general decline in activities that belonged to this category.

Analysis of each activity for the two work sampling periods indicated greatest changes in processing activities (2.2 percent more time during the second period), transportation (2.0 percent less time), cleaning (1.3 percent more time), and personal delays (1.4 percent more time).

II. COMPARISON OF ACTIVITIES BY TIME OF DAY

Activities of processing, transportation, personal delays and cleaning were analyzed. Observations began at 7:30 a.m. and ended at 2:30 p.m. Serving time was from 11:30 a.m. to 12:30 p.m.

TABLE I

SUMMARY OF PERCENT OBSERVATIONS IN WORK FUNCTIONS AND ACTIVITIES FOR TWO PERIODS OF WORK SAMPLING

Functions and Activities	First Period	Second Period	Difference
Direct Work Functions			
Processing[a]	24.1	26.2	2.2
Service	12.8	12.3	-0.5
Transportation[b]	20.1	18.1	-2.0
Clerical, Routine	6.7	6.9	0.1
Cleaning[c]	11.4	12.6	1.3
Receiving	0.3	0.1	-0.3
Total Direct Work Functions	75.4	76.2	0.8
Indirect Work Functions			
Instruction	1.5	0.9	-0.6
Appraisal	1.5	0.8	-0.7
Conference	1.1	1.2	0.1
Clerical Original	1.3	0.5	-0.8
Total Indirect Work Functions	5.3	3.4	-1.9
Delays			
Forced	1.2	0.7	-0.5
Personal	12.8	14.2	1.4
Idle	5.3	5.4	0.2
Total Delays	19.3	20.4	1.1

[a] Includes preparation and prepreparation.

[b] Includes food, supplies, and unladen transportation.

[c] Includes pots and pans, dishwashing and housekeeping.

Comparison of the processing activity for the two work sampling periods, Figure 1, indicated three peaks, the greatest occurring between 8:00 a.m. and 9:00 a.m., the second occurring at approximately 10:00 a.m. and a smaller peak at 1:00 p.m., usually a period of pre-preparation for the next day's production. Low points occurred at 9:30 a.m. a time generally alloted for personal time breaks, from 11:30 a.m. to 12:30 p.m., during serving, and at 1:30 p.m., a period usually devoted to cleaning.

Distribution of processing activities for the second work sampling period was more even than the first, as indicated by the decrease in the first peak between 8:00 a.m. and 9:00 a.m. and the increase in the activity between 10:00 a.m. and 10:30 a.m. This might be an indication that by delaying processing activities to the period prior to serving, there was better utilization of employees' time during the second work sampling period which could be an indication of a positive result of training.

Distribution of time in transportation activities is shown in Figure 2. Peaks in transportation activities occurred at the beginning of the day at 7:30 a.m., prior to the serving period from 10:00 a.m. to 11:00 a.m. and following the serving period at 1:00 p.m. Low periods occurred from 9:00 a.m. to 10:00 a.m. a period during which employees took personal time-breaks. Another low point occurred at 12:30 p.m. before the cafeteria line service was completed.

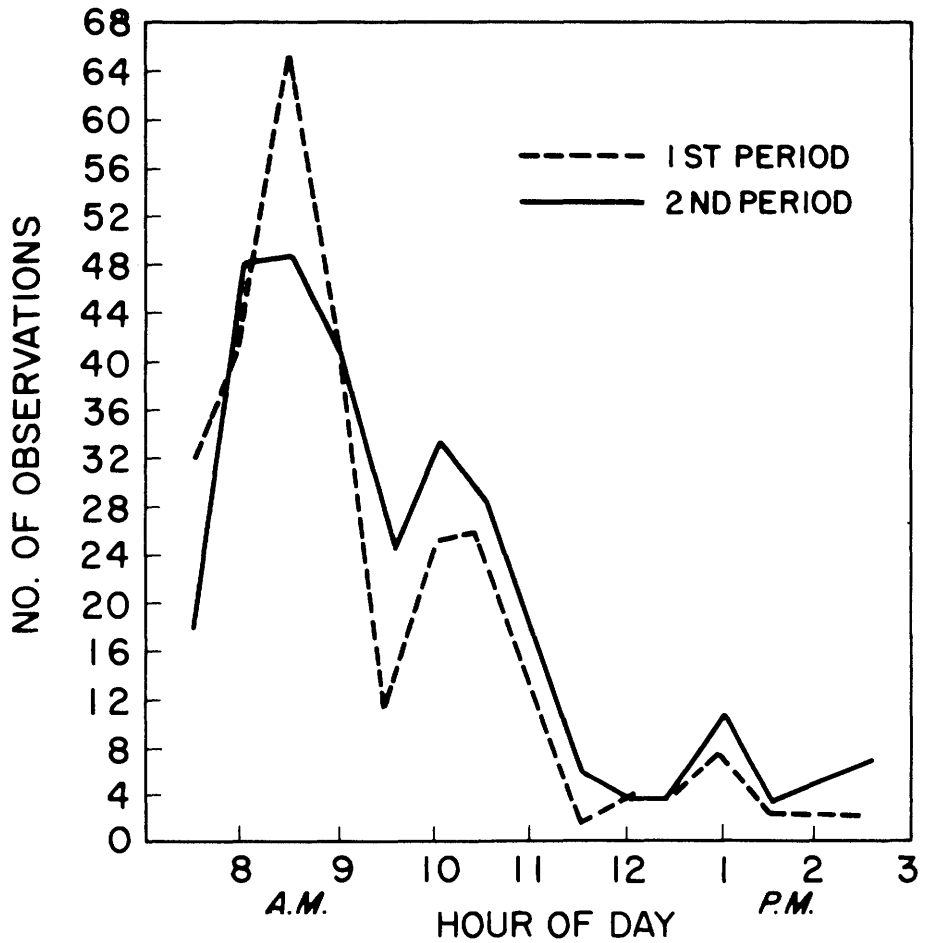

Figure 1. Distribution of Processing Activities by Time of Day for Two Work Sampling Periods

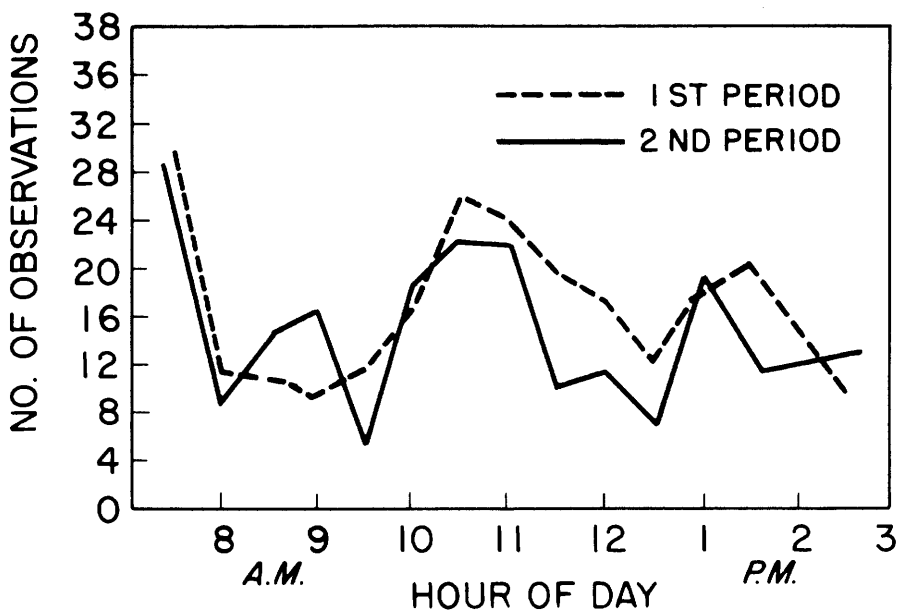

Figure 2. Distribution of Time in Transportation Activities for Two Work Sampling Periods

Distribution of time in cleaning activity (Figure 3) followed similar patterns for the two periods. Peaks in cleaning activities occurred at 1:30 p.m., when most employees were engaged in cleaning activities; at 10:30 a.m. a period of general cleaning after pre-preparation, and at 12:00 p.m. when dishwashing was at a peak. Low points occurred at the beginning and ending of the day and during the time allotted for personal time breaks at 9:30 a.m.

The distribution of personal time for the two periods followed a similar pattern as indicated in Figure 4. Peak observations of this activity occurred between 9:00 a.m. and 10:30 a.m., a period generally designated for personal time breaks and at the end of the day. As the end of the day approached, this activity increased sharply. Low points of personal time occurred at the beginning of the day, during serving and cleaning times.

Relationships of these four activities might be observed by comparing peaks and low points. Peaks in distribution of personal time coincided with low points in processing activities. When transportation activities were at a peak, cleaning activities were at a low point. Cleaning activities were increasing toward the highest peak at 1:30 p.m. whereas personal time was at a low point. As the number of observations in cleaning activities began decreasing after the peak, observations in personal time activities were increasing toward its highest peak at 2:00 p.m. and 2:30 p.m. These figures illustrate the

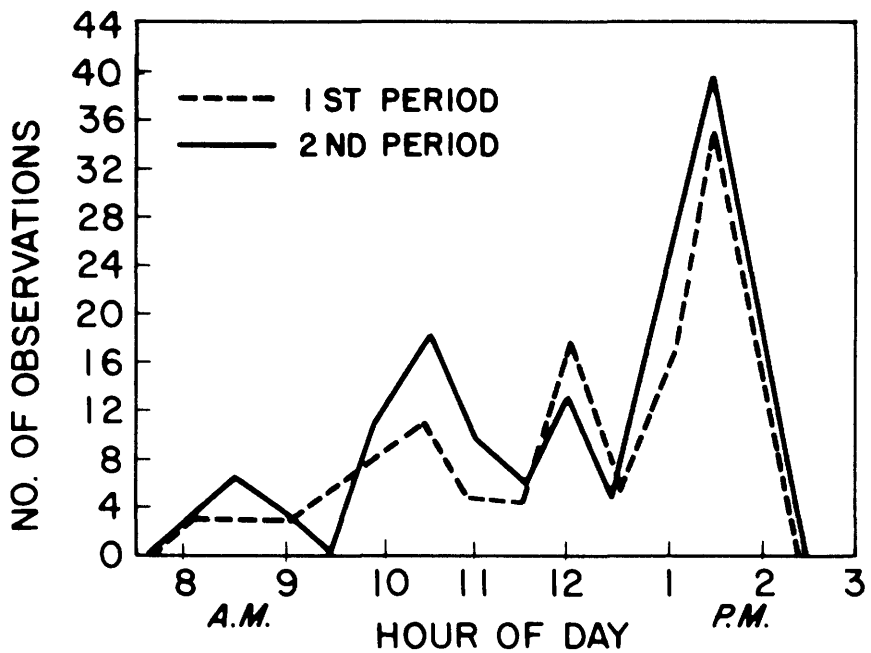

Figure 3. Distribution of Time in Cleaning Activities During Two Work Sampling Periods

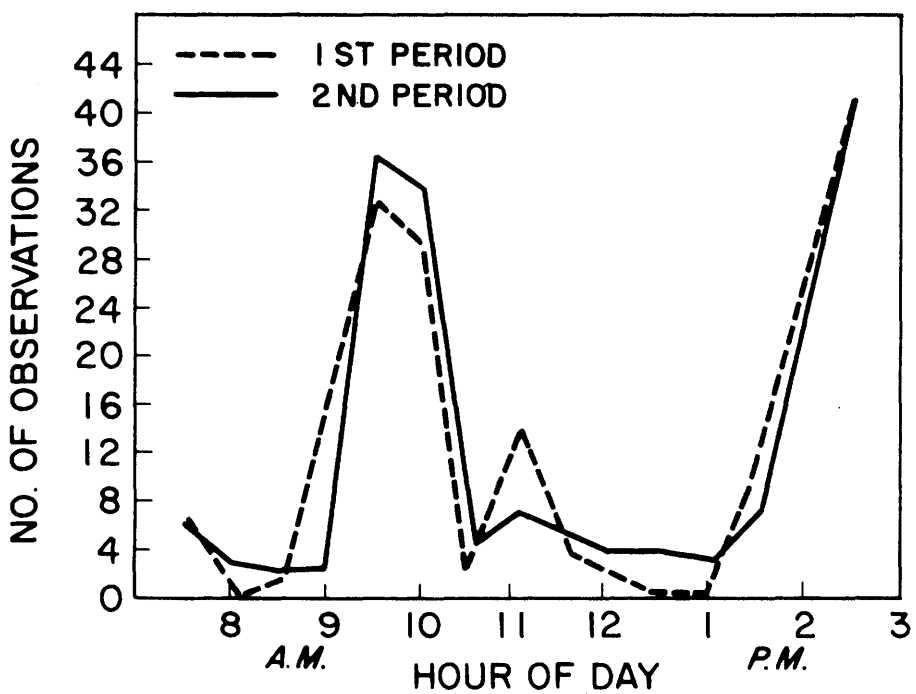

Figure 4. Distribution of Personal Time During Two Work Sampling Periods

interaction between activities of employees throughout the work day. The general decrease in transportation activities and redistribution of the processing activities might be an indication of positive results of the training sessions on work simplification.

III. COMPARISON OF PERCENTAGE CHANGE IN ACTIVITY BY EMPLOYEE

Comparison of employees' time for the two work sampling periods by individual employees is shown in Table II. The most notable changes in time spent in activities are indicated in the following discussion.

Employee 1 spent 13.3 percent less time in transportation activities in the period after training and 7.8 percent more time in cleaning activities. This worker was employed in this cafeteria for only seven months prior to the first work sampling period, and had little experience in quantity food service. She attended one session of the training on work simplification.

Employee 2 spent 4 percent less time in transportation during the second work sampling period. This employee had worked seven years in a school cafeteria before the school year during which the work sampling studies were conducted. She attended one session of the training on work simplification.

During the second work sampling period, employee 3 spent 9.7 percent less time in transportation activities, 8.4 percent less time in service and 12.0 percent more time in personal delays. The increase in personal delays was unusual and might

be attributable to the employee's having spent a comparatively low percentage (10.8 percent) of her time in personal delays during the first work sampling period. During the second period, 22.8 percent of this employee's time was spent in personal delays, a percentage similar to the other employees. A possible explanation for the unusual change in the activities of this worker might be accounted for by her receiving on-the-job training in bread baking during the first work sampling period. This employee had worked in this cafeteria for only one month prior to the beginning of the work sampling period.

Employee 4, who had worked in the cafeteria for 14 years, spent 4.1 percent more time in processing activities the second period. This worker assisted in the two training sessions on work simplification.

Employee 5, who had worked many years in the school cafeteria, spent 4.7 more time in serving during the second period. This employee did not attend the training sessions on work simplification.

Employee 6 was the school cafeteria manager. Her activities during the second period included 6.6 more time in routine clerical work and 13.6 percent less time in indirect work activities. These differences might be attributable to the greater amount of seasonal routine record keeping done in the second period versus more original clerical (or planning) activities during the first work sampling period. Also on-the-job instruction was being given to a worker during the first period but not in the

second. Other notable changes for this employee were 7.6 percent more time in processing activities, 6.8 percent less time in transportation, and 5.8 percent in delays. These changes reflect the variability of the manager's role in the food service system studied.

Employee 7, who had worked 11 years in the cafeteria spent 8.1 percent more time in transportation activities during the second work sampling period. This employee was not present for the training sessions on work simplification. Further study would be needed to indicate reasons for the increase in transportation.

Employee 10, who had worked 14 years in the cafeteria, spent 6.2 percent less time in serving during the second period of work sampling. This employee assisted with the training sessions on work simplification.

Employee 8 and 9 were not included in Table II as these workers were absent one or more days during one of the work sampling periods. Substitutes worked in their places. The activities of the four part-time employees were not compared on an individual basis even though they were included in the total work sampling study.

Comparison of activities by individual workers indicated that those with fewer years experience in school food service who attended training spent less time in transportation activities after training. Employees with many years experience, regardless of their attendance, did not show these changes.

In summary, work sampling could be used to indicate generally the effects of training by comparison of employees' time spent in various activities before and after training. Although the work sampling was not specific enough to indicate the actual time of the individual's activity, it could be used to indicate problem areas upon which further study could be based.

CHAPTER V

SUMMARY

A work sampling study was conducted in a Knoxville, Tennessee, high school cafeteria to study the feasibility of work sampling as an effective tool for evaluating training. Two periods of work sampling were conducted, one prior to two training sessions on work simplification principles and one after the training. All employees with less than seven years experience attended at least one session of training.

Changes as indicated by percent differences in time spent in three major work functions and 18 activities before and after the training were calculated. Further determinations included the percent changes in time spent in observed activities by individual workers and effects of time of day on observed differences in work activities.

Differences in time spent in the three major work functions for the entire group of employees varied little but the time spent in 18 activities within the functions fluctuated to a greater extent as did the observed activities of the individual employees. The greatest differences observed for the group of employees in work activities following the training was an increase in food processing activities, a decrease in transportation activities, and an increase in personal delays. The general decrease in transportation activities and redistribution of percent time in the

processing activities might be an indication of positive results of the training sessions on work simplification.

Comparison of activities by individual workers' indicated that those with fewer years experience in school food service who attended training spent less time in transportation activities after training. Employees with many years experience regardless of their attendance did not show these changes.

In summary work sampling might be used to indicate the effects of training by comparison of employees' time spent in various activities before and after training. Although the work sampling was not specific enough to indicate the actual time of the individual's activity, it could be used to indicate problem areas upon which further study could be based.

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APPENDIXES

APPENDIX A

WORK FUNCTION CLASSIFICATIONS AND DEFINITIONS[1]

I. Direct Work Function. Any essential activity contributing directly to the production of the end product (end product is total number of meals served daily). The activities included in this function, with definitions, can be classified as follows.

A. Processing. Act of changing the appearance of a foodstuff by physical or chemical means.

1. Prepreparation or preliminary processes. Preliminary act or process of making ready for preparation, distribution, or service. Examples: breading, chopping, grinding, measuring, peeling, sorting, thawing, washing, portioning before preparation, turning on cooking equipment or steam table.

2. Preparation or cooking. Final act or process of making ready for distribution or device. Examples: braising, roasting, seasoning, stirring, tossing salad, putting ingredients in steam kettle, putting product in cooking equipment such as: oven, steamer, removing product from cooking equipment.

B. 3. Service. Act of preparing facilities for distribution and of portioning and assembling prepared food for distribution to students (and teachers). Examples: setting up steam tables, cold counters, portioning the finished product, slicing meat, serving in cafeteria line.

C. Transportation. Act of transporting food, supplies, or equipment from one location to another.

4. Transportation of food. Act of moving food from one location to another.

5. Transportation of equipment, supplies and other. Act of moving equipment, supplies, and other items from one area to another.

6. Transportation empty. Act of moving without carrying or guiding anything from one area to another. Example: walking, unladen locomotion.

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[1] Institution Management Laboratory (1967).

D. 7. Clerical (routine). Act of receiving, compiling, distributing, and storing of routine records of data and information necessary for operation of the food service. Examples: copy work, taking inventory, taking money in cafeteria, telephone calls.

E. Cleaning. Act of removing soil or dirt to provide sanitary conditions for the use of equipment, facilities, and supplies.

8. Pot and pan washing. Act of scraping, washing, or rinsing quantity food containers and cooking utensils. Example: running water into pot and pan sink, washing pots and pans.

9. Dishwashing. Act of preparing for or removal of soil or dirt to provide sanitary conditions for use of tableware (china, silverware, glassware, and trays). Examples: filling dish machine, operating dish machine, stacking dishes from dish rack.

10. Housekeeping. Act of removing soil or dirt to provide sanitary conditions for the use of installed and mobile equipment and facilities. Examples: mopping and washing floors, cleaning walls, sweeping floors, locking or unlocking doors and refrigerator.

F. 11. Receiving. Act of acquiring, inspecting, and storing food and/or supplies from an area outside the school. Examples: inspection on delivery, storing, unpacking.

II. Indirect Work Functions. Any catalytic activity which contributes to production of end product.

G. 12. Instruction or teaching. Act of directing or receiving direction by oral or written communication in a training situation or on the job. Examples: on the job training, giving instructions, receiving instructions, reading the menu or schedule.

H. 13. Appraisal. Act of judging or estimating the value or amount of work in order to make decisions for future planning. Examples: checking dishes for cleanliness, inspection of area, inspection of leftovers, tasting food.

I. 14. Conference. Act of oral communication with one or more persons in the form of a scheduled meeting. Example: counseling, meetings.

J. 15. Clerical (original or non-delegable). Act of compiling and formulating management control records of data and information necessary for the operation of the food service. Example: menu writing, ordering food and supplies.

III. Delays. All time when an employee is scheduled to be working and is not engaged in either a direct or indirect work function.

K. 16. Forced delay. The time an employee is not working due to an interruption beyond his control. Example: Broken machine, slow cafeteria line.

L. Personal and Idle Delays

17. Personal delays. The time an employee is not working due to time permitted away from his work area. Examples: coffee breaks, restroom, putting on apron, drinking water, lunch break.

18. Idle time. Any avoidable delay (other than forced or personal delay) that occurs for which the employee is responsible. Example: conversation not pertaining to business, loafing.

APPENDIX B

RANDOMLY SELECTED OBSERVATION PERSONNEL TIME PERIODS

Date:

No.	Random No.	Worker	Time	No.	Random No.	Worker	Time
1				45			
2				46			
3				47			
4				48			
5				49			
6				50			
7				51			
8				52			
9				53			
10				54			
11				55			
12				56			
13				57			
14				58			
15				59			
16				60			
17				61			
18				62			
19				63			
20				64			
21				65			
22				66			
23				67			
24				68			
25				69			
26				70			
27				71			
28				72			
29				73			
30				74			
31				75			
32				76			
33				77			
34				78			
35				79			
36				80			
37				81			
38				82			
39				83			
40				84			
41				85			
42				86			
43				87			
44				88			

OBSERVATION TIMES ARRANGED IN SEQUENTIAL ORDER

Date:

Minutes	7:00AM 7:59AM	8:00AM 8:59AM	9:00AM 9:59AM	10:00AM 10:59AM	11:00AM 11:59AM	12:00PM 12:59PM	1:00PM 1:59PM	2:00PM 2:59PM
00 - 01								
02 - 03								
04 - 05								
06 - 07								
08 - 09								
10 - 11								
12 - 13								
14 - 15								
16 - 17								
18 - 19								
20 - 21								
22 - 23								
24 - 25								
26 - 27								
28 - 29								
30 - 31								
32 - 33								
34 - 35								
36 - 37								
38 - 39								
40 - 41								
42 - 43								
44 - 45								
46 - 47								
48 - 49								
50 - 51								
52 - 53								
54 - 55								
56 - 57								
58 - 59								

SUMMARY OF DAILY WORK FUNCTION ACTIVITIES FOR _____
DATE:_____

WORK FUNCTION CATEGORY

FUNCTION	TOTAL	PREV. TOTAL	ACCUM. TOTAL	PERCENT
DIRECT WORK Prepreparation or preliminary processing				
Preparation or cooking				
Service				
Transportation of food				
Transportation of equipment, supplies, other				
Transportation empty				
Clerical (routine)				
Cleaning - pot and pan washing				
Cleaning - dishwashing				
Cleaning - housekeeping				
Receiving				
TOTAL-DIRECT WORK FUNCTIONS				
INDIRECT WORK Instruction or teaching				
Appraisal				
Conference				
Clerical (original or non-delegable)				
TOTAL-INDIRECT WORK FUNCTIONS				
DELAYS Forced delay				
Personal delays				
Idle time				
TOTAL-DELAYS FUNCTION				
GRAND TOTAL OF READINGS (All Activities)				

PERCENTAGE OF TOTAL ACTIVITIES IN CATEGORY OF PRIMARY INTEREST

$$\frac{\text{Total of Accumulated Activities in Category of Primary Interest}}{\text{Grand Total Accumulated Readings (All Activities)}} =$$

APPENDIX C

MENUS

FIRST WORK SAMPLING PERIOD

First Day

Roast Beef
Whipped Potatoes (Fresh)
Buttered Peas
Fried Okra
Sliced Beets
Orange Juice

Jello Salad
Tomatoes and Cottage Cheese

Rolls--Butter--Milk

Iced Cake
Cobbler
Peanut Butter Candy
Pie
Fresh Fruit
Fruit Cup
Pudding Jello Whipped and Cubed

Second Day

Baked Fish
Chili-Cheese Wedge
Buttered Potatoes (Fresh)
Green Beans
Fried Okra
Orange Juice

Mixed Fruit Salad
Sliced Tomato/shredded lettuce

Cornbread--Butter--Milk

Prune Cake
Banana Pudding
Cranberry Crunch
Fresh Fruit
Fruit Cup
Jello Whipped and cubed
Pudding

Third Day

Cheeseburger
Beef Pattie
Pinto Beans
Creole Spaghetti
Kale Greens
Sliced Tomato
Orange Juice

Tunafish Salad
Pineapple Cheese Salad

Buns (purchased)--Cornbread--Milk
Chocolate Cake
Pie
Plain Cake
Fresh Fruit
Fruit Cup
Jello, whipped and cubed
Pudding

Fourth Day

Chipped Ham on Bun
Baked Ham
Beef Patty
Buttered Potatoes (Fresh)
Pinto Beans
Green Beans
Mixed Vegetables
Apple Sauce
Orange Juice

Congealed Fruit Salad
Stuffed Celery
Buns (school made)--Milk
Sweet Rolls
Peanut Butter Squares
Cobbler
Cake
Fresh Fruit Jello
Fruit Cup Pudding

Fifth Day

Oven fried Chicken
Fluffy Rice
Sweet Potatoes (canned)
Buttered Peas
Broccoli
Orange Juice

Bananas in Jello
Sliced Tomatoes on Lettuce

Rolls--Butter--Milk

Pineapple Cake
Oatmeal Cookies
Frozen Fruit Salad
Cake
Fresh Fruit
Fruit Cup
Jello
Pudding

Sixth Day

Salisbury Steak
Fried Chicken
Whipped Potatoes (Fresh)
Buttered Corn
Glazed Carrots
Green Beans
Orange Juice

Cottage Cheese and Lettuce
Sunshine Salad (congealed)

Rolls-Butter--Milk

Cherry Pie
Lemon Roll
Cake
Raisins
Fresh Fruit
Jello
Pudding

Seventh Day

Meat Loaf
Salisbury Steak
Whipped Potatoes (Fresh)
Squash Casserole
Green Peas
Scalloped Tomatoes
Grape Juice

Cottage Cheese
Bananas in Jello

Cornbread--Butter--Milk

Cake
Cream Pie
Cobbler
Pie
Raisins
Fresh Fruit
Fruit Cup
Jello
Pudding

Eighth Day

Macaroni and Cheese
Buttered Potatoes (Fresh)
Fried Okra
Greens
Beets
Orange Juice

Congealed Salad
Stuffed Celery

Rolls--Butter--Milk

Prune Cake
Cherry Cobbler
Cake
Cake
Raisins
Fresh Fruit
Fruit Cup
Jello
Pudding

Ninth Day

Oven-fried Chicken
Fluffy Rice (corn)
Broccoli
Peas and Carrots
Candied Apple Slices
Orange Juice

Peach w/cheese salad
Tossed Salad (stuffed celery)

Rolls--Sliced Bread--Milk

Oatmeal cookies
Peanut Butter Balls
Banana Pudding
Cobbler
Raisins
Cake
Fresh Fruit
Fruit Cup
Pudding
Jello

SECOND WORK SAMPLING PERIOD

First Day

Pizza
Club Sandwich
Potato Salad
Candied Apples
Pineapple and cheese
Tossed Salad
Tomato Cup
Tomato Juice (Greens)

Cheese Glow (congealed salad)
Sliced tomatoes on lettuce

Milk--Sliced Bread--Butter

Cakes (1-2-3-4) and others
Peanut Butter Brownies
Cobbler
Fresh Fruit
Fruit Cup
Jello
Pudding

Second Day

Oven-fried Chicken
Pizza left over
Fluffy Rice (Potatoe Salad)
Buttered Noodles
Green Beans
Broccoli
Cucumber Salad (20)
Tomato Juice

Pineapple and Cheese Salad
Tuna Salad

Hot Rolls--Butter--Milk

Honey Spice Cake (and others)
Oatmeal Pudding
Cobbler
Fresh Fruit
Fruit Cup
Jello
Pudding

Third Day

Baked Fish
Fried Chicken left-over
Buttered Potatoes
Barbeque Beans
Squash Casserole
Cole Slaw (Broccoli)
Green Beans
Tomato Juice

Bananas and Peanut Butter
Cottage Cheese Salad

Salty Cornmeal Buns--Butter--Milk

Cherry Pie
Honey-P'nut Butter Candy
Banana Pudding
Cobbler
Cup Cakes and Cake
Fresh Fruit
Fruit Cup
Jello
Pudding

Fourth Day

Chili Pie
Buttered Corn
Creole Spaghetti
Greens
Apple Sauce
Tomato Juice

Mixed Fruit Salad
Tossed Salad

Cornbread--Butter--Milk

Apple Cobbler
Pineapple Upside Down Cake
Cake
Banana Bread
Fresh Fruit
Fruit Cup
Jello
Pudding

Fifth Day

Hot Dog
Chili
Pinto Beans
Parsley and Potatoes (Fresh)
Cole Slaw
Sauerkraut
Tomato Juice

Tuna Salad
Pear and Cheese Salad

French Bread--Butter--Buns (purchased)
Milk

Devil's Food Cake
Apple Pie
Cake
Oatmeal Cookies
Frozen Fruit Dessert
Fresh Fruit
Fruit Cup
Jello
Pudding

Sixth Day

Beef Patty
(Hot Dogs)
F.F. Potatoes (Frozen)
Buttered Corn
Greens
Waldorf Salad
Tomato Juice

Egg Salad
Peach Salad

Sliced Loaf Bread--Butter--Milk

Sweet Rolls
Quickie Candy
Banana Bread w/P'nut Butter
Fresh Fruit
Fruit Cup
Jello
Pudding

Seventh Day

Roast Beef
Fluffy Rice
Sweet Potatoes
Green Beans
Buttered Cabbage
Tomato Cup
Tomato Juice

Peanut Congealed Salad
Egg Salad

Rolls--Butter--Milk

Strawberry Shortcake
Banana Pudding
Cookies
Banana Bread
Fresh Fruit
Fruit Cup
Jello
Pudding

Eighth Day

Oven-Fried Chicken
Whipped Potatoes (Fresh)
Green Peas
Broccoli
Apple Sauce
Tomato Juice

Sunshine Salad
Sliced Tomatoes on Lettuce

Rolls--Butter--Milk

Prune Cake
Cherry Pie
Strawberry Shortcake
Cake
Fresh Fruit
Jello
Pudding

Ninth Day

Oven-Fried Chicken
Macaroni and Cheese
Lima Beans
Tossed Salad
Glazed Carrots
Tomato Juice

Mixed Fruit
Egg Salad

Salty Cornmeal Buns--Milk

Cake
Peach Pie
Cherry Pie
Fresh Fruit
Fruit Cup
Jello
Pudding

APPENDIX D

TRAINING GUIDE FOR PRINCIPLES OF WORK SIMPLIFICATION

I. Objectives of Training Session

A. To increase efficiency of school food service workers through development of the ability to analyze job assignments and make improvements where needed.

B. To develop an awareness in school food service employees of the importance of "thinking through" and planning of job assignments.

II. Concepts to be developed in training

A. Work Simplification Principles

1. Job Analysis

a. Assembling

b. Transporting

c. Processing

d. Putting away

2. Job Improvement

a. Eliminating

b. Combining

c. Rearranging

d. Simplifying

B. Variability of job assignments in food services

III. Evidences of behavioral change in employee as a result of training

A. Will be able to analyze job tasks and make changes in work habits

B. Will be able to explain why job analysis is important

C. Will be observed organizing work tasks

D. Will spend less total time in transporting food, equipment and supplies, such as walking empty-handed

E. Will take regulated official rest periods.

F. Will work steadily and spend less time in idle delays

IV. Procedures for training sessions

A. Antecdote or skit illustrating need for work simplification and the benefits to be derived from applying work simplification principles

B. Definition of work simplification

C. Application of work simplification in continuous and variable job tasks

D. Advantages of being able to apply work simplification principles

E. Analysis of work simplification principles using antecdote or skit as a reference

1. Rules for working smoother

2. Rules for working smarter

F. Application of principles to individual trainees' jobs

G. Challenge trainees to try principles in their job tasks

V. Visual aids

A. Flip chart to emphasize points

B. Mimeographed guide for work simplification

1. Rules for working smoother

2. Rules for working smarter

3. Applying rules for working smarter

WORK SIMPLIFICATION

RULES FOR WORKING "SMOOTHER"

1. WORK COMFORTABLY: Wear comfortable shoes and clothes...get plenty of light and proper support for back and feet...use the right tools.

2. AVOID EXCESSIVE BODY STRAIN: Limit weight load to 50 pounds... bend knees to lift heavy objects...push or pull instead of lift and carry.

3. DEVELOP A STEADY PACE: Working too fast (like driving too fast) uses up too much energy.

4. TAKE REGULATED RESTS: Avoid energy drain by resting between motions...restore energy by regulated rest between work periods...get plenty of rest between work shifts.

5. MAKE MOTIONS ECONOMICALLY: Use both hands...use both hands in unison, starting and stopping together...use symmetrical arm movements in opposite directions...use continuous curved movements...use momentum and drop delivery.

6. CONFINE WORK TO NORMAL AND MAXIMUM WORK CENTERS: Keep tools and materials within easy reach...use assembly line techniques... use mobile work centers.

RULES FOR WORKING "SMARTER"

1. SELECT THE JOB (or part of the job) to be improved...look for bottlenecks that slow up production and jobs that involve a lot of chasing around.

2. GET ALL THE FACTS about the job...by making a simple list of all the activities involved...by listing and visualizing them on a string chart or flow process chart.

3. CHALLENGE THE FACTS by asking: Why is the job being done at all? Why is it being done in that place? Why is that person doing it? Why is he doing it that way? Why can't we find a better way?

4. DEVELOP THE BETTER way by using these job improvement techniques: ELIMINATE details to get rid of unnecessary work...COMBINE details to make one operation do the work of two...REARRANGE details to shorten procedures and avoid duplication...SIMPLIFY details to make the job easier.

APPLYING RULES FOR WORKING SMARTER

1. List your job (or part of the job):

2. List facts about the job or steps involved:

3. Challenge the facts:

4. Develop the better way: (Eliminate, Combine, Rearrange, Simplify)

VITA

Vivian Bowie Beard was born in Columbia, Tennessee on March 13, 1941. She attended grades 1-11 in Columbia and graduated from Key West High School in Key West, Florida in 1960. She received a Bachelor of Science degree with a major in Vocational Home Economics from The University of Tennessee at Martin in 1965. From 1966 to 1968, she was employed as the Director of Food Services and Nutrition Education for Weakley County Schools in Tennessee.

In the summer of 1968, she accepted a graduate assistantship at The University of Tennessee, Knoxville, and began working toward a Master's degree. She was awarded a graduate scholarship by the American School Food Service Foundation for 1969-70.

She has two daughters, Kimberly Anne and Pamela Kay.