

A TRAINING PROGRAM IN WORK SIMPLIFICATION

by

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INTRODUCTION

Although work simplification is not new to many industries, it is a comparatively recent tool of management to appear in food services. Different designations such as methods improvement, work efficiency, and motion and time economy or study all refer to the same basic procedures. Work was started in this field by Gilbreth and Taylor in the latter part of the nineteenth century. The principles developed for use in industry and business at that time may also be applied to food service units today.

Responsibilities of management are to instruct employees; provide adequate equipment and tools; rearrange equipment to eliminate unnecessary walking and reaching; provide adequate lighting, heating, cooling, and ventilation; reduce accidents; increase earning power; reduce turnover; and aid employees in achieving a feeling of security and well being within the framework of their employment. The fulfillment of these responsibilities may be reached through the use of work simplification.

The fact that this tool has been used infrequently may be due to lack of knowledge of its principles on the part of food service managers and/or inadequate employee training methods. Management and workers alike should be shown that its use will increase production; insure more uniform quality; standardize methods, materials, tools and equipment; increase efficiency; and reduce fatigue. The training of both new and old employees will be facilitated, also.

Today, research in motion economy is being done by industry, the armed forces, and colleges and universities. Much of this investigation consists of motion and time studies of work as it is done, analysis of work methods used, development of the easiest and most effective ways of doing given tasks, and application of new methods. Findings are reported through books, scientific journals, service magazines, government pamphlets, bulletins, educational movies, work shops, and various other media. Even with all of this available material, it is still difficult for some managers to apply these ideas to specific working situations.

The purpose of this study was to survey the principles of work simplification from the standpoint of their use in the institutional kitchen and to relate them to the various kitchen activities, as well as to provide material and ideas suitable for use in an employee training program.

REVIEW OF LITERATURE

Development of Work Simplification

Today, work simplification is based on time studies, combination motion and time studies, and systematic motion and time studies.

Time Studies. The original work in time study was done by Frederick W. Taylor in the machine shop of the Midvale Steel Company in 1881, according to Barnes (1953). He developed scientific management which stressed a questioning attitude and constant search for facts. Although emphasizing materials, tools,

and equipment in the improvement of methods, he was aware of the influence of human factors.

Scientific Method. Substitution of fact-finding or scientific methods for rule of thumb procedure was used first by Frederick Taylor (Barnes, 1953). He believed that management should train, teach, and develop the worker for a particular job rather than having the worker select his own job and train himself. The establishment of cooperation between management and workers, with each department doing the work for which it was best fitted, was of great importance in Taylor's philosophy.

Barnes (1953) listed the steps used by Taylor in finding the best way to do the job. These were: find the proper method of doing a given piece of work, teach the worker how to do the job the best way, maintain an environment conducive to the best working conditions for the task, set a definite time standard for accomplishing the work, and pay the worker a premium in the form of extra wages for doing the job as specified.

The time study was developed to determine the maximum speed at which the worker could accomplish his tasks and still be contented and thrive continuously. A stop watch was used to find the time needed to do a piece of work. The amount of rest necessary to maintain the worker's best physical and mental state also was established. Taylor concluded that practically all work required $12\frac{1}{2}$ per cent rest.

Further findings by Taylor indicated that rest periods reduced the number of accidents and that the worker felt more

competent in his work when he knew what was expected of him. As a result of these studies, training programs were developed in which the worker eliminated waste motions and cut down fatigue. This in turn stimulated the worker's initiative which management rewarded by promotions.

Through the use of time studies, management often found inadequate work areas, improper tools, machines in need of repair, unsanitary conditions, and poor lighting and ventilation. Time studies also gave management the opportunity to improve construction methods, standardize tools and working conditions, and evolve improved methods and machines.

Analytical Work of Time Study. Barnes (1953) outlined Taylor's method of conducting analytical work in the following manner:

1. Dividing work into simple elementary movements.
2. Eliminating unnecessary movements.
3. Selecting the quickest and best method of making each elementary movement through the use of the stop watch.
4. Describing, recording and indexing of each elementary movement including its proper time.
5. Studying and recording the percentage which should be added to the actual working time of a good workman to cover unavoidable delays, interruptions, minor accidents, newness of a good workman to a job the first few times that he does it, and the allowance for rest at the intervals at which rest must be taken in order to offset physical fatigue.

With Frederick Taylor's discovery of the advantages of recording unit times, came recognition of the need for including time study with motion study.

Motion and Time Studies. Two great American pioneers in the field of motion and time were Frank B. and Lillian M. Gilbreth. The principles and techniques which they developed many years ago, still are being adapted to business and industry today.

Basic Concepts. Lillian Gilbreth, a psychologist, displayed a superior understanding of the human factor; and Frank Gilbreth, a mechanical engineer, possessed an unusual talent for analyzing tools, materials, equipment, and the motions used by workmen. Together they developed basic concepts concerning (1) the joint relationship of employer-employee, (2) the importance of feelings, sentiments, and emotions in the motivation of individual workers, and (3) the appropriate emphasis on methods improvement.

From the time Frank Gilbreth entered the contracting business in 1885, he was interested in the fact that each man had his own method of doing a specific job and used one set of motions when working rapidly, another set when working slowly, and still a third set when teaching someone else how to do the task. He also noted that organization presented two phases, theory and practice, which often seemed to diverge greatly.

By the turn of the century, Frank Gilbreth was in business for himself; and he soon learned that the direction of a large group of men of various levels of intelligence, working in several locations at once, was an assignment requiring experience, brains, and highly specialized training in the art of handling men. During this period he studied the actions of the workmen, the conditions surrounding their work, and all the other

variables. Through these studies, ways were found to eliminate motions, rearrange work areas, and place tools in convenient positions. Some of these changes made slight differences in themselves, but all together totaled an immense saving of time and energy. For example, in the case of brick laying, the new method took $4\frac{1}{2}$ motions as compared to 18 motions used in the old method. The new system almost tripled (120 to 350 bricks per hour) production.

After discovering his ability to analyze the motions used by workers, Gilbreth gave up his contracting business in order to devote his time to motion study investigations and applications. These studies included research in the areas of fatigue, monotony, transfer of skill, and work for the handicapped.

Methods Used in Making Motions Studies. The pattern used by Gilbreth (1911) in making any motion study was to write down the methods and motions used, to enumerate the variables affecting each motion, and to record the method using the best sequence of motions with the variables affecting each motion.

To obtain accurate measurements, the units to be measured, the methods to be used, and the devices to be utilized for measuring were determined in the order given. The methods and devices used provided the least possibility of error and were within a reasonable cost range. Gilbreth classified errors as two kinds, those due to instruments and those due to personal bias of the observer. The use of micro-motion and chronocycle-graph excluded mistakes of that kind.

According to Gilbreth (1911), in an analysis of any problem of motion reduction, many variables should be considered. Those affecting the worker were his anatomy, brawn, contentment, creed, earning power, experience, fatigue, habits, health, mode of living, nutrition, size, skill, temperament, and training. Others influencing his surroundings, equipment, and tools were appliances, clothes, colors, entertainment, music, reading, heating, cooling, ventilation, lighting, quality of materials, reward and punishment, size and weight of unit moved, special fatigue-eliminating devices, and union rules. The variables of motion itself were acceleration, automaticity, combination with other motions and sequences, cost, direction effectiveness, foot-pounds of work accomplished, inertia and momentum overcome, length, necessity, path, play for position, and speed.

Devices Used for Motion Study. The term micromotion study was introduced by the Gilbreths to the public at the American Society of Mechanical Engineers Conference (Gilbreth, 1912). Barnes (1953) defined micromotion study as follows:

Micromotion study is the study of the fundamental elements or subdivisions of an operation by means of a motion picture camera and a time device which accurately indicates the time intervals of the motion films. This, in turn, makes possible the analysis of the elementary motions recorded on the film and the assignment of time values to each.

Another technique developed for motion study by Gilbreth was the chronocyclegraph which made it possible to record the path of motion in three dimensions. A small electric light bulb was attached to the part of the body doing the motion. A stereoscopic

camera was used to photograph the path of light as it moved through space. The use of an interrupter in the electric circuit made it possible to distinguish between fast and slow motions. The resulting pear-shaped dots were close together when the operator moved slowly, and widely separated when he moved rapidly. In this manner, time, speed, acceleration, and retardation were measured accurately. From these graphs Gilbreth constructed models of motion paths to aid in improving methods, to demonstrate correct motions, and to assist in teaching new operators.

The simultaneous cycle motion chart was used first by the Gilbreths when installing scientific management and motion study in industry and surgery, and later was found applicable to all lines of activity. Indicating in vertical columns the process element occurring in each time unit, this chart pictured the activity of the working members of the body at a given time.

Arranged in varying sequence, the following elements made up the motion cycle: search, find, select, grasp, position, assemble, use, disassemble, inspect, transport loaded, transport empty, position for next operation, release load, wait (unavoidable delay), wait (avoidable delay), and rest (for overcoming fatigue). Each of these elements was referred to as a therblig (Gilbreth spelled backwards) and was represented on the chart with an individual color.

The simultaneous cycle motion chart also was used to make studies of jobs which might be available to the handicapped. For example, studies of certain tasks might indicate that one

hand was used very little. With a few changes, these tasks could be set up so that the use of one hand could be eliminated or the use of a foot could be substituted instead. Through the Gilbreths' concentrated efforts, many handicapped people succeeded in becoming useful, efficient, and happy citizens.

Today, the simultaneous cycle motion chart is better known as the process chart (Barnes, 1953). Its use has been simplified through the publishing of five standard process chart symbols by the American Society of Mechanical Engineers in 1947. Accepted universally, these symbols were for operation, transportation, inspection, delay, and storage.

Fatigue. The Gilbreths (1916) pioneered in research in the area of fatigue. The objectives of their studies were the accurate determination of the causes of fatigue for various types of work, the elimination of all unnecessary fatigue, the reduction of necessary fatigue where possible, the provision of means for overcoming fatigue, and the presentation of data obtained from the studies in easily used form.

Two kinds of fatigue, according to the Gilbreths, were unnecessary fatigue resulting from needless work, and necessary fatigue resulting from essential work. To aid in overcoming fatigue among workers, they believed that management should institute rest periods; furnish devices for rest such as chairs; provide adequate equipment, materials, and tools; and ensure adequate lighting and ventilation. They also believed that new methods should be sought to improve work and that employees

should be trained to use correct sequences in their work, as well as to pre-position their materials and equipment.

Although Frank Gilbreth chose practically all of his illustrations from the bricklaying trade, the principles he established are applicable to many trades, industries, and professions today. Since her husband's death in 1924, Lillian Gilbreth has continued their work in motion and time with special emphasis on the tasks of the homemaker. Still active on several university campuses, she has given speeches all over the world, as well as carrying on the many activities in motion study while raising 11 children, each now having a college education.

Causes and Effects. Cause which produced an effect from which something resulted in relation to time was the thesis of Henry Gantt (1907), an industrial engineer. In a paper given before the American Society of Mechanical Engineers, he stated that as workers "become more skilled, they form better habits of work, lose less time, and become more reliable. Their health improves, and the improvement in their general appearance is very marked." Acquiring good work habits in one area not only caused the worker to become more versatile and efficient, but carried over into other work areas as well.

Gantt (1902) created the policy of "Task and Bonus" which consisted of a regular day's pay for the worker during the period he was learning and unable to produce much output. When the quantity and quality of his work reached a certain level, he was paid for any excess of output. This assured a minimum of a full

day's pay for learners and unskilled workers and extra compensation for the skilled workers if they were able to produce above a set standard.

Twelve Principles of Efficiency. In the preface of the book, "The Twelve Principles of Efficiency," written by Harrington Emerson (1912), Goings stated his belief that Emerson's work was the declaration of a philosophy in work simplification. Five of the principles dealt with employer and employee relations and seven with methods or systems to be established in the manufacturing plant. They were listed as (1) ideals, common-sense and judgment, (2) competent counsel, (3) discipline, (4) justice, (5) reliable, immediate, and accurate records, (6) planning and dispatching, (7) standards and schedules, (8) standardized conditions, (9) standardized operations, (10) written standards, (11) practice instructions, and (12) efficiency reward.

To eliminate plant inefficiency which he believed was due to lack of knowledge and/or application of the principles of efficiency, Emerson (1911) suggested the following procedure: determine the cause, set up standards to be used to increase efficiency, and insist on the use of the standards. His description of the perfect organization was "one in which specialists formulate the underlying principles, instruct as to their application, and relentlessly reveal both their observance and neglect."

Today, Emerson's terminology is not commonly used, according to Crandall and Gross (1954) who noted that he emphasized

scheduling, record keeping, standardized conditions and standardized operations, and considered time and motion studies a subdivision of standards.

Systematic Motion and Time Studies. Emphasizing practical application, Marvin Mundel (1947), associate professor of industrial engineering at Purdue University, treated the study of time and motion systematically and scientifically. In writing his books, he drew freely from the works of the Gilbreths as well as his own research on work simplification. Widely known for his concept of five classes of change, Mundel outlined them as:

- (1) change in body motion and position, (2) changes in tools, equipment, and work areas, (3) change in production sequence, (4) change in the finished product, and (5) change in raw materials.

Body Motion and Position. The number of motions made should be cut down and steps eliminated through proper arrangement of equipment and work areas. Workers should be trained to end one motion where the other begins, as well as to let the eye precede the motions. Employees should be taught to use both hands, to begin and complete motions with both hands at the same time, to allow hands to be idle only at rest, to do supplementary work with hands which otherwise would be free, and to use as few movements as possible. Feet and other portions of the body should be substituted for hands when possible, as for the use of pedals on wash basins and drinking fountains. Carrying devices such as carts, trays, and dollies should be used. Duplication of tools

and pre-positioning were stressed when eliminating unnecessary shifting of position. Gravity should be utilized as with gravity feed bins or drop deliveries. Good posture should be encouraged through the use of correct table and chair heights. Fatigue should be minimized by sitting or alternately sitting and standing when working.

Tools, Equipment, and Work Area. Tools do not have to be the newest and most modern to be effective, but should be designed to do the best possible work. They should be stored within easy reach and at the location of their first use. When used in more than one place, they should be duplicated for each area. Whenever possible, combination tools should be used.

Equipment should be arranged to allow its most efficient use. All movable equipment should be on wheels. Materials should also be stored at the location of their first use when possible. Duplicate storage areas for materials should be made available when necessary, according to Mundel (1947).

A study should be made in each work area of lighting, ventilation, cooling, and heating and the findings used to improve working conditions. Work areas should be pleasant, clean, well-painted, and the right size and shape for the work to be done.

Production Sequences. Before starting a job, the best sequence of work should be determined in order to save time. Work sheets made out by the manager, and short daily conferences have been found to aid the employee in planning his work more efficiently.

Finished Product. When changing the end product, the sequence, tools, equipment, work areas, and body motions should be investigated and possibly modified.

Raw Materials. The use of different raw materials was found to affect classifications. In other words, alteration of any one of Mundel's classes of change modified all the other areas.

Principles of Analysis. Basic principles of analysis delineated by Mundel (1947) were the elimination of all unnecessary steps, the combination of steps, the shortening of steps, the arrangement of steps in the best sequence, and the making of each step as economical as possible. In order to achieve the goals set up by these principles, Mundel suggested that the following questions be asked:

1. Can any operation be eliminated, combined, shortened, or simplified?
2. Can any movement be eliminated, combined, shortened, or simplified?
3. Can delays be eliminated, combined, or shortened?
4. Can the safety be improved for any step?

He believed that adequate training in work simplification for both managers and workers was necessary before these questions could be answered satisfactorily and work patterns improved.

Process Chart-Product Analysis. Steps needed to make a process chart-product analysis as recommended by Mundel (1947), were to reduce the number of steps, arrange steps in the best sequence, make steps as economical as possible, reduce handling, combine steps if economical, shorten moves, and provide the most

economical means for moving. A series of questions were asked to aid in the analysis of each step. For example, when considering the reduction of the number of steps, such questions as the following should be asked: (1) why is it a step; (2) why is present equipment used; (3) why is it done there; (4) why is it done in its present order; (5) why is it done as it is; (6) why is it ordered in its present form or used at all. From such detailed studies as proposed by Mundel, managers and supervisors were able to improve work methods with a resulting improvement in overall efficiency.

Principles of Work Simplification

After considering the development of the area of motion and time economy as a whole, the literature was surveyed in an attempt to ascertain those principles of work simplification, as evolved by present day workers, which would be applicable to food services. It soon became apparent that the same principles would apply, whether the job was brick laying, typing, or table setting.

Principles of Motion Economy. Although Barnes (1953) discussed the principles under the heading "principles of motion economy," he believed a more accurate designation to be "some rules for motion economy and fatigue reduction." After summarizing available material, he selected 22 rules which he classified according to their relationship to the use of the human body, the arrangement of the work place, and the design of tools and equipment.

Use of the Body. In considering those principles of motion economy related to the use of the human body, the first three appeared to be closely related.

1. The two hands should begin as well as complete their motions at the same time.
2. The two hands should not be idle at the same time except during rest periods.
3. Motions of the arms should be made in opposite and symmetrical directions and should be made simultaneously.

Most people, Barnes (1953) observed, worked productively with only one hand. Additional work could be accomplished through the use of both hands. When using both hands, application of the third principle made it possible to increase output with a minimum amount of fatigue. Symmetrical movement of the arms allowed one arm to balance the other, which in turn reduced shock and jar on the body and enabled the worker to perform with less mental and physical effort.

4. Hand motions should be confined to the lowest classification with which it is possible to perform the work satisfactorily.

Hand motions were classified according to the time, effort, and fatigue involved. These classifications were: (a) finger motions; (b) motions involving fingers and wrists; (c) motions involving fingers, wrists, and forearm; (d) motions involving fingers, wrists, forearm, and upper arm; (e) motions involving fingers, wrists, forearm, upper arm, and shoulder and resulting in disturbance of the posture. In order to confine hand motions to the lowest classification, materials and tools were located as

closely as possible to the point of use so that the hand motions could be as short as the work permitted.

5. Momentum should be employed to assist the worker wherever possible, and it should be reduced to a minimum if it must be overcome by muscular effort.

In most kinds of work, observers noted that the total weight moved by the worker consisted of the weight of the materials moved, the weight of the equipment moved, and the weight of the part of the body moved. The momentum of any of these aided the accomplishment of the work to be done. A forcible stroke, delivered when it reached its greatest momentum, gave maximum power.

6. Smooth continuous motions of the hands are preferable to zigzag motions or straight-line motions involving sudden and sharp changes in direction.

Use of a movement involving stop and change in direction was found to consume 15 to 25 per cent of the total time required by the movement. Other studies indicated that continuous curved motions were preferable to straight-line motions involving sudden and sharp changes in direction. Curved changes in direction were less time consuming and less fatiguing than zigzag motions.

7. Ballistic movements are faster, easier, and more accurate than restricted (fixation) or "controlled" movements.

Barnes (1953) explained ballistic movements as resulting from a single contraction of a positive muscle group with no other muscle group contracting to oppose it. Controlled movements, on the other hand, were in evidence when antagonistic muscle groups contracted in opposition to each other. Ballistic movements used one group of muscles acting at the first of the movement and

remaining relaxed during the last of the movement. Such movements were more powerful, faster, more accurate, less likely to cause muscle cramp, and less fatiguing than controlled movements. With practice, workers found it easy to develop free, loose, easy movements of the wrist and forearm.

8. Rhythm is essential to the smooth and automatic performance of an operation, and the work should be arranged to permit an easy and natural rhythm wherever possible.

Rhythm was interpreted by Barnes as either a regular sequence of uniform motions or a regular sequence of accented motions. The proper arrangement of work place, tools, and materials and the proper sequence of motions enabled the worker to establish a rhythm which made the operation automatic and eliminated mental effort. Habits were found to affect the speed and sequence of motions. Since effort may be required to change or modify a habit, Barnes (1953) found it unwise to change sequences of motions established over a long period of time.

Arrangement of the Work Place. The second group of principles dealt with the arrangement of the work place.

9. There should be a definite and fixed place for all tools and materials.

The ability to perform an operation with little or no conscious mental effort was to the worker's advantage, according to Barnes. Definite places for materials and tools helped to develop habits which permitted automaticity, reduced fatigue, and saved time.

10. Tools, materials, and controls should be located close in and directly in front of the operator.

Workers were found to have a definite and limited area in which they could work with a normal expenditure of effort. The normal work space was determined by drawing an arc with a sweeping motion of, first, the right forearm and then the left. Work could be done conveniently by the two hands where the arcs overlapped. The maximum work area was determined in the same manner, except that the arms were pivoted from the shoulder. Beyond the overlapping area formed by these two maximum arcs, two-handed work could not be accomplished without poor posture and followed by excessive fatigue.

Barnes recommended the arrangement of work places so that the materials and tools used most frequently were nearest to the overlapping area. The use of duplicate items arranged systematically on either side of this zone, permitted the hands to make simultaneous motions in opposite directions while performing the task. Such placement made possible the use of natural, easy, rhythmical movements of the arms.

11. Gravity feed bins and containers should be used to deliver material close to the point of use.

A bin with sloping bottom permitted its contents to be fed to the front of the container by gravity, thus preventing excessive changes in body motions and saving time of the user.

12. "Drop deliveries" should be used wherever possible.

Organization of the work so that the finished product was released into the position in which it was completed and delivered to its destination by gravity, saved time and effort. Disposal

of the objects in this manner freed the two hands so that the cycle could begin simultaneously again and without breaking the rhythm of the task.

13. Materials and tools should be located to permit the best sequence of motions.

Pre-positioning for the next task was done by storing the clean tools or equipment near or at the location of next use. Time could be saved by planning, organizing, and pre-positioning for the best sequence of motions. According to Barnes, the time for the motion, transport empty, was longer when followed by the motion, select, than when followed by a well-defined motion such as grasp of a pre-positioned tool. In the latter case, the mind could select during the transport empty.

14. Provisions should be made for adequate conditions for seeing. Good illumination is the first requirement for satisfactory visual perception.

Good lighting has been found to be one of the most important factors necessary for efficient working conditions. For correct illumination, light of sufficient intensity, the proper color, without glare, and coming from the right direction should be provided. Where this is done, eye-strain and fatigue minimized and errors and accidents decreased.

15. The height of the work place and the chair should be arranged so that alternate sitting and standing at work are easily possible.

Sitting in excess was found to be as tiring as too much standing. As a result, some states have required by law the provision of stools in institutional kitchens so that workers may alternately sit and stand at their tasks.

In order to determine the proper height of his work table and bench, the worker was asked to stand erect without stooping, and with his arms comfortably relaxed from the shoulders. The distance from his elbow to the floor was measured. The work table should be one to three inches lower than the elbow of the user. The distance from elbow to floor should also be the same while sitting as when standing. The seat of the chair should be six to ten inches below the under side of the table to allow for the worker's legs.

In most cases, the height of the work table and bench have been based on the height of the average worker. For women, the distance from elbow to floor was found to be 40 inches and for men, 42 to 43 inches. Therefore, the height of the average work table has been set at from 37 to 39 inches and that of the chair from 25 to 31 inches.

16. A chair of the type and height to permit good posture should be provided for every worker.

For maximum efficiency of the worker and minimum back-strain, Barnes (1953) believed that the body should be kept straight from the hips to the neck and should not be allowed to flex or bend at the waist line. Also, he specified that a rigidly built chair, adjustable in height in order to fit the needs of different users, should be furnished. The chair seat should be form fitting and a back rest provided to support the lower part of the spine.

Design of Tools and Equipment. The last six principles of motion economy outlined by Barnes (1953) were concerned with the

design of the tools and equipment used or to be used.

17. The hands should be relieved of all work that can be done more advantageously by a jig, a fixture, or a foot-operated device.

Until recently, tool and equipment designers have not given much thought to the principles of motion economy. Fixtures, such as water faucets, were hand-operated even though studies proved that foot-operated faucets permitted both hands to be free to perform other motions. When pedals are used, they should be designed to require little effort for manipulation.

18. Two or more tools should be combined wherever possible.

It should be easier to turn small, two-ended tools, end for end, than to lay one tool down and pick up another one. Barnes (1953) also suggested that employees should practice using the third and fourth fingers and the palm of the hand, as well as the thumb and second finger when handling small tools. He pointed out, too, that when small tools did not interfere with the motions of the hand, they should be kept in the hand during the operation.

19. Tools and materials should be pre-positioned whenever possible.

The term pre-positioning was defined by Barnes as the "placing of an object in a predetermined place in such a way that when next needed it may be grasped in the position in which it will be used." Pre-positioning should lead to automatic movement which, in turn, will save time and reduce mental fatigue.

20. Where each finger performs some specific movement, such as in typewriting, the load should be distributed in accordance with the inherent capacities of the fingers.

Even though most right-handed people were observed to perform work with less fatigue and greater dexterity with the right hand than with the left, they could be trained to work equally well with either hand on most factory operations. However, individual fingers on each hand, had unequal inherent capacities for doing work. Studies proved the first and second fingers of the two hands were ordinarily superior in their performance to that of the third and fourth fingers.

21. Handles such as those used on cranks and large screwdrivers should be designed to permit as much of the surface of the hand to come in contact with the handles as possible. This is particularly true when considerable force is exerted in using the handle. For light assembly work, the screwdriver handle should be so shaped that it is smaller at the bottom than at the top.

One effective handle had a straight main shank with a slight indentation near the tip of the forefinger, while another efficient handle had a straight shank with a rounded end. Whatever the shape of the handle, as much as possible of the hand should be used to grasp it; thus providing a low unit of pressure on the hand and so resulting in maximum efficiency.

22. Levers, crossbars, and hand wheels should be located in such positions that the operator can manipulate them with the least change in body position and with the greatest mechanical advantage.

Levers should be placed so that when using them, the worker need not bend over or twist his body in an uncomfortable or strained manner. Hand wheels were found to be most effective when placed in the vertical plane at the 1080 mm. height.

The authors reviewed, drew freely from the principles of motion economy as written by Barnes (1953) for their rules or guides for work simplification to be used in quantity food services. His book, "Motion and Time Study," first published in 1937 and since revised three times, has been the basis for the development of work simplification in large and small quantity food service kitchens.

Ten Principles of Motion Economy. In a talk given in 1950 at a meeting of the Kansas Dietetic Association, R. C. Wishart pointed out that the 22 principles of motion economy had been condensed into 10 for use in factories and elsewhere. He declared without reservation that these principles could be applied to any job whether it was done on a turret lathe, a typewriter, or a kitchen table. In his opinion, every worker should be trained in the use of the following rules in order to perform his operations economically:

1. The height of the work place and the chair should be arranged to permit alternate sitting and standing at work. Adequate lighting should be provided, and the worker should be made as comfortable as possible.
2. There should be a definite and fixed place for all tools and materials.
3. Gravity feed bins and containers should be used to deliver materials close to the point of use.
4. Tools and materials should be located close in and directly in front of the operator so as to be within easy reach of the hands. Transport distances should be as short as possible and movements should be as few as possible.
5. Tools and materials should be pre-positioned wherever possible.

6. "Drop deliveries" should be used wherever possible.
7. Materials and tools should be located to permit the best sequence of motions. Rhythm is essential to a smooth easy work pattern.
8. Motions of the hands should be simultaneous and symmetrical.
9. Smooth continuous motions of the hands are preferable to zigzag motions or straight-line motions involving sudden and sharp changes in directions.
10. The hands should be relieved of all work that can be done more advantageously by the feet. Power-operated tools and equipment should be used wherever economical. A vise jig or fixture should be used to hold the work wherever possible, thus releasing the hands to productive work.

Five Principles of Motion Economy. For use in training employees, Ercole (1951) further condensed the principles of motion economy into the five which follow:

1. Smooth continuous motions of the hands are preferable to zig-zag motions or motions involving sudden or sharp changes in direction.
2. The sequence of motions should be arranged to build rhythm and automaticity into the operation.
3. The hands should be relieved of all work that can be done by the feet or other parts of the body.
4. There should be a fixed and definite place for all tools and materials.
5. Drop disposal and gravity feed chutes should be used wherever possible.

Guides to Work Simplification. Eleven guides were developed by McKinley (1956) for use in a work simplification training program for food service workers. Terminology was used which could be easily understood by the employees. The first three guides were related to tools, equipment, and work place. They were

listed as:

1. Use the available equipment that is best for the job.
2. Keep tools, equipment, storage, and work place in good working order.
3. Have equipment and supplies within easy reach at the place where they are used.

The second set of four guides dealt with hand and body motions and were as follows:

4. Let both hands do useful work at the same time, when possible.
5. Perform work in a rhythmic way--use smooth, continuous, curved motions.
6. Use the fewest, shortest, and simplest motions.
7. Maintain a comfortable working position, and bring the work you are doing right in front of you if possible.

The last four guides written by McKinley were concerned with the work process or sequence.

8. Arrange work areas to eliminate unnecessary walking or reaching.
9. Eliminate or combine parts of a job, if possible.
10. Plan the order and time of work for best results.
11. Standardize procedures to eliminate the need for repeated decisions.

Principles of One-Motion Storage. Unnecessary time and effort were spent in quantity food service kitchens as a result of poor storage, according to Kotschevar (1957). To remedy this situation he developed principles of one-motion storage which meant that food, tools, or utensils were handled only once from

the time of storage until use. In order to apply this labor-saving technique, food or equipment had to be stored as close as possible to the point of use. Principles of one-motion storage as listed by Kotschevar were:

1. Store frequently used items in the most accessible places and less frequently used items in less desirable spots.
2. Store at the point of first use.
3. Plan and organize storage.
4. Eliminate unneeded storage.
5. Store only like items in front of one another.
6. Storage place is frequently determined by weight of the item to be stored.

Benefits Derived from the Use of Work Simplification

In food services, benefits derived from the use of the tool, work simplification, may relate to management, as exemplified by the supervisor, or to the worker. Obviously there will be some overlapping of benefits in both of these areas.

Management. Motion studies in food service units, said Thomas (1947), could lay the basis for recommendations for labor-saving equipment and facilities which would be more practical and more efficient than those acquired without study.

Because of a tremendous amount of wasted effort in the average food preparation center, Schmid (1948) believed that there were great possibilities for the application of work simplification in these units. According to this worker, work simplification should provide the means by which a greater percentage of

effort expended by employees in the kitchen could be directed into effective channels. In some cases, work loads could be reduced as much as from 20 to 50 per cent.

Spickler (1948) noted that through the use of work simplification in quantity food services, not only would better methods for doing work be evolved, but proper use of time for all concerned would result. Wishart (1950), an industrial engineer who cooperated with Smull, a dietitian, in the making of motion and time studies in a food service kitchen, pointed out that food services could be studied and improved in much the same manner as industrial operations. Although large savings would not necessarily result from individual studies, Ercole (1951) was convinced that the continual application of the principles of work simplification would produce substantial reductions in operating costs for the food service operator. Such a program would also insure employees well-trained to follow efficient methods, thus releasing more of the supervisor's time for non-routine problems. Ercole also believed that the sincere supervisor could not help but find satisfaction in the increased efficiency of his workers.

When staffing work stations, careful analysis of process charts and the analysis of work procedures in a specific work area should aid the supervisor to distribute work loads fairly, as well as to improve work methods, Wright (1953).

Several advantages for management which resulted from an adequate training program were cited by McKinley (1956) as: increased learning rate, increased quality of performance,

decreased breakage and spoilage, reduced number of accidents, reduced labor turnover, reduced absenteeism, and increased production.

The Worker. Several authors noted that workers should benefit from the application of the principles of work simplification in food services through uniform work loads, decreased fatigue, and increased attention of management to the worker's comfort. McKinley (1956) added increased earning power, preparation for advancement, enhanced self-respect, and increased feelings of security and economic independence.

Training Programs

Working people receive three incomes--cash, real, and psychic, contended Esray (1947). Psychic income, an intangible, results from the satisfactions of the job and is the real reason most people work. Esray also stressed that security in employment depends not only upon the employee's self-confidence, but upon his training experience and his relationships with his supervisors.

In food services, management's responsibilities as outlined by Mitchell (1955) were to: serve good quality, nutritious food in pleasant, sanitary surroundings; train personnel in their respective work; offer them progression; create for them a pleasant working atmosphere; and organize the department efficiently, so that these goals can be accomplished within a predetermined operating budget.

To achieve the goals resulting from the needs of employees and the responsibilities of management, an effective training program becomes imperative.

Definition of Training. Training was defined by Lundberg (1958) as the vehicle by which information, skills, and attitudes were communicated to others. Education was for the purpose of implanting ideas and attitudes, and training attempted to build habits of performance into the learner. Such a definition placed the burden of responsibility upon the trainer who was assumed to have the best information, skills, and attitudes available.

Basis of Training. The basis of a training program should be understanding between management and workers, concluded Mitchell (1955). Training, the formal method and process used by management to develop or modify skills, knowledge, and attitudes of the employee, should contribute to the welfare of the food service as well as to that of the employee.

Lundberg (1958) claimed that effective training required definite goals and set standards. In his mind, definition of the training problem was as important as the training itself. He advocated that training goals be set up for the overall organization as well as for each task.

The Trainer. Although management should initiate the training and keep the program alert to changing needs, Lundberg (1958) believed that at least 85 per cent of the actual training should be handled by supervisors. His reasons were:

(1) training gives the supervisors prestige and importance in the eyes of the learner; (2) the emotional relationship between trainer and learner can be one which makes for a better supervisor-employee relationship; and (3) emphasis on training keeps supervisors alert to new ideas and makes for personal job satisfaction.

McKinley (1956) emphasized that top management should support training programs, but noted a difference in opinion as to who should do the training. Most authors agreed that the individual selected to be the trainer should have demonstrated an aptitude for instructing others, along with a sound knowledge of the structure of the organization and his particular responsibilities as the trainer.

The Trainee. Employees in need of training were listed by Mitchell (1955) as follows: (1) old employees who must learn new procedures and methods pertaining to their jobs; (2) old employees who have been upgraded to new jobs; and (3) new employees who must be trained quickly and efficiently, as well as oriented to the new place of work.

Organization of the Training Program. The authors reviewed concurred in the belief that the training program was most effective when divided into several parts. A training program worked successfully for Mitchell (1955) when divided into the following periods: (1) introduction or orientation period which, among other things, developed pride in the job; (2) on the job training; (3) group training; and (4) follow-up training.

Principles of teaching used advantageously in this program were telling, demonstrating, repeating, and questioning.

Ten Commandments of Training. Ten commandments of training attributed to Lundberg (1958) should be of value to every supervisor.

1. Be selfish; want to make your job easier. Trained employees do better work and do it faster with less effort.
2. Have patience. Rome was not built in a day. Neither can a good fry cook, dishwasher, or porter be trained in "one easy lesson."
3. Avoid criticism of the "old way." No one wants to feel that the way he has been doing a job is wrong. Use the approach, "here is a better way." Never put anyone "on the spot."
4. Put yourself in the learner's place. Recognize that learning is work. Take the learner along with you one step at a time. What seems easy to you may have taken you months to learn.
5. Speed learning with plenty of praise. Encouragement is oil to the wheel of the mind. Most supervisors give far too little praise. Look for things to praise.
6. Set realistic goals. Set a goal that the learner can reach. Let him experience success in each step of the training road. Start off with easy standards. Step them up as the learner progresses.
7. Recognize different mental capacities. Some employees can learn twice as fast as others. Don't be disappointed with those persons who are not very bright. They may make the best porters or dishwashers.
8. Start with a job breakdown. The trainer needs a plan of teaching. Without a plan he is like a home builder without blueprints.
9. Space the training periods. Learning is more efficient when it is spread out. A half-hour a day is probably enough training for most jobs. Learning goes on in the mind between training sessions.

10. Be enthusiastic, positive, encouraging, optimistic, but do not expect miracles. Remember that if the employee has not learned, the trainer has not taught.

Work Simplification Training Programs for Food Services

Work simplification, said Spickler (1948), should be the organized application of common sense to find easier and better ways of doing work. This did not mean necessarily working harder and faster, but placing the emphasis on finding a better way to do a task through the elimination of any part of the job adding nothing to the value of the product.

Introducing Work Simplification to Employees. It is important to remember two traits common to all people, stressed Spickler (1948). These are resistance to change, and resentment of criticism. When changes involve new work procedures, both West (1955) and Clipping (1957) suggested that the temperaments and abilities of the employees involved should be carefully considered. They emphasized that employee interest, understanding, and cooperation were essential to the successful operation of work simplification in a food service. West maintained that once the employee learned and applied the principles involved, saw objectively the benefits derived from the altered procedures, and became motion conscious, the elimination of unnecessary motions was easy.

The Work Simplification Training Program. A work simplification training program should be developed to fit the needs of

the food service for which it is intended.

Objectives for a Work Simplification Training Program for Employees. Six objectives were given by McKinley (1956) for a work simplification training program.

1. To provide an understanding of work simplification which will make the workers receptive to analysis of their jobs, to methods proposed by management, and to adoption and use of the methods prescribed.
2. To improve management-labor relations and increase the interest of employees in their work.
3. To stimulate employees to make suggestions for improving work methods.
4. To assist the workers to improve those methods of work which are determined by them.
5. To lower cost.
6. To give impetus to a continuing program of work simplification.

Spickler's Plan. In order to apply successfully the principles of work simplification, Spickler (1948) believed it was essential to have the approval of top management, an effective channel of communication, the incentive to use the tool, an effective follow-up program, and the determination to stay within the framework of the employees' abilities.

It was demonstrated to the workers that the use of work simplification in quantity food services would reduce fatigue; increase efficiency; standardize methods, materials, tools, and equipment; increase production; and insure more uniform quality in the products made. The workers were then instructed in the use of the tools of work simplification. These tools included

the principles of work simplification; an open mind; an inquiring, questioning, and challenging attitude; and a five-step formula for simplifying work. The steps in this formula were: (1) pick the job to be improved; (2) break the job down into details; (3) question and challenge the job and its details; (4) work out a better method; and (5) apply the new method.

After learning how to use these tools, the employee was told to back far enough away from the job to see it as a whole and then to work out his own improvements. Since the innovations were those of the employee, resistance to change or resentment of criticism were not exhibited.

The Scientific Approach. According to Carlson (1954), the scientific approach prevented employee rejections. Such a presentation was accurate, interesting, and easy to explain and understand. High supervisory skill was required in order to use the principles of motion economy as a tool of management in quantity food production. The procedure for their use was to: (1) write down each activity in the job and prepare a complete and detailed description of the job as it is presently being done, including the use of men, materials, and equipment; (2) question each and every activity; and (3) devise a better method.

The authors reviewed were agreed that the principles of work simplification were applicable to quantity food services, that every worker should be trained in these principles, and that progress would be dependent upon management and skilled supervisors with a knowledge and understanding of the tool, "Time and

Motion Economy."

Use of Audio-Visual Aids in a Training Program

Films. One of the first audio-visual aids used in time and motion investigations was the micromotion study developed by the Gilbreths in 1912, Barnes (1953). Motion pictures were taken of the operation being studied with a timing device prominently displayed. The time lapse was determined for each motion and each set of motions. The film could either be scanned, frame by frame, or projected on a screen at different rates of speed. Convenient to use, this tool afforded an accurate presentation of detail.

Films, both movies and slides, are used today in many food services to demonstrate correct procedures to be used in the different areas of the institutional kitchen and its supplementary units. When included in the training program, film lessons should be previewed before use so that points of emphasis can be explained to the viewers. A review of the film following the showing should be scheduled to re-emphasize important sections and to answer any questions. The usefulness of the motion picture as a teaching aid will be dependent upon its coverage of the subject matter and the manner of its presentation.

Travelgrams. Smull (1952) found the travelgram an effective method of showing the employee how far he had traveled doing a specific task. Proof was offered that weary feet could have relief if the employee cooperated in working out procedures that

would eliminate unneeded steps. The worker soon began to question why he went from one place to another. When this occurred, he was in the right frame of mind to undertake another work simplification study and to discuss improvements with his supervisor and fellow workers.

Posters and Photographs. Posters have been found to be helpful in stimulating the learning experience. Their contribution will be dependent on both the appropriateness of their material and the way in which it is used. McKinley (1956) stated that poster material should have eye appeal, should be suitable to the level of the ability of the employee to comprehend, should use a variety of devices to reach the various abilities of the viewers, should be as like the real condition as possible, should utilize the maximum of the senses, should be geared to the goals of training, and should assist in creating the desired attitudes.

Pictures were used by Pfeiffer (1955) to help eliminate variations in appearance, plating, arrangements of various items, and portion sizes. Photographs of correct table service aided in the development of the right procedures for this task. This worker also used pictures for salesmanship and publicity purposes and was convinced that they were more effective in promoting safety than were posters. Amateur photographers were cautioned to be sure that the material covered in the picture was to the point if the employee was to learn from the photograph. Pfeiffer concluded that "The best training tool available is the audio-visual presentation," while McKinley (1956) stated, "The sensory

devices used should be made a part of the total learning situation." Slides produced a mental image of the items shown and hastened the learning process, Goldrath (1955).

Although from the literature reviewed, it was apparent that the audio-visual presentation was being used more and more in the field of work simplification for quantity food services, there still appeared to be a need for the continued development of motion pictures, slides, photographs, and posters in this area.

METHOD OF PROCEDURE

Preliminary Work

In order to develop material and ideas suitable for use in a work simplification training program for food service employees, it was believed the program, itself, should be planned and executed. To do this, certain decisions were required, such as: (1) demonstration of the need for such a training program with visual aids; (2) selection of a suitable food service for the study; (3) determination of the status of knowledge of the employees in this food service, regarding the principles of work simplification; and (4) evaluation of the ability of these employees to apply any knowledge they might have of the principles of work simplification.

Inspection of Several Kansas Food Services. A trip was made to Wichita, Kansas to visit several representative food services to see if principles of work simplification were utilized; and if so, how employees were trained in their use. Six institutional

kitchens were inspected including the following: hospital, high school cafeteria, industrial, commercial, college residence hall, and college union.

Knowledge of Supervisors. Although all supervisors and managers contacted indicated awareness of, and interest in methods improvement, little or no work appeared to have been done in most cases. Reasons given for this failure were divergent employee schedules and/or lack of time due to the type of menu used and the number and skill of employees. The food supervisors postulated that effective training programs should result in less employee turnover than was usual in most food services; but, because of inadequacies of training methods used, they found it difficult to offer proof that this was true.

Kitchen Lay-outs. The kitchens visited varied from very old, inadequately equipped to new generously furnished units. Some of the older kitchens had expanded to meet current needs without evidence of too much forethought; whereas others had definite plans for enlargement, and efficient use. All kitchens were divided into specific work areas.

Principles of Work Simplification Observed in Use. In all of the food services visited, an attempt was made to supply each work area with it's own set of tools to avoid loss of employee time in looking for, waiting for, or rewashing utensils before use. In many cases, the kitchens were arranged so that storage was at the point of first use. Examples noted were: potatoes and other tuberous vegetables near peeler; meat freezers and

walk-in refrigerators near meat preparation area; thawing racks with drain near meat preparation area; tubes to pipe fat from grill to can for easy future storage; bain-maries to keep food hot near ranges; mixer bowls near mixer; stock pots near water supply for cooking and cleaning; pans to be filled with freshly cooked vegetables near steam equipment; open shelves in bakery for storage of pans near work table; pass-through refrigerators from kitchen to serving counter; racks in walk-in refrigerators to hold shallow counter pans; and many sizes of carts available in areas where needed.

Frequently used items were stored in accessible places and those used not so often, in less easily reached spots. Drawers were arranged so that frequently used utensils were stored where they could be seen and readily grasped. In some kitchens, the supervisors pointed out that labeling spice bins, large bins on wheels, cabinets, and refrigerators saved time and patience of the workers.

Principles of Work Simplification Not Applied Efficiently. Examples of the need for improved application of some of the principles of work simplification were noted as: insufficient carts and bins on wheels; obsolete equipment; refrigerated and dry storage too far from the point of first use; too few can openers, inconveniently placed; inadequate lighting and ventilation; incorrect table heights; uneven, ill-kept floors; and poor arrangement of work areas.

Inconveniently arranged work areas observed were: vegetable peeler on the far side of the kitchen from the walk-in refrigerator and vegetable and salad preparation units; vegetable preparation unit across the kitchen from the steamer and steam jacketed kettles, necessitating cross traffic; switch for the vegetable peeler on opposite wall; and insufficient duplication of equipment in the various work areas.

A time consuming and inaccurate work procedure, seen in one institutional kitchen, was the measuring of large amounts of dry ingredients volumetrically instead of by weight with scales. Employees were observed working with only one hand, carrying heavy loads with one hand instead of two or using a cart, utilizing zigzag motions instead of smooth continuous motions, wasting time searching for misplaced utensils or ingredients, working at improper table heights, and wearing uncomfortable clothing.

Training Programs in Work Simplification. None of the establishments visited had a formal training program in work simplification, as such. In the industrial and commercial units observed, any information given to the employee on this subject, was through occasional individual instruction in the arrangement of the work place. The institutional kitchen workers in the high school cafeteria received training in work simplification when attending the school food service work shop held each summer.

The food supervisors and managers of the food services visited expressed a need for a good employee training program in work simplification. They were interested in the proposed

development of an employee training manual, pictures, posters, and other visual aids which might be made available for use in a training program. In their opinion, a personal copy of a work simplification manual would stimulate the workers to apply the principles, not only at work, but also at home.

On the basis of this inspection trip, it was evident that a training program in work simplification, keyed to food service activities, would be welcomed by many food service managers and supervisors in Kansas.

Location of Proposed Training Program. Because the worker responsible for the development of the proposed training program in work simplification for food services was the dietitian in charge of the Van Zile Dining Hall, this unit was selected for use in this study.

Physical Characteristics of Van Zile Dining Hall. The first residence hall at Kansas State University, Van Zile Hall, was built in 1926 with money appropriated by the state legislature and was planned to house 130 college women. At the time of this study, 33 years later, it was one of four halls in use and accommodated 155 residents.

Remodeling of the kitchen area in 1954 involved not only the addition of 182 square feet of space, but the installation of new and rearrangement of old equipment. A well designed, attractively furnished dining room supplied a pleasant place for students to eat meals around tables seating six to seven persons. Dinners were served family style, with the exception of Friday and

Saturday nights, which reverted to the cafeteria service used for breakfast and lunch.

Organization of Food Service Personnel. The social director, working in cooperation with the associate dean of students, was in charge of all social activities of the residents. The dietitian, a member of the department of institutional management staff, was responsible for the management of the food service operation.

Because the university administration believed that residence hall life should offer a form of gracious living, special dinners were included in the social program as a part of the educational experience. Responsibilities for these extraordinary functions were delegated as follows: invitations and seating arrangements, the social director aided by the student social chairman; table decorations, dining room supervisor and two other residents; food and service, the dietitian assisted by either a graduate student in institutional management or by another dietitian alternating half time between halls.

Employees, under the supervision of the dietitian, were women employed as cooks or institutional workers under state civil service regulations and wage scales, and students. All workers were obliged to undergo successfully a food handlers health examination. In order to receive the classification of cook and commensurate wages, employees were required to pass a civil service examination covering cooking methods and procedures. All residence halls but one, were operated for a nine-month period. The

work week was 44 hours.

At Van Zile Hall, four full-time and two part-time employees were needed. Regular employees were the breakfast and lunch cook, dinner cook, baker, and salad preparation worker. A part-time employee served as relief cook and was scheduled for special cleaning. These positions were filled by homemakers working to supplement the family income. They usually were living, or had lived, in rural areas; and often had been active in community affairs, home demonstration groups, and 4-H work. Some had held professional jobs, such as teaching in rural schools. About half of the women employed in the residence halls were widows who had moved to town in order to obtain work.

Students living in the halls who wished to work were given the opportunity to do so and were paid an hourly wage for their services. Two male students lived in the dormitory and worked in return for board and room, plus an hourly wage for overtime. Men student employees, not living in the hall, were paid an hourly wage for work done over and above the two and one-half hours required each day to earn their meals.

The number of student employees utilized differed for each meal. Girls were used as waitresses in the dining room; to serve food at the cafeteria counter; and in the kitchen to set up salads and desserts, to dish food for the tables when family style service was used, and to clean work areas. Boys served as waiters in the dining room, bus boys for the serving counter, and storeroom boy in the kitchen. They also washed dishes and

pots and pans; and did heavy cleaning such as sweeping, scrubbing, and washing out walk-in refrigerators.

Employee Training Program. At the time of employment, the dietitian explained the policies of the residence hall food services to the new worker, who also was given a policy book, or in the case of student employees a policy sheet, to be used as a reference (Figs. 1 and 2, Appendix). During this initial conference, the duties of the regular workers and the student helpers were described; and the importance of cooperation of all employees was stressed.

Each dietitian was responsible for giving instructions to the workers in her food service. Some of the dietitians used the retiring employee to train the replacement. Other dietitians preferred to train the new worker, and thus avoid the transmission of bad habits. In addition to instruction in procedures to be used for daily tasks, knowledge needed later was included as possible. An extended training period was necessary, since the menu and type of service varied throughout the year. Work schedules were posted, which aided the new employee in learning how to plan and organize his work in a logical sequence. Detailed work sheets were made by the supervisor until the employee had learned correct preparation procedures for the different foods appearing on the menu.

Each year, four employee meetings were planned for all residence hall institutional kitchen workers. Some of the subjects covered were sanitation, work simplification, meat cookery,

deep fat frying, yeast breads and rolls, and quick breads. Discussions, reports, demonstrations, and movies were used. On occasion, representatives of different departments in the University assisted, as when the professor of bacteriology conducted a meeting on sanitation.

Employees' Knowledge of the Principles of Work Simplification. The four full-time employees working at Van Zile Hall had served on the kitchen force for from two to seven years at the time of this study. During this period, they had received some training in motion and time economy from the staff dietitian and from senior students majoring in dietetics and institutional management or restaurant management at the college. In order to determine how much these employees knew about the principles of work simplification, as well as their ability to apply any such knowledge to their work, a period of observation was undertaken.

Indexed for easy use, a notebook was prepared containing the 22 principles of motion economy related to the use of the human body, the arrangement of the work place, and the design of tools and equipment, as listed by Barnes (1953). The four workers who were cooperating in the study were observed as they went about their daily tasks. Each employee was assigned a number I through IV. As the use of various principles was witnessed, appropriate notations were entered in the notebook with the number of the corresponding employee.

Development of Training Program in Work Simplification for Food Service Employees

As a result of information obtained from the survey of the literature in the field of motion and time economy, and the periods of observation held in some food services in Kansas and in the Van Zile Dining Hall kitchens, a training program in work simplification for food service employees was planned. Thirteen principles of work simplification were selected as the material to be taught. An interview was used to introduce the four full-time employees individually to the program, its objectives, and the 13 principles of work simplification to be studied. Devices utilized to explain and demonstrate the principles were process charts, operation charts, travelgrams, posters, pictures, and an employee hand book listing the 13 principles and illustrating their application. At the end of the training period, a second conference was scheduled with each employee to determine reaction to the program.

Principles of Work Simplification to be Related to Institutional Kitchen Activities. From the various principles of motion economy surveyed in the literature, which related to the use of the human body, the arrangement of the work place, and the design of tools and equipment, the following 13 rules were organized and worded in terms which could be easily understood by all workers:

1. The height of the work place and the chair should be arranged to permit alternate sitting and standing at work. Good lighting and ventilation are important. The worker should be as comfortable as possible.

2. Muscles are tools. Use the right ones for the job being done.
3. There should be a definite and fixed place for all tools and materials.
4. Gravity feed bins and containers should be used to deliver materials close to the point of use. Bins and large containers should be on wheels.
5. Tools and materials should be located close in and directly in front of the operator. Tools and materials should be within easy reach of the hands. Transport distances should be as short as possible and movements should be as few as possible.
6. "Drop Deliveries" should be used whenever possible.
7. Materials and tools should be located or pre-positioned to permit the best sequence of motions.
8. Motions of the hands should be simultaneous and symmetrical. Rhythm is essential to a smooth easy work pattern.
9. The two hands should begin as well as complete their motions at the same time. The two hands should not be idle at the same time except during rest periods.
10. Smooth continuous motions of the hands are preferable to zigzag motions or straight line motions involving sudden and sharp changes in direction.
11. The hands should be relieved of all work that can be done more advantageously by other means.
12. Hand wheels and handles, such as those used on cranks, should be designed to permit as much of the surface of the hand to come in contact with the handle as possible.
13. Plan ahead.

Introductory Interview. An interview was planned to be conducted with each employee individually. The purpose of this conference at the beginning of the training program was to

explain the project to the workers and to ask for their cooperation. Points covered were: management's interest in the motion and time economy methods to be used in the development of a work simplification program at Van Zile Dining Hall and the 13 principles or rules of work simplification to be utilized in the program. Each employee was asked for comments and suggestions pertaining to her particular work area.

During the interview, reasons stressed for proposing research in the area of work simplification in institutional kitchens were to: reduce fatigue; increase efficiency; standardize methods, materials, tools, and equipment; increase production; insure uniform quality; assist in training employees in new methods; and assist in training new employees. It was pointed out that information obtained in this study would help supervisors and workers in institutional kitchens everywhere.

The interview was concluded by asking for employee comments and suggestions, thus giving each worker an opportunity to express her feelings toward such a study. The following questions were included in the interview to stimulate the employee to discuss work simplification: (1) what jobs make you tired; (2) what improvements could be made in your work area; (3) do you have adequate lighting and ventilation; (4) does your clothing bother you while working.

The individual approach was used rather than a group meeting, because it was believed that the interest of each worker in the project might be stimulated through personal contact with

the supervisor and that each one might talk more freely than when in a group. In this way, too, one person could not monopolize the project leader's time.

Process Chart. The process chart may be used for product and man analysis. In product analysis, the steps of procedures involved in performing work required to modify a product from one stage of completion to another are delineated. This type of study is valuable in planning or revising the institutional kitchen layout for efficient arrangement and use of equipment. On the other hand, the man analysis chart shows the steps followed by an employee in doing a job, and may be used in re-organizing the task. For the purpose of this study, man analysis was used to assist the workers in the systematic scrutiny of tasks believed in need of improvement.

Design of Process Chart. A form was designed to present graphically, through the use of colored symbols representing specific processes, the separate steps involved in a given job. Thus, the entire task could be condensed into a compact, easy-to-interpret outline (Fig. 3, Appendix).

The employee was observed at a given task; and, using the form for the process study chart, the explanation for what was done and the length of time required for each distinct step was noted. After this was completed for the whole task, the appropriate colored symbols were added (Fig. 3, Appendix). Each symbol had a code color which simplified the determination of repetition in any process. The five symbols and their respective

colors were: green O for operation or main steps in the process, black arrow for transportation or movement, red D for delay, blue inverted triangle for storage, and yellow square for inspection or examination for quality and/or quantity.

Use of the Process Study Chart. The completed chart was studied for possible methods improvements, such as: elimination of all unnecessary work, combination of operations or elements, changes in the sequence of operations, and simplification of necessary operations. For the elimination of operations, guides were: elimination, combination, shortening, and/or simplify. Steps were changed by listing as unnecessary, changing the order of the work, use of new or different equipment, changes in the layout such as improved grouping of the equipment, changes in the form of the product, and/or increased knowledge on the part of the worker.

Points considered when eliminating excess movements were the omission of unnecessary operations, rearrangement of the work area or layout, changing of old equipment or addition of new equipment, and/or changing the order of work.

The process chart was used also to reveal delays which could be eliminated, combined, or shortened by changing the order of work, layout, and/or by new or different equipment.

After detailed study of the completed chart, suggested changes were discussed with the worker, tested by use, and a process chart made of the new method (Fig. 4, Appendix). If this did not prove satisfactory, other possibilities for

improvement were identified. At this point, further study using an operation chart might be feasible.

Operation Chart. Operation charts were used to describe work done in a job taking place at one location. They were used also, not only to improve performance of a task, but to train employees to do new tasks or use new procedures for old tasks.

Design of the Operation Chart. In the chart developed for use in this study, symbols were used to denote the various movements of both the left and right hand (Fig. 5, Appendix). These symbols were small circle for transportation, such as moving the hand to grasp an article, and large circle for actions such as grasping, positioning, using, and releasing the article.

Use of the Operation Chart. As the employee worked at the task under scrutiny, the supervisor filled in the description of the actions of the left and right hand. On completion of the job, the appropriate symbols were entered on the chart (Fig. 5, Appendix). Systematic study of the completed chart helped to eliminate all unnecessary motions and to rearrange the necessary ones in the most logical sequence.

Factors Affecting an Operation. In addition to the motions used in the performance of a specific operation; materials, tools, equipment, working conditions, the worker, and other factors affecting the job were considered. A series of questions of assistance in appraising the overall operations, were: (1) can the operation be eliminated; (2) can the work be done in multiples; (3) can the machine speed or feed be increased; (4) can

an automatic feed be used; (5) can the operation be divided into two or more short operations; (6) can two or more short operations be combined into one; (7) can the sequence of operations be changed; (8) can the amount of scrap and spoiled work be reduced; (9) can the part be pre-positioned for the next operation; (10) can interruptions be reduced or eliminated; (11) can an inspection be combined with an operation; (12) is the machine in good condition.

The individual worker also required careful analysis in relation to the task being investigated. Helpful questions were: (1) was the operator qualified mentally and physically to perform the operation; (2) could unnecessary fatigue be eliminated by a change in tools, fixtures, layout, or working conditions; (3) was the base wage correct for this kind of work; (4) was the supervision satisfactory; (5) could the employee's performance be improved through further instruction.

Adequate lighting and ventilation were known to reduce fatigue, limit the number of errors and accidents, and improve sanitation. In order to determine the part played by these factors in the job under consideration, the following questions were asked: (1) were the light, heat, and ventilation satisfactory for the job; (2) were washrooms, lockers, restrooms, and dressing facilities adequate for the job; (3) were there any hazards involved in the operation; (4) was provision made for the operator to work in either a sitting or standing position; (5) were the length of the working day and the rest periods set for maximum

economy; (6) was good housekeeping maintained throughout the institutional kitchen.

Any new procedures evolved from study of the operation chart were discussed with the employee. The improved method was tested and another operation chart made (Fig. 6, Appendix). After the second study, the new method was either approved or other changes were initiated.

Travelgrams. To enable the workers to visualize the process chart analysis, the travelgram was used. This device demonstrated the distance and direction traveled during the accomplishment of a task. To facilitate the making of travelgrams, a drawing of the Van Zile Hall kitchen was made, using a scale of one-fourth inch per foot. Blueprints were made of this drawing (Form 1, Appendix).

For the travelgrams which were not to be photographed, the blueprint was secured to a piece of corrugated cardboard. At each point in the kitchen where the worker changed direction while doing the task being studied, a straight pin was placed on the corresponding point of the blueprint. Using the process chart, measured colored thread or string was used to retrace the employee's steps on the travelgram. Two travelgrams were made, one for the original process chart and one for the revised method exemplified by the second process chart. By calculating the amount of thread or string used and adjusting it to the scale used on the drawing, the number of steps traveled could be estimated, as well as the number of steps saved by the proposed method.

For the travelgram which was to be photographed, the kitchen blueprint was mounted on three-fourths-inch thick plywood (Plates I and II). Bridge nails from which the heads had been removed, were substituted for the straight pins used with the cardboard. An added advantage of these nails was the fact that they were grooved, so that the thread could be held in place at different levels.

Posters. Throughout the period of the study, posters were placed on the employees' bulletin board in the kitchen to stimulate the workers to use the tool, work simplification, and to supplement the teaching aspects of the training program. Two types of placards were designed. For one kind, the emphasis was on work simplification as a whole (Plates III, IV, V, and VI). For the second kind, principles of work simplification were either illustrated or listed (Plates VII, VIII, and IX).

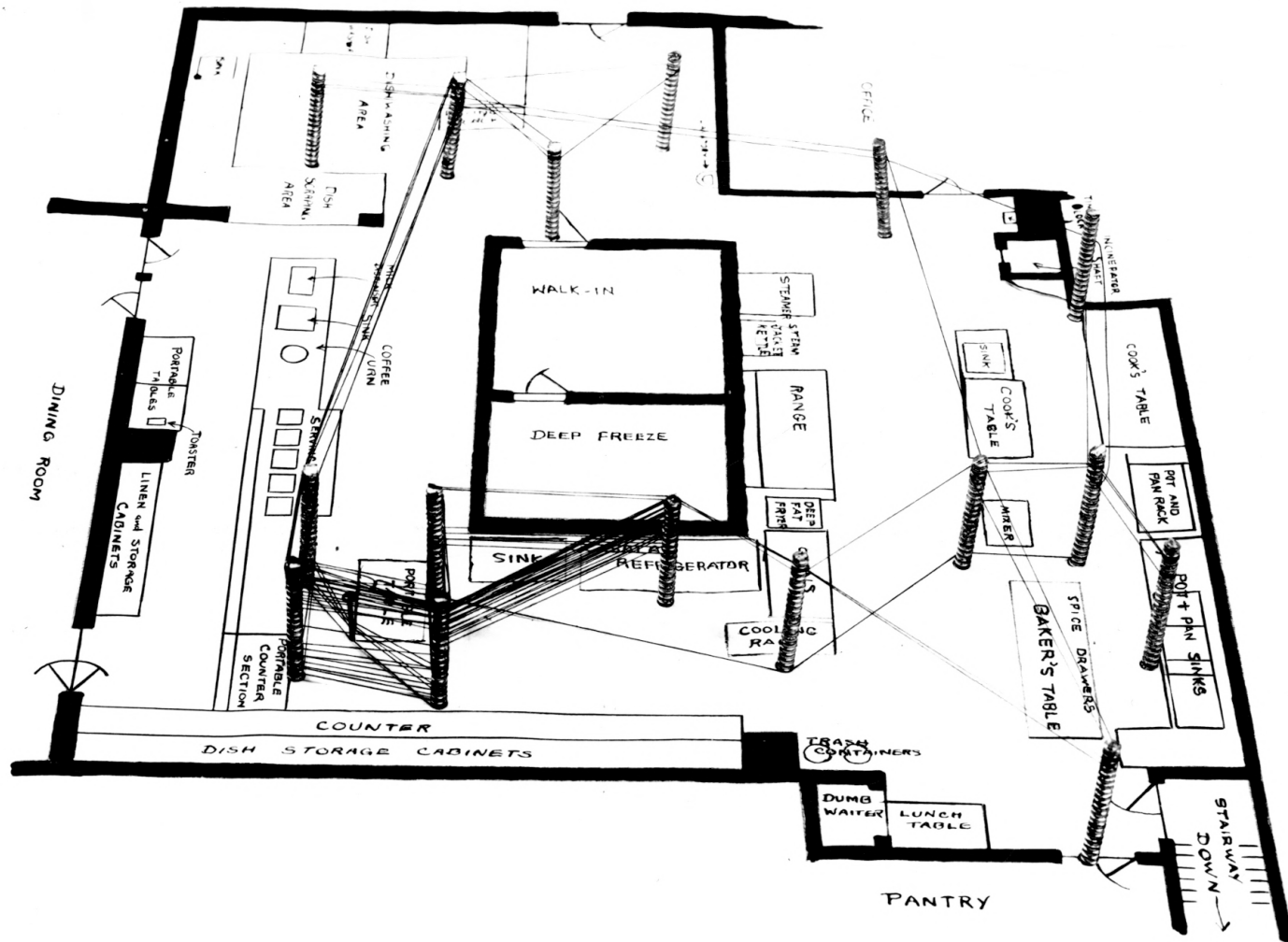
Guides used in planning each poster were that: the wording be short, concise, and to-the-point; the pictures or drawings illustrate the point being emphasized; eye appeal be utilized; the material be appropriate to the immediate learning experience; and the material be suitable for the level of the ability of the workers to whom it is directed. Many ideas were found in books, magazines, journals, and on-the-job experience. Humorous posters seemed particularly effective.

Pictures. A simple camera with flashlight attachments was used to take more than 80 pictures illustrating "right and wrong" procedures and "before and after" methods. Employees doing actual

EXPLANATION OF PLATE I

Travelgram made from process chart showing original method of making tossed vegetable salad (Fig. 1, Appendix).

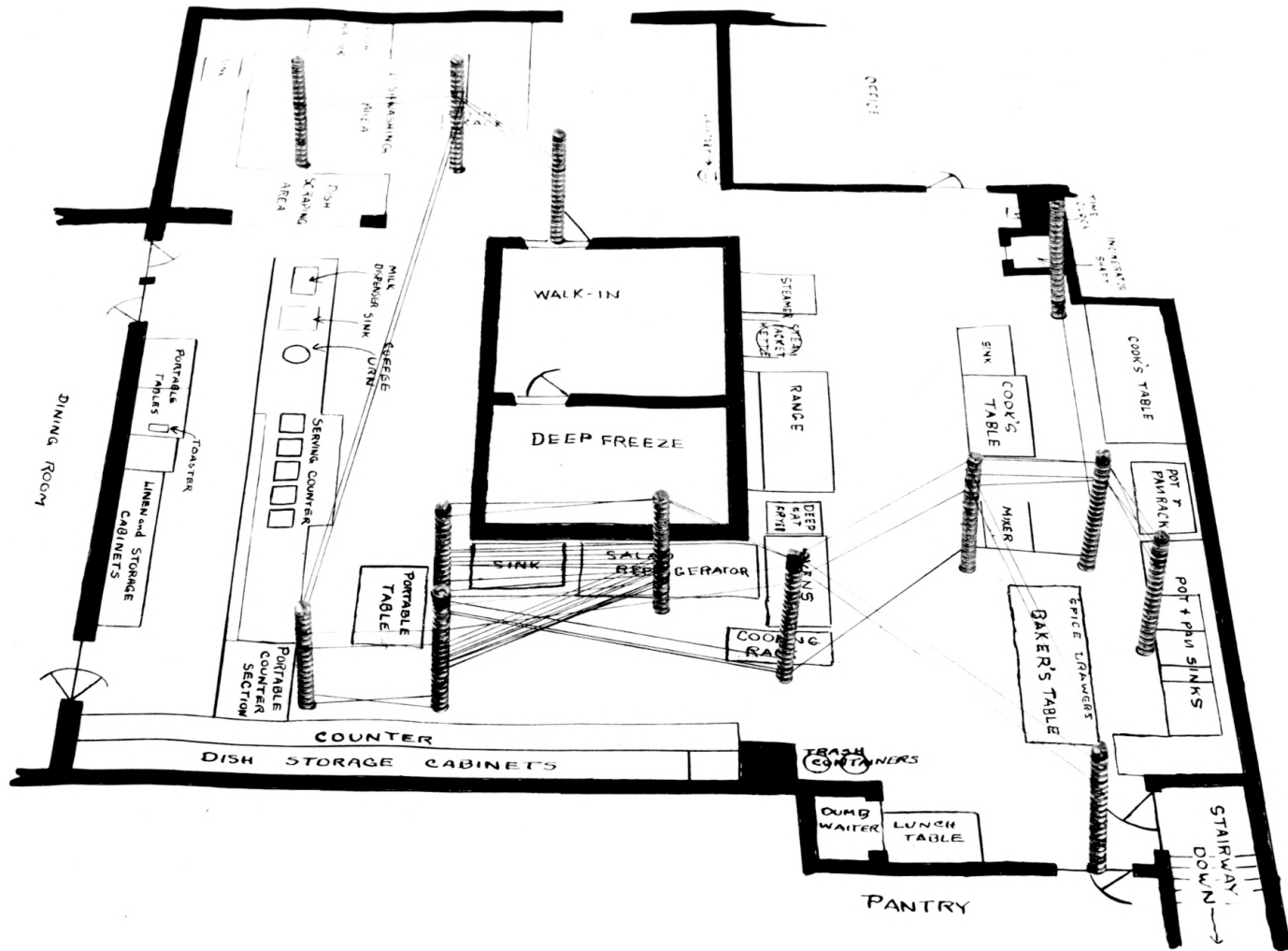
PLATE I



EXPLANATION OF PLATE II

Travelgram made from process chart showing revised method of making tossed vegetable salad (Fig. 2, Appendix).

PLATE II



EXPLANATION OF PLATE III

Photograph of poster emphasizing work simplification as a whole.

ARE YOU
TIRED?

TRY...



WORK SIMPLIFICATION

EXPLANATION OF PLATE IV

Photograph of poster emphasizing work simplification
as a whole.

PLATE IV

IT'S NOT THE



RIGHT WAY

IF IT ISN'T THE

BEST WAY



EXPLANATION OF PLATE V

Photograph of poster emphasizing work simplification
as a whole.

PLATE V



LET'S
FACE
IT!

APPLYING SIMPLE
WORK METHODS
IS UP TO
YOU

88

EXPLANATION OF PLATE VI

Photograph of poster emphasizing work simplification
as a whole.

PLATE VI

There is a better way
to do every job ~



if you don't know-- Ask!

What is done?
Why is the work done?
Who does the work?
Where is the work done?
How is the work done?

EXPLANATION OF PLATE VII

Photograph of poster listing principles of work
simplification.

PLATE VII

SIX IMPORTANT PRINCIPLES

1. Keep tools in easy reach.

2. Work in a comfortable position.



3. Use best equipment and tools for job.

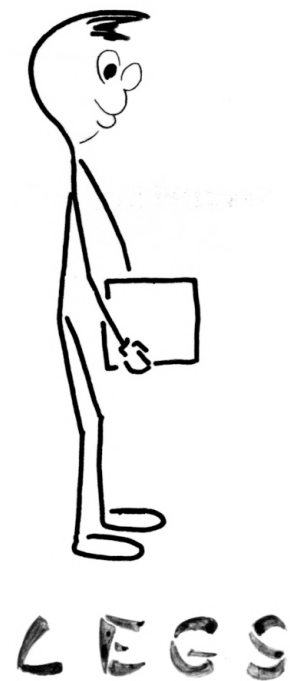
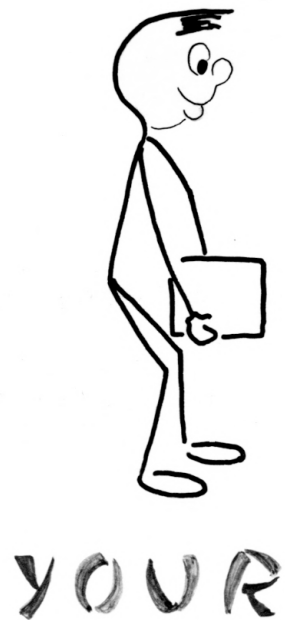
4. Combine jobs or parts of job.

5. Leave out any part of job you can.

6. Use both hands.

EXPLANATION OF PLATE VIII

Photograph of a poster illustrating a principle of work simplification.

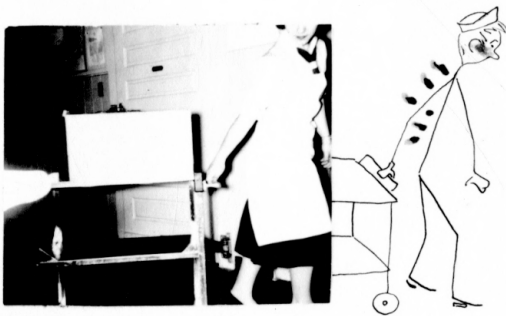


EXPLANATION OF PLATE IX

Photograph of a poster illustrating principles of work simplification with photographs of a kitchen employee.

PLATE IX

Fatigue can be the result of poor posture.



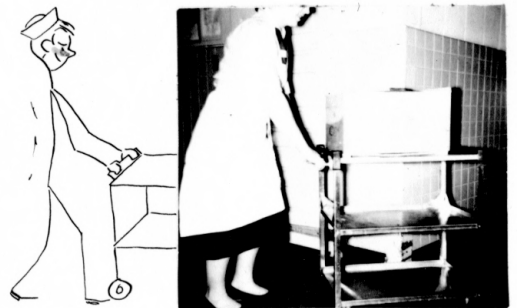
incorrect

Avoid unnecessary strain on shoulder muscles.

Never pull, when you can push.

Push with strong leg muscles.

Push heavy objects in center of weight at center of gravity.



correct

tasks were selected as models. In setting up the pictures, the opportunity was seized to explain carefully the purpose of the photograph and any principle of work simplification being illustrated. The pictures were posted on the bulletin board, as such; or used on posters (Plate IX).

Handbook. A booklet was produced for the use of food service workers (Fig. 7, Appendix). Its purpose was to help the employee in an institutional kitchen understand the principles and approaches used to develop better work methods, as well as to relate these principles to familiar activities.

The handbook was written during the training period. As it evolved, the employees were consulted as to its appeal, clarity, and usefulness. The 13 principles of work simplification, which formed the basis of the training program, were listed with examples of their application in a food service. IKE, an Institutional Kitchen Employee, pointed out the usefulness of the tool, work simplification, in a manner calculated to appeal to the employees. Fourteen simple line drawings were used as illustrations.

On the Job Training. Throughout the training program and its accompanying development of visual material, most of the instruction in the principles and application of work simplification was carried on through the medium of on the job training. The supervisor in charge of the project utilized every opportunity available to work with the employees in improving their working procedures and arrangements, and to coach them in the use of work

simplification.

During the training period, in order to use efficiently the work force, machines, and materials available, the project leader followed these steps: (1) break down the job; (2) question every detail; (3) develop the new method; and (4) apply the new method.

The process study chart was employed to break down the job. Details were listed exactly as done in the original method. Materials handling, machine work, and hand work were included.

To question every detail, the following information was sought: (1) why is it necessary; (2) what is its purpose; (3) where should it be done; (4) when should it be done; (5) who is best qualified to do it; and (6) how is the best way to do it. Materials, machines, equipment, tools, product design, layout, work-place, safety factors, and housekeeping practices were considered.

To develop the new method, the process chart, made of the original method, was studied carefully. Unnecessary details were eliminated. All necessary details were simplified. When practical, details were combined. Methods, tools, equipment, and materials were rearranged in logical sequence. The new method thus evolved was recorded on a process study chart.

When the new method required rearrangement of the work area, change in product, and/or purchase of new equipment, approval of the director of residence hall food services was sought. If approved, the next step was to sell the new method to the employee involved. Travelgrams which presented the process chart visually

were found helpful. After the new method was in use, the employee was urged to continue to seek improvements.

The supervisor was careful to give credit where credit was due. Praise was used to stimulate thinking.

Evaluation of the Training Program. At the last meeting of the 18-week study period, an attempt was made to determine the efficacy of the training program from the employee viewpoint. Two check lists had been prepared to be given to the employees at this time. The first sheet contained 13 statements concerning the tool, work simplification, in general, which were to be answered yes, no, or partly.

1. The work simplification training program has made me familiar with the principles of work simplification.
2. The work simplification training program has given me an understanding of these principles.
3. The photographs, posters, and cartoons posted on the bulletin board have helped me to understand the principles of work simplification.
4. The individual conferences with the supervisor have helped me to apply the principles of work simplification to my work and work area.
5. The work simplification training program has stimulated me to make suggestions for improving my work methods.
6. My work habits are more efficient now than they were before the training program.
7. I am less tired at the end of the day's work than I was before the training program.
8. My products are more uniform in quality now than before the training program.
9. My production has increased because of improved work methods.

10. The work simplification training program has increased my understanding of my job.
11. The training program has increased my ability to apply the principles of work simplification.
12. I am doing my work more skillfully as a result of the training program.
13. I am glad to have had a chance to participate in this training program.

After answering the first sheet, each employee was handed a list of 13 questions relating specifically to the principles of work simplification stressed during the training program. These questions were to be answered with yes or no.

1. Do you have a clear understanding of the principles of work simplification?
2. Did the photographs help you to understand how these principles may aid you?
3. Did the posters and cartoons help you to understand the principles?
4. Has the work simplification training program met the needs of your work area?
5. Do you look for a method requiring less effort in doing your work?
6. Do you know how to rearrange and pre-position your tools and equipment to simplify your work?
7. Did the instructions covering working in the most comfortable position, using the right muscles for the job, and using both hands save you from muscle strain?
8. Are you less tired at the end of the day's work than you were before this training period?
9. Can you select the best piece of equipment or tool for the task at hand?
10. Do you see opportunities for combining jobs or parts of jobs?

11. Do you see opportunities for omitting unnecessary parts of the job?
12. Have you been applying these principles at home, as well as at work?
13. Has this training program covered the principles of work simplification sufficiently and related them to your jobs?
14. Please write below how you would like to see the program improved.

FINDINGS

Since the unit used for this study was comparatively small, much individual attention and contact could be given to each employee in the course of the training period. A large food service would need to resort to the use of employee group meetings rather than the individual approach used in this study. The project leader had the added advantage of having known the employees of the Van Zile Dining Hall, both as a senior student in dietetics and institutional management and as their supervisor at the time of this study.

Employee Knowledge of the Principles of Work Simplification

During the observation period at Van Zile Dining Hall, it was apparent that the employees had some knowledge, understanding, and appreciation of the principles of work simplification, but were lax in the application to their work. When rushed, the workers frequently were observed to apply the principles to the task at hand. When excess time was available, the job was done the hard

way. The theory used apparently, was that it was more important to look and keep busy, than to do the job the best way and use extra time for rest or other tasks, such as cleaning.

The data, collected in the notebook prepared for that purpose, were condensed in table form (Tables 1 through 21, Appendix). By no means complete, this information was of value in determining how well the employees applied their knowledge of the principles of work simplification to various tasks. Each table contained information related to a specific principle. Common tasks utilizing the principle were listed. The four regular full-time employees were assigned a number from I through IV. The code used to indicate the degree of application of the principle was: always, 3; usually, 2; seldom, 1; and never, 0. If the employee did not perform that particular job, the space was left blank.

Training Program

Introductory Interview. To eliminate discussion and misapprehension among the workers, one work day was used in which to conduct the introductory interview individually with each employee.

Designated for the purposes of this study as Employees I, II, III, and IV, the four workers expressed interest and willingness to cooperate in the project. The fact that their kitchen was to be used for the study seemed to please them. All indicated some knowledge of work simplification and appeared to be aware of the value of its application to work. The women welcomed the idea of a training program in this area, pointing out that it would be of

value not only to them, but to all food service workers.

During the interview, each worker made comments and suggestions freely. Employee I questioned the adequacy of the ventilation in the cooking area, which she blamed for frequent dizzy spells, although admitting to high blood pressure. An irritant for this worker was that the only can opener in the kitchen was located on her work table. In order for other employees to use it, she had either to suffer interruptions in her work or rearrange her work area constantly.

The small carts in use in the kitchen were too small to hold the large aluminum baking sheets she used frequently. The bottom shelf was of no value, for this reason, and she worried for fear the baking sheet might be knocked off of the top shelf. Because her sink was too low, her shoulders and back ached when using it for any length of time, as on the days when baked potatoes were on the menu. She recommended the use of shallow, half-counter pans for fried eggs for breakfast as being easier to handle than the larger pans, and, also, the designing of a spatula which would lift food out of the deep counter pans easily.

Employee II was desirous of having studies made of some of the simplified work procedures she had devised and put into practice. In describing her method of preparing sweet potatoes, she noted that by cutting the unpeeled potatoes in half and laying them cut side down on trays to steam, cooking time was cut in half. After steaming the potatoes, using both hands to lift off the peelings quickly, an additional saving of time was effected

over machine peeling and hand eyeing. This method also prevented the discoloration of the uncooked potato. Much thought had been given by this worker, also, to the arrangement of her work area. Although not subject to fainting or dizzy spells, she believed her fatigue at the end of the work day was due to the hot, stuffy kitchen.

Previously well trained in the principles of work simplification, Employee III demonstrated greater knowledge, understanding, and interest in their application than the other members of the kitchen staff. Even so, there were certain principles which she did not utilize in her work. Improvements she deemed necessary in her work area were a lavatory for hand washing near her work area, additional oven space, additional cooling racks, a wooden table top, and correct table heights to permit alternate sitting and standing. She agreed with Employee I that the carts were not only too small, but also that the lower shelf was too low for convenient use. She pointed out that hours of searching would be saved if the student employees washing cooking utensils were trained to put them away in the proper locations.

A baker, Employee III, expressed interest in having a time study made, comparing the time required to make sheet layer cakes with that required to make round layer cakes; and added that cakes were more moist when baked on baking sheets, in her opinion, than when baked in the round layer cake pans. In agreement with the other workers that the kitchen was inadequately ventilated and too hot, she also commented that in hot weather, her feet

became swollen.

Always tired, Employee IV gave as reasons for this condition the poor ventilation, inferior lighting found in her work area, as well as the fact that her work table was too low for standing and too high for sitting. Because her work area was across the kitchen from the storage of the foods she worked with, as well as the garbage disposal unit, a considerable amount of carting back and forth was necessary. Many of the products she used were in boxes, crates, or lugs, too heavy to lift.

Process Charts. At the beginning of the training period, the workers believed their work procedures good, on the whole, and not in need of improvement. In spite of this attitude, they were willing to try new methods, even though at first they seemed awkward. Much interest was evidenced in the process chart, which ferreted out incorrect work habits, and served as a challenge to do work the best way.

One or more process or operation charts were made in each work area of the institutional kitchen used in this study. Process charts made and analyzed included: the preparation of oatmeal cookies, butterscotch cookies, sheet cakes, layer cakes, and dishing of fruit, baker's unit; deep fat frying, slicing of meat, cleaning of vegetables, and preparing sweet potatoes, cook's unit; and preparation of tossed salad and cabbage slaw, salad unit. Student employee jobs analyzed were: putting ice in water glasses, setting tables, filling the storeroom requisitions for one day, and storing pots and pans.

A process chart which was thoroughly studied and reviewed by the employees, was the dishing of tossed salad (Fig. 3, Appendix). The serving of any food may involve many extra steps and motions unless the worker plans ahead, organizing the work area and procedures to be used. In this particular job, it was revealed that the employee broke the task down into 170 separate steps and traveled 1143 feet.

Elimination of Operations. Analysis indicated possibilities for the elimination of certain steps: (1) salad bowls to be placed directly on trays, rather than transferred from cabinet shelves to the tables, to the trays; (2) cabinet door to be left open until all bowls needed were removed; (3) all needed bowls and trays to be arranged before the dishing of the salad; (4) two stacks of trays to be placed on the salad table rather than the trays spread out on the cabinet table top and the serving counter; (5) a cart to be used to clear away unused ingredients, waste, soiled utensils, etc., after the salad was complete; (6) pot and pan garbage unit to be used in the last step; (7) cleaning tools to be obtained at one time from the broom closet.

Elimination of Movements. The improved work arrangement and elimination of some of the operations automatically reduced the number of movements made in the original method of dishing tossed vegetable salad.

Improved Method. After analysis of the process chart of the original method was made, and the steps were labeled unnecessary, combine, shorten, and/or simplify the process chart of the revised

method was made (Fig. 4, Appendix). The improved method was introduced to Employee IV and tested.

The work area was limited to the salad table. The trays were stacked, salad bowls were placed on two trays at a time, filled, and placed in the refrigerator. A cart was used to assist in cleaning up the work area. Only one trip to the broom closet was made. The number of steps was reduced from 170 to 126; the distance traveled from 1143 feet to 586 feet; and the time required from 45 minutes to $29\frac{1}{2}$ minutes. Although only 44 steps were eliminated, the distance traveled and the length of time needed were considerably less for the revised method than for the original method.

After this revealing study, Employee IV became interested in organizing her work. The fact that in her work area the table was $6\frac{1}{2}$ inches too low and the sink was 12 inches too low was not the only reason she went home tired at the end of the work day.

Operation Charts. Operation charts were made of tasks in the dishwashing area which utilized male student workers. Since the dish return following a meal was completed in a very short period of time, the number of workers needed to cover the peak period of return was comparatively high. The operation charts were made: scraping one tray, racking one rack, unracking one rack, sorting and dipping silver, filling the dishmachine, and operating the garbage disposer. These studies indicated that not only were the methods in need of improvement, but time was wasted while employees remained idle waiting for trays to be returned

from the dining area for scraping. Keeping both hands working together smoothly and continuously was difficult to do in this area, also. For some operations, one hand would be idle while the other hand did as many as five extra operations. The operation chart made of the task, sorting and dipping silver, revealed the idle left hand; whereas, the right hand and arm muscles were lifting heavy loads with resulting fatigue (Fig. 5, Appendix).

Factors Affecting the Operation. Following the operation study of the original method of sorting and dipping silver, five nylon cylinders for silver were purchased, the use of which altered the order of work and eliminated extra handling. The time-consuming motions required to arrange the silver in boxes were no longer needed. To wash, the silver was placed vertically in the cylinder with the handles down. Following the washing and dipping processes, the silver was inverted into an empty cylinder with the handles in position to be grasped, for storage and service.

Since the nylon cylinders were purchased on a trial basis, not enough were ordered to take care of all the silver. As a result, the employees had difficulty in adjusting to the new procedure; and tended also, to put too much silver in a cylinder at one time. One of the boys, who had worked at the hall for several years, was convinced that the cylinders would not be as efficient as the original method. After little progress was made in their use, the cylinders were sent to another hall to try and there were readily accepted for the task of sorting and dipping silver.

Investigate the Employee. Investigation of the negative results obtained in the use of the nylon cylinders in the dishwashing area of Van Zile Hall brought out that one employee and two of his followers were stubbornly resistant to the change. After discussing the situation with the director of residence hall food services, the project leader discovered that these three student employees had resisted other changes in the same manner. Further instruction was needed before cooperation and acceptance could be expected.

Improved Method. The revised method was given several trials with careful supervision before it was finally accepted by the student workers in the Van Zile Hall dishwashing area. However, as a result, the operation was shortened, hands learned to work together smoothly and continuously, and sanitation was also improved (Fig. 6, Appendix). Further, it was recommended that enough nylon cylinders be purchased to handle all of the silver.

Travelgrams. Several travelgrams were made during the study in order to demonstrate visually, direction and distance traveled in the accomplishment of certain tasks. Travelgrams made of process charts of original and revised methods offered quick comparison of the two procedures. Upon seeing a travelgram depicting one of her tiring tasks, a worker exclaimed, "Now why did I make so many trips to the walk-in refrigerator, when one trip with a cart would have done the job?" After several travelgrams had circulated through the various work areas, the employees became noticeably conscious of the direction and distance traveled in the

pursuance of their work. Student workers studied the travelgrams, also, and indicated an interest in "using their heads to save their heels." The principles of work simplification and their application became a common topic of conversation for the kitchen force. Suggestions were made frequently by the workers, not only to help themselves, but the other employees. No resentment was noticed among the employees at any time when suggestions were made to save travel distance.

Travelgrams proved to be exceptionally successful as teaching supplements, due to the fact that they required no background or experience for visualization of the results of a work simplification program. The travelgrams were explicit in showing the direction of travel, number of feet traveled, and the time which was required for an employee to do the task (Plates I and II).

Posters. Throughout the development of the work simplification training program, many posters and cartoons were sketched and used by the project leader. Placed upon the employee bulletin board in the kitchen, directly across from the outside entrance, they were designed to catch and hold the eye of anybody who might pass. Short, concise, to the point wording was utilized. The employees were not the only persons to benefit from the use of these visual aids. Visitors, salesmen, home economics staff members, and residence hall personnel stopped to read them when in the kitchen on business. Although the posters were meant for use in a quantity food service, the messages they carried could be applied by anyone to everyday work situations.

Altogether, 30 posters were created. Since drawing was not one of the project leader's talents, seven of the ideas appearing on the original posters were redone for photographing by an art student (Plates III through IX). However, even the amateur posters appeared to be effective as teaching supplements and were evaluated as stimulating and helpful by the employees to whom they were directed.

Pictures. Using an inexpensive camera with flash attachments, the project leader took 84 photographs during the course of the study. As the employees were taught how to apply the 13 principles of work simplification forming the basis of the training program, pictures were taken of the workers doing different tasks the "wrong" and "right" way. Some of these pictures provided illustrative material for posters. Others were put up on the bulletin board as examples of "before" training program and "after" training program. The remaining pictures were circulated among the kitchen workers. Even the most amateur of the photographic efforts proved helpful in getting certain points across. The employees seemed to enjoy seeing themselves in print as well.

Some of the tasks and/or principles illustrated through the use of photographs were: (1) employee cleaning vegetables in a low sink to show the disadvantages of using incorrect work heights; (2) employee stooping to the task rather than bending to the task; (3) employees lifting crates of food, using strong leg muscles rather than weak back muscles; (4) employee stretching beyond normal reach; (5) comparison of sliding shelves with

stationary shelves; (6) employee carrying a load near the center of gravity, with the weight balanced and the shoulders relaxed; and (6) examples of well-arranged work areas for different tasks.

Handbook. The handbook compiled as a work simplification manual for institutional kitchen employees was not completed in time to supplement the entire training program. Instead, the employees participating in the program actually helped the project leader to develop the handbook, through their critical appraisal of the material as it was written.

From the beginning, the employees cooperating in the study expressed the need for a manual which listed the principles of work simplification and related them specifically to the work of food services. In their opinion, the training program would be greatly strengthened by such a manual to serve as a reference guide.

Upon completion of the handbook, the employees were asked to read and evaluate it. They concluded that it was clearly written, coherent, to the point, and would fulfill the need for which it was created.

On the Job Training. Employees were eager to improve work methods upon realizing that decreased fatigue at the end of the work day was one of the rewards. The supervisor and employees observed that most jobs could be improved when everyone in the food service exhibited a willingness to eliminate waste of time, energy, and materials by maintaining a questioning attitude; by finding and using the facts, not opinions; and by working on

causes, not effects. Together, the supervisor and employees learned that organization must precede production for greatest efficiency, maximum economy, and minimum effort.

Workers learned to seek out tables of the correct height for the task to be done, and to alternate sitting and standing for long jobs. They practiced using the correct muscles when lifting, carrying, and pushing. Workers learned to let wheels on carts and bins work for them. They used trays to eliminate extra house-keeping. Storage was improved as a result of this study. Cabinets, drawers, and shelf storage were labeled. Gravity bins and drop deliveries were used when possible. At-the-point-of-first-use and one-motion storage increased efficiency and contributed to decreased employee fatigue at the end of the work day. The employees learned to pre-position tools and materials to permit the best sequence of motions. They used both hands in smooth, continuous motions when possible. Motions of the hands, for the most part, were simultaneous and symmetrical. Rhythm, essential to a smooth, easy work pattern, began to appear.

Evaluation of the Training Program. In an effort to determine the worth of the training program in work simplification, two series of statements and questions were presented to the four co-operating employees for their consideration. The first list was designed to find out the employees' opinions of the training program, and the second to see how well the workers were able to apply the principles of work simplification to their work following the training program.

Whereas two of the employees thought that the training program had familiarized them with the principles of work simplification, the other two believed it only partly accomplished this goal. All of the workers agreed that the training program had given them an understanding of the principles of work simplification, and that the utilization of photographs, posters, and cartoons was partly responsible for this. The individual conferences with the project leader helped the four cooperating workers to apply the principles of work simplification to their respective tasks and work areas. There was further agreement that the training program had stimulated individual workers to make suggestions for improving work methods.

Two employees were of the opinion that their work habits had improved following the training program, one believed this was partly true, and the fourth worker did not answer. Three employees credited the training program with alleviating fatigue at the end of the work day, whereas one thought this was only partly true. Again, three of the workers believed that they noted an improvement in product quality following the training program, as well as increased production due to improved work habits. One employee believed this to be only partly true in both instances.

The four cooperating workers gave an affirmative answer to the last four statements. In other words, they thought the work simplification training program had increased their understanding of their jobs, had increased their ability to apply the principles to their work, and had enabled them to increase their work skill.

They all expressed appreciation for having had the opportunity to participate in the training program.

In response to the questions on the second sheet, the four workers believed that they had a clear understanding of the principles of work simplification, and that the pictures, posters, and cartoons had helped them to achieve this understanding.

Three of those questioned thought that the program had met the needs of their work areas, whereas the fourth worker believed that this was only partly true. After completing the training program, all workers admitted to: looking for methods requiring less effort in doing their work; rearranging and repositioning tools and equipment to simplify their work; feeling less muscle strain after applying the instructions concerning working in the most comfortable position, using the right muscles for the job, and using both hands; being less fatigued at the end of the work day; being able to select the best piece of equipment or tool for the job; and being able to recognize opportunities for combining jobs or parts of jobs. Three of the workers could see opportunities for omitting unnecessary parts of the job and one could not. Three of the workers were able to apply the principles of work simplification at home, as well as at work, and one could not. All workers indicated the belief that the training program had covered the principles of work simplification sufficiently and had related them to the workers' jobs.

The four employees requested additional help in simplifying their jobs. Even though aware of the principles and their

applications, methods improvement was still not always easy to see. The project leader concluded that the workers had: benefited from the training program in work simplification; were interested in further study and application of the principles to their respective jobs; and had made a start at recognizing methods of improvement. The visual aids used, consisting of pictures, posters, travelgrams, and handbook, greatly strengthened the training program in work simplification.

SUMMARY

The purpose of this study was to survey the principles of work simplification from the standpoint of their use in the institutional kitchen and to relate them to the various kitchen activities, as well as to provide material suitable for use in an employee training program.

A brief investigation was made of the work simplification training programs used in institutional kitchens located in a hospital, high school cafeteria, industrial cafeteria, commercial cafeteria, and college union, and in several college residence halls. The food supervisors and managers of the institutional kitchens visited recognized the need for a good employee training program in work simplification, with especial emphasis on the development of visual aids which might be made available. Because of difficulty in scheduling, lack of material, and supervisory staffs with an inadequate knowledge of the principles of work simplification, little, if any training in work simplification

was found in most of these food services.

Plans were made to develop a training program in work simplification, using Van Zile Dining Hall as the laboratory. Individual interviews were held with the four regular full-time employees, to explain the proposed study and the 13 principles of work simplification selected as the basis of the training program. All four workers indicated interest and willingness to cooperate in the project.

Each work area was studied carefully by the supervisor in charge of the program and the employee most concerned. The supervisor used the following guides when investigating possibilities for improvement: (1) break down the job; (2) question every detail; (3) develop the new method; and (4) apply the new method.

Process charts were used to present graphically, through the use of colored symbols for a given process, the separate steps involved in a specific job. Operation charts were used to describe work done in performing a job taking place essentially at one location. Symbols were used to denote the various movements of both the left hand and the right hand. The use of these two devices permitted detailed analysis of the jobs or tasks studied, and resulted in improved methods through the elimination of unnecessary steps and rearrangement of steps in a more logical sequence. In some instances, travelgrams were made from process charts showing original and revised procedures. These travelgrams showed the supervisor and worker the distance and direction traveled during performance of a task. A visual comparison of the

two methods could thus be made.

Pictures and posters, displayed on the employees' bulletin board, were designed to stimulate employee interest in work simplification and to supplement the total learning experience.

On the job instruction in the principles and use of work simplification played an important role in the training program. To make work easy and safe, employees were taught to: pre-position materials, tools, and equipment at logical places in the work area; use gravity-feed bins and drop deliveries when possible; let both hands do useful work; and use devices to hold work instead of hands when possible.

The employees learned to communicate and work out ideas for methods improvement with other workers. Exchange of ideas was found important in determining the best way.

A work simplification handbook for quantity food workers was developed to be used as the text during the training program. The booklet listed the 13 principles of work simplification used as the basis of the training program, and related them to quantity food production. Illustrations, simple line drawings, were used to make the manual more meaningful to employees.

Evaluation of the training program by the employees indicated that all concurred in the belief that the training program had been successful. The workers believed that they understood the principles of work simplification utilized in the training program. They were of the opinion that the visual aids devised were helpful; and expressed an interest in continuing, on their own initiative, the work started by the training program.

ACKNOWLEDGMENT

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APPENDIX

Table 1. In doing different tasks, frequency with which employees utilized Principle 1. (The two hands should begin, as well as complete, their motions at the same time.)

Task studied	: Frequency of use by employee			
	: I	: II	: III	: IV
Kneading bread	2	0	3	0
Rolling rolls	1	0	3	0
Deep fat frying	1	2	1	1
Chopping with French knife	3	3	3	3
Carrying heavy objects	1	2	2	1
Lifting heavy objects	1	2	2	1
Transferring stacks of dishes	3	3	3	3
Serving food		0	3	3
Dipping fruit		1	1	1
Cleaning vegetables	3	3	3	3
Dipping-coating	1	2	2	1

* Always, 3
 Usually, 2
 Seldom, 1
 Never, 0

Table 2. In doing different tasks, frequency with which employees utilized Principle 2. (The two hands should not be idle at the same time except during rest periods.)

Task studied	: Frequency of use by employee			
	: I	: II	: III	: IV
Rolling rolls	2	0	3	0
Cutting cakes and pies			1	1
Dipping foods with ice cream dipper	1	1	1	1
Placing foods in deep fat fryer	1	2	1	1
Dipping-coating	1	2	2	1
Chopping foods in electric chopper	1	1	1	1
Serving dessert or salad at the counter		0	3	3
Pouring butter over vegetables	0	0	0	0
Garnishing	1	1	1	1
Opening steamer doors	3	3	2	1
Wiping tables	0	0	0	0
Washing walls	0	0	0	0
Stirring in steam-jacketed kettle	0	0	0	0

Table 3. In doing different tasks, frequency with which employees utilized Principle 3. (Motions of the arms should be made in opposite and symmetrical directions and should be made simultaneously.)

Task studied	: Frequency of use by employee			
	: I	: II	: III	: IV
Rolling rolls	1	0	3	0
Eyeing and trimming potatoes	3	3	3	3
Placing desserts and salads on the counter	3	3	3	3
Serving at the counter			3	2
Transferring stacks of dishes	3	3	3	3

Table 4. In doing different tasks, frequency with which employees utilized Principle 4. (Hand motions should be confined to the lowest classification with which it is possible to perform the work satisfactorily.)

Task studied should have	: Frequency of use by employee			
	: I	: II	: III	: IV
Correct table height	3	3	3	1
Racks and shelves of correct height	1	1	3	3
Stored equipment frequently used, waist level	1	1	3	3

Table 5. In doing different tasks, frequency with which employees utilized Principle 5. (Momentum should be employed to assist the worker wherever possible, and it should be reduced to a minimum if it must be overcome by muscular effort.)

Task studied	: Frequency of use by employee			
	: I	: II	: III	: IV
Emptying potato peeler during rotation	1	1		
Pushing carts	3	3	2	2
Mopping	1	1	1	1
Placing whips into mixer bowls	3	3	3	3

Table 6. In doing different tasks, frequency with which employees utilized Principle 6. (Smooth, continuous motions of the hands are preferable to zigzag motions or straight-line motions involving sudden and sharp changes in directions.)

Task studied	: Frequency of use by employee			
	: I	: II	: III	: IV
Using hand whip thumb down and circular motions	1	1	1	1
Dipping-coating meats	1	1		
Deep fat frying foods	1	1		
Dipping fruits and vegetables	2	2	3	2
Cleaning vegetables	2	2		2
Weighing ingredients	2	2	3	2
Measuring liquids	2	2	3	2
Stirring in steam-jacketed kettle	1	1	1	1
Panning rolls	2		3	
Dipping with ice cream dipper	2	2	2	2

Table 7. In doing different tasks, frequency with which employees utilized Principle 7. (Ballistic movements are faster, easier, and more accurate than restricted /fixations/ or "controlled" movements.)

Task studied	: Frequency of use by employee			
	: I	: II	: III	: IV
Rolling rolls	2		3	
Stirring foods	1	1	1	1
Dipping and serving fruits and vegetables	2	2	3	1
Deep fat frying foods	1	1		
Dipping-coating meats	1	1		
Wiping tables	0	0	0	0
Cleaning walls	0	0	0	0

Table 8. In doing different tasks, frequency with which employees utilized Principle 8. (Rhythm is essential to the smooth and automatic performance of an operation, and the work should be arranged to permit easy and natural rhythm whenever possible.)

Task studied	: Frequency of use by employee			
	: I	: II	: III	: IV
Dipping foods	2	2	3	1
Slicing foods	2	2	1	1
Chopping foods	3	2	2	3
Stirring foods	1	1	1	1
Deep fat frying foods	1	1	1	
Wiping tables	0	0	0	0
Cleaning walls	0	0	0	0

Table 9. In doing different tasks, frequency with which employees utilized Principle 9. (There should be a definite and fixed place for all tools and materials.)

Task studied should have	: Frequency of use by employee			
	: I	: II	: III	: IV
Spices	3	3	3	3
Tools	3	3	3	3
Equipment	3	3	3	3
Foods used	3	3	3	3

Table 10. In doing different tasks, frequency with which employees utilized Principle 10. (Tools, materials, and controls should be located close in and directly in front of the operator.)

Task studied should have	: Frequency of use by employee			
	: I	: II	: III	: IV
Tools	3	3	3	3
Materials	3	3	3	3
Controls	3	3	3	3

Table 11. In doing different tasks, frequency with which employees utilized Principle 11. (Gravity feed bins and containers should be used to deliver the material close to the point of use.)

Task studied	: Frequency of use by employee			
	: I	: II	: III	: IV
Vegetables	3	3	3	3
Spice bins	3	3	3	3
Steam-jacketed kettles	3	3	3	3
Water outlet above steam-jacketed kettle	3	3	3	3
Milk dispenser	3	3	3	3

Table 12. In doing different tasks, frequency with which employees utilized Principle 12. ("Drop deliveries" should be used whenever possible.)

Task studied	: Frequency of use by employee			
	: I	: II	: III	: IV
Chopped foods	3	3	3	3
Milk dispensers	3	3	3	3
Elevator	3	3	3	3

Table 13. In doing different tasks, frequency with which employees utilized Principle 13. (Materials and tools should be located to permit the best sequence of motions.)

Task studied	: Frequency of use by employee			
	: I	: II	: III	: IV
Materials	2	2	2	2
Tools	2	2	2	2

Table 14. In doing different tasks, frequency with which employees utilized Principle 14. (Provisions should be made for adequate conditions for seeing. Good illumination is the first requirement for satisfactory visual perception.)

Task studied should have adequate	: Frequency of use by employee			
	I	II	III	IV
Lighting	3	3	3	3

Table 15. In doing different tasks, frequency with which employees utilized Principle 15. (The height of the work place and the chair should preferably be arranged so that alternate sitting and standing at work are easily possible.)

Task studied should have alternate	: Frequency of use by employee			
	I	II	III	IV
Standing	2	2	3	3
Sitting	2	2	3	3

Table 16. In doing different tasks, frequency with which employees utilized Principle 16. (A chair of the type and height to permit good posture should be provided for every worker.)

Worker should have an adequate	: Frequency of use by employee			
	I	II	III	IV
Chair	1	1	1	1

Table 17. In doing different tasks, frequency with which employees utilized Principle 17. (They should be relieved of all work that can be done more advantageously by a jig, fixture, or a foot-operated device.)

Task studied	: Frequency of use by employee			
	: I	: II	: III	: IV
None				

Table 18. In doing different tasks, frequency with which employees utilized Principle 18. (Two or more tools should be prepositioned wherever possible.)

Task studied	: Frequency of use by employee			
	: I	: II	: III	: IV
Mixing	2	2	3	2
Cleaning of vegetables	3	3	3	3
Dipping-coating meat	2	2	2	

Table 19. In doing different tasks, frequency with which employees utilized Principle 19. (Tools and materials should be prepositioned whenever possible.)

Task studied	: Frequency of use by employee			
	: I	: II	: III	: IV
Serving	2	2	2	2
Storing utensils and dishes	3	3	3	3
Preparing food in containers from which they will be served	3	3	3	3

Table 20. In doing different tasks, frequency with which employees utilized Principle 20. (Where each finger performs some specific movement, such as in type-writing, the load should be distributed in accordance with inherent capacities of the fingers.)

Task studied	: Frequency of use by employee			
	: I	: II	: III	: IV
None				

Table 21. In doing different tasks, frequency with which employees utilized Principle 21. (Handles such as those used on cranks and large screwdrivers should be designed to permit as much of the surface of the hand to come in contact with the handle as possible. Lever, crossbars, and hand wheels should be located in such positions that the operator can manipulate them with the least change in body position and with the greatest mechanical advantage.)

Use of handles, levers, and hand wheels	: Frequency of use by employee			
	: I	: II	: III	: IV
Steamer hand wheel	3	3	2	1
Mixer hand wheel	1	1	1	1
Mixer gear	3	3	3	3
Walk-in and deep freeze refrigerator door handles	2	2	2	2
Wire whip handles	2	2	2	2
French fry cutter	3	3		

The design of handles, levers, and hand wheels on institutional kitchen equipment deserves a great deal of attention. The observations made indicated that, in many cases, the handles on heavy objects, such as walk-in freezer doors, were designed to be operated with one hand. As a result, the hand and arm muscles are frequently strained and fatigue occurs.

Form 1. Blueprint of Van Zile Hall kitchen.

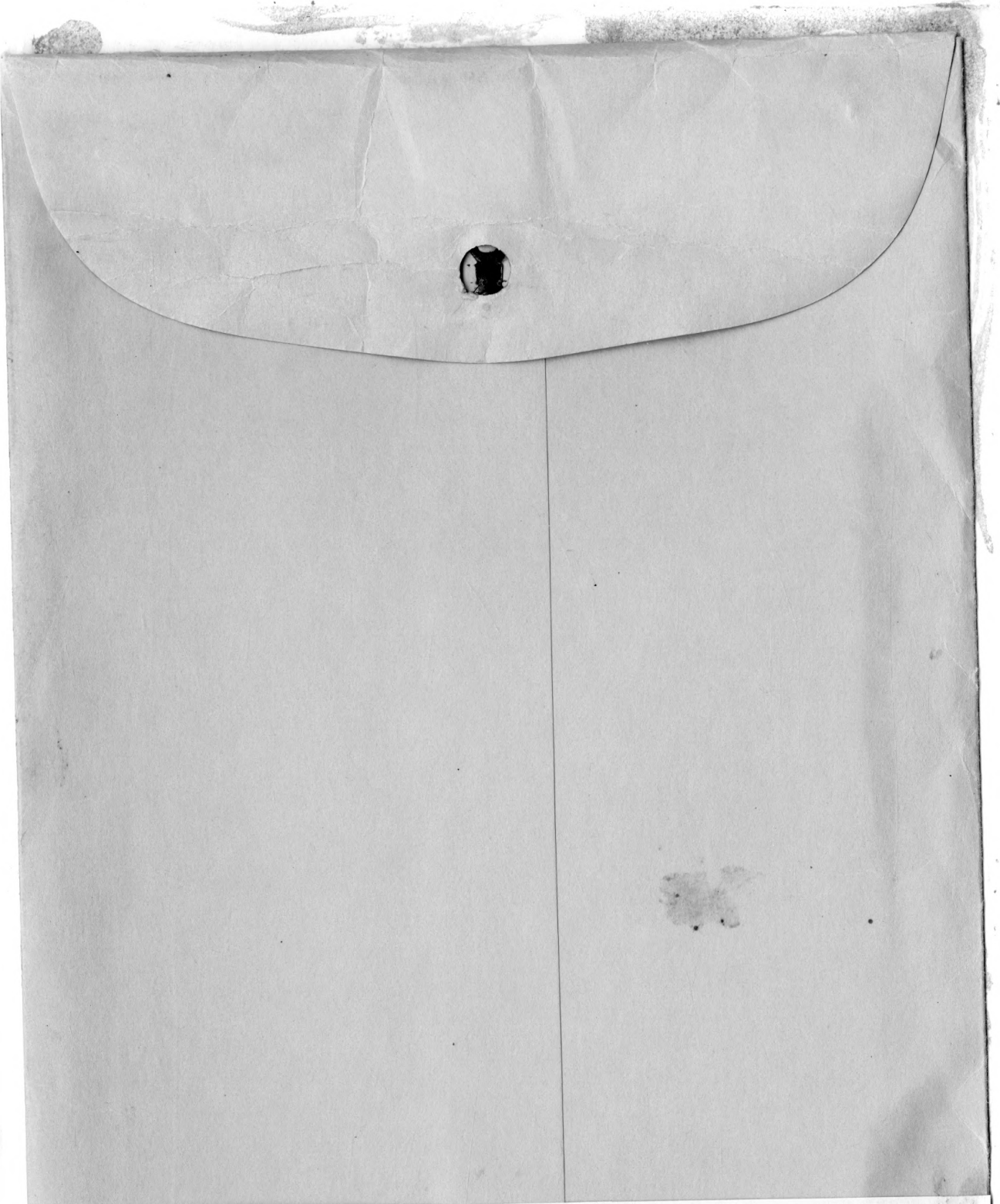


Fig. 1. Policy book for employees working in the Kansas State University residence hall food services.

POLICY BOOK

Food Service Employees

Women's Residence Halls

Kansas State College

POLICY BOOK
Food Service Employees
Women's Residence Halls
Kansas State College
August 1957

This is your book. As an employee of the Women's Residence Halls Food Service, you should familiarize yourself with its contents.

The purpose of the dining hall organization is to offer well prepared, high quality, nutritious food within the limits of the price paid by the students. We are here as a service to the students who are residents in these halls. Special meals and parties are planned throughout the year, so some catering is expected of us, in addition to the three meals a day.

Part of the responsibility of the residence hall food service is educational, and we try to add to the students knowledge of food by introducing new foods, by serving nutritionally balanced meals, by serving attractive, well seasoned foods, and by using different types of service in the dining room. Many women come to college knowing only the food customs of their own family, and our menus give them an opportunity to become familiar with new foods and customs.

We place emphasis on high quality food and on extreme care in its preparation. To eliminate guesswork we provide tested recipes which have been developed to assure a standard product, so it is important that recipes are read carefully and followed unless otherwise instructed.

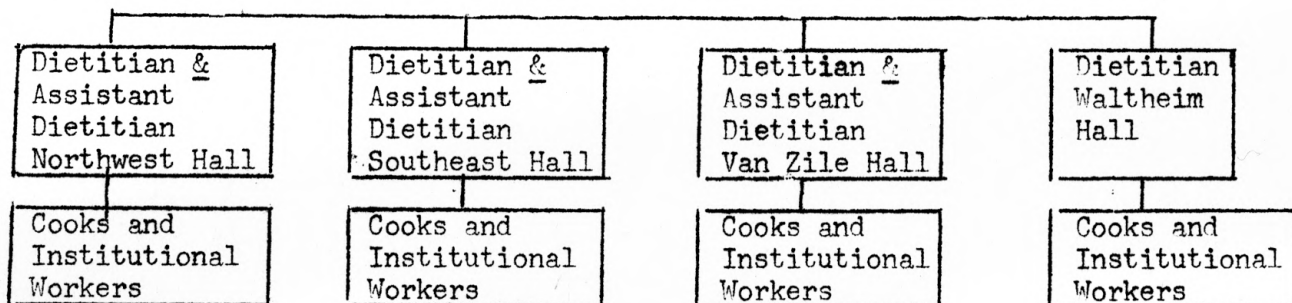
The food service department of the residence halls may be used from time to time for part of the class instruction in Institutional Management, and we cooperate with the teaching staff in these laboratory assignments.

ORGANIZATION

Each Hall has a dietitian and an assistant and they, with the Director of Residence Halls Food Services, plan the menus and supervise the preparation and service of the food.

Organization Chart

Director of Residence Hall Food Services



GENERAL POLICIES

Time Clock

You, as an employee, are to use the time clock to record hours on duty. Check in when you are ready to begin working and out when you have finished work. Check out for the periods assigned for meals, and in again as you report back to work.

If the time clock does not record your time correctly, report the error at once to the dietitian in charge.

Payroll

Pay checks are received about the 10th of each month. Example: The check received in October is for service rendered September 1 to 30.

Any questions concerning pay checks or civil service regulations should be discussed with the dietitian. She will present your problems to the proper authority.

If you are a new employee you are responsible for -

- 1) signing a federal withholding tax certificate
- 2) signing a loyalty oath
- 3) reporting your social security number before you begin work
- 4) making arrangements for physical examination

For items 1, 2, and 3, go to the Van Zile Hall Food Service Office.

Arrangements for physical examinations are made by the dietitian in each Hall.

Forty-six hours of work constitute one week in Residence Halls.

Leaves

According to the State Civil Service:

"Sick leave with pay shall be granted to all probationary, permanent and provisional employees in the classified service at the rate of one working day for each full month of service."

"Each permanent employee in the classified service shall be entitled to vacation with pay at the rate of one working day for each full month of service." Sick leave or vacation leave may not be taken until earned. Sick leave not to exceed 90 days may be accumulated. Vacation leave is accumulated at the rate of one day a month. During school vacations, or when institution is closed, time is given with pay but counted against annual leave. If employee is separated before six full months of service, then she shall be charged on a final pay voucher for all such leave taken with **pay**. Vacation not to exceed 18 days may be accumulated. Leave without pay in excess of 12 days may be granted only upon the approval of the Director of Residence Halls Food Services and the appointing authority. A leave of more than five days without pay in any one month causes the forfeit of the sick and vacation privileges during that month. A day taken without pay preceding a holiday or a Sunday forfeits the pay for the holiday or the Sunday.

Absence for any reason must be reported to the dietitian's office as early as possible, and leave papers signed upon return to work.

In order to retain good standing in Civil Service, written resignations must be made at least one week before work periods end.

Appearance and Cleanliness

Gum chewing and smoking on duty are prohibited.

An alert expression, a smile and a good posture add to the attractiveness of the employee. When serving at the counter, the employee should always stand erect and ~~not carry on unnecessary~~ conversation with either the other employees or those being served.

Clean, neat, light colored cotton dresses are to be worn when at work. Cotton does not absorb odors and is easily laundered.

White aprons are furnished and laundered by the food service. They should be tied as neatly as possible and adjusted to the length of the dress. A clean apron must be worn when the worker is serving at the counter

Hose are required for all regularly employed workers.

Hair nets of suitable color are to be worn in the kitchen and dining rooms at all times. After combing your hair, be sure to check for loose hair that might fall into the food.

Low heeled shoes are comfortable and safer than high heels. Open toed shoes are an accident hazard.

Fingernails should be short, clean and unpolished.

Costume jewelry is inappropriate in the kitchen and is apt to fall into the food.

Pin curls, clips, bandanas, flowers, bows and turbans are inappropriate and are not to be worn in hair while on duty.

Visiting while you are working is discouraged. It is impossible to concentrate on two things at once. A quiet atmosphere is less tiring.

Telephones are for business purposes, and only necessary calls will be permitted.

Food taken on the tray as part of the meal allowance must be eaten at the dining table. No food may be carried out of the dining room or kitchen except on sick trays.

No food, cans, boxes, sacks or packages are to be taken from the kitchen. Any packages taken out of the building are subject to inspection by the dietitian on duty.

Dressing rooms are for all women employees. Please leave no money or valuables there, as such items are not necessarily safe from theft.

Coats and wraps are to be left in the dressing room, not hung in the pantry, stairways or elsewhere.

Lights in the dressing rooms and storerooms are to be turned out when you leave if they are not being used by others.

Cleaning

Cooks and institutional workers are expected to keep equipment (large and small) in the kitchen and dining room clean.

Dietitians may ask kitchen workers to perform cleaning jobs during slack periods in food preparation.

General cleaning is scheduled at the beginning and end of the year and prior to vacation periods.

Sanitation Policies

One of the major objectives of the Residence Hall dining service is to prepare and serve safe and wholesome food. In order to do this, certain sanitary practices must be followed. These may be summarized as follows:

Sanitary food service can result only if there is cooperation between employees and dietitians in all matters pertaining to cleanliness.

Wash your hands with warm water and soap before starting work, after eating, using your handkerchief, touching your face, hair, or clothing, and on returning from the toilet. Paper towels, soap, and hand sinks are placed at convenient locations in the dressing rooms and kitchens. Paper towels are to be used for hand drying. Keep the dressing room in order. You should report any broken equipment, burned out lights, or lack of paper supplies.

Cloths for cleaning purposes are available. Use them, not towels, napkins or aprons.

Wear aprons provided by the food service department when on duty.

Use only clean pot holders. Do not substitute a tea towel for pot holders. There is never an excuse for using a soiled pot holder. When a pot holder becomes soiled, place it in the laundry basket, not in the drawer.

All soiled and wet laundry should be placed in the proper container.

Hold tea towels in the hand or place on the table when not in use. They are not to be thrown over the shoulders or elsewhere.

Use only the specific equipment and supplies provided for each type of cleaning. Be certain to use the correct cleaning materials in the correct amount. If you do not know, ask the dietitian.

Keep garbage cans covered except when they are being filled. Garbage cans put outdoors must be kept covered.

Containers and utensils are to be handled by the surfaces which do not come in contact with food or drink. Fingers should touch only the outside surfaces of glasses, cups and dishes, and the handles of spoons, forks, and knives.

Dish washing standards and practices will be explained to you in detail by the dietitian.

Tasting during meal preparation or service is prohibited, except by those preparing the food and by the dietitian, and then only for the purpose of testing quality. NEVER dip fingers into food being prepared or served. For tasting, always use a clean spoon, not the stirring spoon.

Careful storage of food is essential. To insure safe storage, food should be cooled as quickly as possible. As soon as serving is completed, place food to be saved in shallow pans, cover and place in a refrigerator. Storage conditions should be such that food is cooled to a temperature of 50°F. within one hour after it is placed in the refrigerator.

All deliveries of food should be placed immediately in proper storage by the employees responsible.

Work areas should be kept as clean and neat as possible. Put garbage in garbage cans, papers in waste basket or incinerator, soiled cloths in laundry basket. Wipe up any spilled food or liquid from tables, stoves or equipment with clean cloths. Empty cans and cartons should be put in the designated places.

Floors should be kept free of food, grease, water and unnecessary utensils not only for sanitary reasons but to prevent accidents.

If anything is spilled, always wipe it up. It is a good policy to carry a clean cloth at all times in order to keep surfaces and equipment neat and clean.

If you borrow anything from another worker or another unit always make it known. Return the equipment **clean and in working order**.

The person using cutters, slicers, scales or other machines is responsible for leaving them clean and reassembled correctly.

Pans and utensils should be rinsed thoroughly and then stacked neatly by the pot sink to be washed.

When supplies are taken from the pantry or refrigerator, always return containers to the assigned place. Never handle equipment, jars, cans or other containers with doughy or greasy hands.

Health and Hygiene

Only employees who are free from colds or other infections can safely handle food. Please do not report for work if you have a cold or other contagious disease. An employee must realize her responsibility to the Hall residents.

A food handler's examination is required each year. This is given at Student Health Department at no cost to you. Appointments for these examinations

must be made through the dietitian's office. The physical examination consists of the following: Wasserman blood test, chest x-ray, and typhoid carrier test. These tests are of value to you as a check on health.

A daily bath and fresh underclothing are essential to personal cleanliness, and a deodorant is necessary to prevent perspiration odor.

Colds, sore throat, or other infections should be reported to the dietitian before you come on duty. Several hours' notice of expected absence should be given when at all possible.

First Aid Kit

Bandages, antiseptic, applicators, cotton, and burn salve are kept in the office. All accidents, even though minor, should be reported to the dietitians. If you notice the supply of the first aid material is getting low, notify the dietitian so that the supply may be kept adequate for any emergency.

Insurance

Blue Cross Insurance and Blue Shield are available to all employees within 60 days after employment or once a year -- usually in the spring. Information concerning membership can be obtained in the Comptroller's office, Anderson Hall.

Accident Prevention

Use equipment correctly. Ask for instruction if you are in doubt. Turn off moving parts of equipment and wait until they stop before you leave.

Be sure steamer is turned off before opening doors.

Pick up at once anything dropped on the floor.

Do not leave cloths, pot holders or papers on the range. Wipe up anything spilled, immediately.

Never walk on wet floors.

Use portable tables for moving heavy objects to prevent strain. Ask for help when lifting heavy articles.

Be careful when carrying hot food so as to not bump into another employee.

Report damaged, lost or broken equipment to the dietitian immediately on discovery.

* * * *

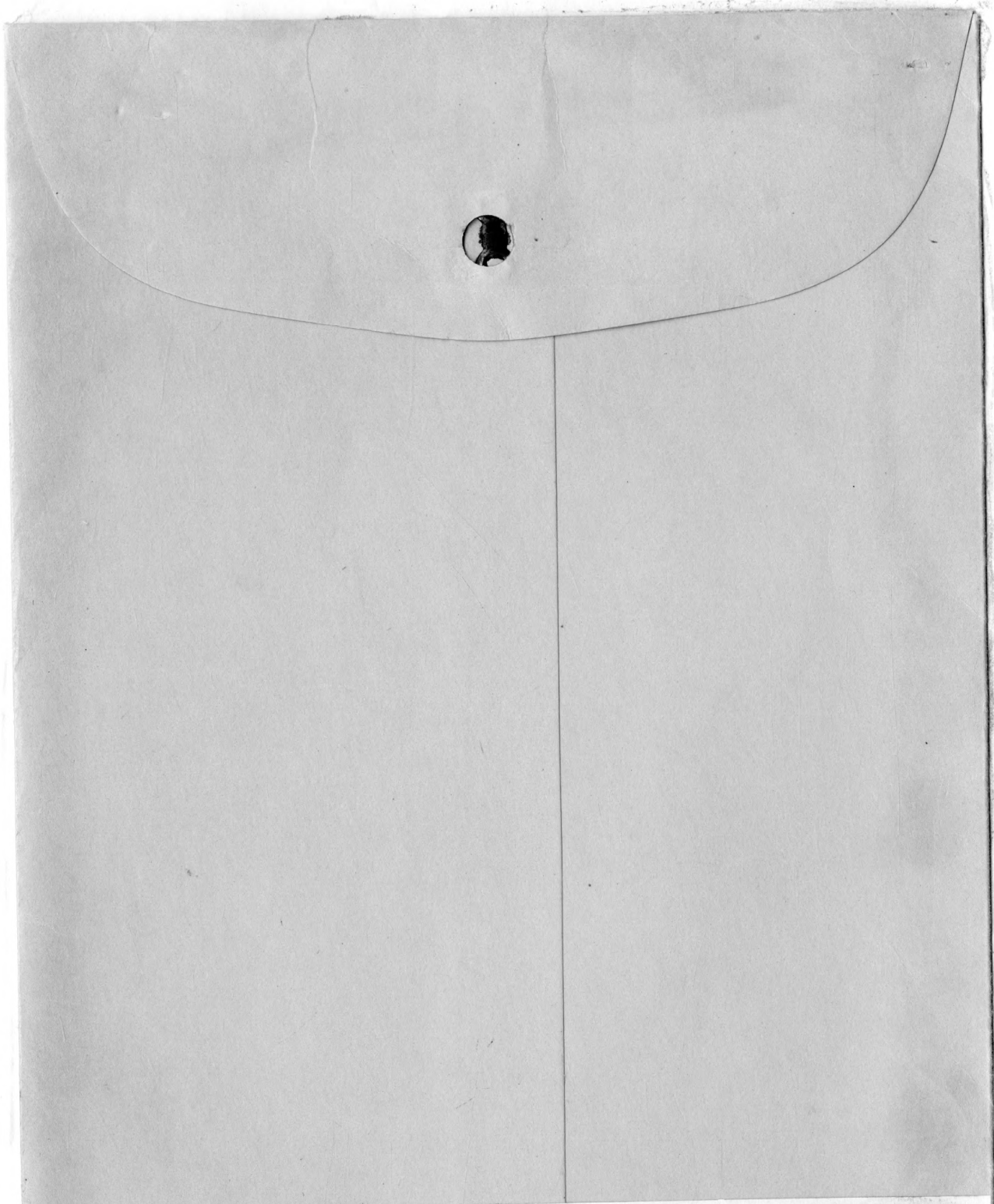


Fig. 2. General policy sheets for student employees working in the Kansas State University residence hall food services.

Instructions for Waitresses
Dinner Service

APPEARANCE AND PERSONAL ATTIRE:

1. A good waitress is quiet, courteous, neat and efficient.
2. Waitresses control much of the attitude and atmosphere of the dining room.
3. Wear clean wash dresses or washable blouses and skirts. Sweaters or wool dresses must not be worn by waitresses. Hose must be worn on guest nights and Sundays.
4. White aprons are furnished and laundered by the food service department. Clean aprons will be issued by the dining room supervisor before dinner on guest night and Sunday. If your apron is soiled before those meals, ask for a clean one. Do not wear a soiled, ragged or wrinkled apron in the dining room. Aprons must be folded and put away neatly before you check out.
5. Hair should be neatly combed and held in place by a hair net.
6. Hands should be washed just before you begin work.

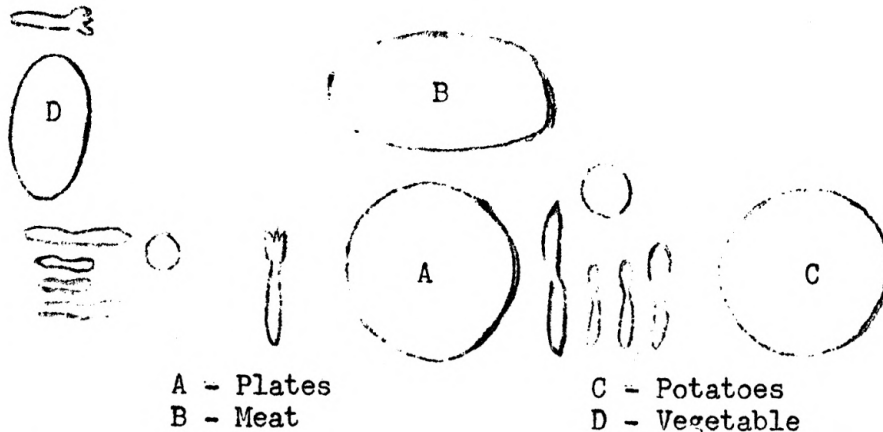
SETTING TABLES:

1. Linen, dishes and silverware will be placed on the table by table setters. (See separate "Instructions for Table Setters.")
2. As soon as you have eaten, wash your hands, check in on the time clock and check your table to see that it is set correctly. Table assignments will be made by the dining room supervisor.
3. Set up service table with:
 - a. service napkin and plate
 - b. rubber dish scraper
 - c. service plates for desserts when needed
4. Place salads, butter, cream, salad dressings and relishes, if any, on tables. This should not be done too soon, especially if the room is warm or if the salad is made of gelatine.
5. Fill water glasses just before serving. Refill water pitchers and place on serving stand.
6. Place heated dinner plates at hostess' place just before dining room doors are opened.
7. Go to serving room and line up with tray for food, in order designated by the dining room supervisor.

SERVING DINNER

When the guests are seated:

1. Carry serving dishes of food on trays for one table to serving stand.
2. Place platter of meat in front of hostess' place. Use left hand, place from the left. (see diagram below)
3. Place potatoes at right of hostess, using right hand and from the right side.
4. Place the other vegetable in front of assistant hostess with the left hand, from the left side.
5. Place plate of hot rolls in front of person opposite hostess. Place on table from left side using left hand.
6. Return to kitchen for serving dishes for other assigned tables.
7. Ask hostesses how many servings of coffee are needed.
8. Serve coffee. The procedure will vary slightly in each hall. Fill cups at coffee stations or tray stands and serve from the right side using the right hand.



DURING THE MEAL:

1. Remove dishes from empty places. First ask hostess if you may remove them.
2. Refill glasses as needed: catch drip with service napkin. Do not fill over $\frac{3}{4}$ full. Do not remove glass from table while filling.
3. Check with dining room supervisor to see if there are refills available. If so, ask hostess if she would like to have additional servings. There are no seconds on salads or desserts and none on meat unless indicated by the dietitian in charge.

4. As soon as hostess is through with the service dishes remove them, first asking permission of the hostess.
5. Clear service dishes in the following order: meat platter, potato dish, vegetable dish, roll plate. Use the same method as for serving. Take service dishes to kitchen on a tray and unload on the service counter.

CLEARING TABLES:

1. As soon as residents at your table have finished eating, ask the hostess if you may remove the dishes.
2. Starting with the hostess and proceeding to the right, remove plates. Remove dinner plate from the left with the left hand. Transfer to right hand, then remove the bread and butter plate with the left hand and place on top of the dinner plate. Remove salad plate with the left hand. Take to serving stand and place on tray.
3. Never stack dishes in front of the guest.
4. If the silver has not been properly placed on the plate and there is danger of it falling, move it toward the center of the plate before removing it.
5. Do not remove too many dishes at once.
6. Quietly scrape refuse onto one plate at the serving table, then stack the rest of the dishes so they can be safely carried to the kitchen.
7. Handle the dishes quietly. Do not hurry so fast that you will drop dishes or silver. It is not necessary or profitable to rush. Five minutes more spent clearing the tables will do a great deal toward making the dining room a pleasant place in which to eat.
8. Remove all unused silver belonging to the main course before serving dessert. Also replace salt and pepper shakers and sugar bowl.
9. Crumb the table, using a napkin and plate. Crumb from the left side with the left hand. Attract as little attention as possible, yet remove spilled food if necessary.
10. Bus boys will carry soiled dishes to kitchen and remove from tray onto soiled dish table.

SERVING DESSERTS:

1. Bring desserts from kitchen on trays. All waitresses should serve desserts at the same time, even though the first course is cleared by tables as the guests are finished eating. Head table waitress should enter dining room first. Serve hostess first.
2. Serve desserts from the left with the left hand

3. Refill coffee. Place at right of place setting with the right hand.
4. Refill water if necessary.

AFTER DINNER DUTIES:

1. Finish clearing tables after guests leave dining room.
2. Crumb tables with folded napkin and plate.
3. Remove and carefully fold tablecloths and silence cloths.
4. Wipe chairs and arrange in order.
5. Be excused by dining room supervisor before checking out

TIME TABLE:

- | | |
|------|---|
| 5:20 | Eat dinner and return soiled dishes to soiled dish table. |
| 5:45 | Check in on time clock.
Set up service trays. |
| 5:50 | Place relish or spread and butter on the table. |
| 5:53 | Place salads on the tables. |
| 5:55 | Fill water glasses 3/4 full. Return to kitchen and refill water pitchers and place on serving stands. |
| 5:58 | Place hot plates at hostess' place. |
| 6:00 | Go to kitchen for food. |

GENERAL RULES:

1. Serve all food from the left side, using the left hand.
(Exception: potato dish served from right with right hand.)
2. Pour beverages from right side, using right hand. Do not lift glass from the table to fill it. Carry a napkin in your left hand to catch drops as you finish pouring.
3. When serving food (or beverage) never reach across or in front of a person.
4. Handle dishes carefully. Let bottom of plate rest on your hand and be sure your thumb remains on outer edge of the rim.
5. Order of service: start with hostess, then person to her right, etc. Counterclockwise.
6. Balance trays. Heavy dishes in center. Glasses near center. Don't stack sherbets or glasses.

7. Carry everything to and from the kitchen on a tray.
8. No talking among waitresses during serving period.
9. Do not lean against walls.
10. Assume responsibility for serving at your assigned tables, but if necessary to help speed up service in the dining room, be willing to help another waitress. You may need help some day!
11. Be sure to have an approved substitute if you are unable to work and that you report your substitute to the head waitress.

KANSAS STATE COLLEGE
Residence Halls Food Service
August 1957

GENERAL POLICIES FOR STUDENT EMPLOYEES

Preparation for work:

See the bookkeeper in the Van Zile Dining Hall office before starting work.

1. Fill out an employees' withholding exemption certificate.
2. Sign a loyalty oath.
3. Give your social security number, or if you do not have a number, fill out application for one.
4. Obtain a note to the Student Health Service for your examination for a food handler's certificate, required of all food service employees. Examinations must be taken within the first two weeks.
5. Men students fill out "Employment Agreement."

Appropriate clothing for work:

Women students:

1. Washable blouses and skirts are recommended. Cotton does not absorb odors and is easily laundered. You are expected to wear a skirt - no shorts, jeans, or Bermudas.
2. Hair nets of suitable color are to be worn in the kitchen and dining rooms at all times. Hats are to be worn on guest nights and Sundays when serving in the dining room.
3. White aprons are furnished and laundered by the food service. Laundering is expensive and care should be taken to soil as few aprons as possible. Always wear a clean apron when serving at the counter or working in the dining room.
4. Pin curls, clips, bandanas, turbans, flowers, and bows are inappropriate and are not to be worn in the hair while you are on duty. No jewelry is to be worn while on duty. This included earrings.

Men students:

1. Clean, neat clothing should be worn for work in the kitchen or dining room. White coats are furnished and laundered by the food service for those working in the dining room. Jeans are not to be worn in the dining room. Dress trousers are to be worn in the dining room on dress nights and Sunday.
2. Blue striped aprons are furnished and laundered by the food service department and are to be worn in the kitchen.

Reporting for work:

1. Check in on the time clock when you are ready to begin work, not be-

fore. Check out when you have finished. Check out for meals.

2. If you do not understand the operation of the time clock, ask the dietitian to explain it to you.
3. If the time clock does not record your time correctly, report this to the dietitian at once.
4. If you cannot be on duty at the specified time, sign the substitute roster.

Your responsibilities:

1. An effort is made to use as much student help as possible. To be of value to the food service, you must feel a responsibility for your particular job. Study your job and strive for efficiency by eliminating unnecessary motions, seeing things to do without being told, and assisting with other work if you have finished yours.
2. You are hired for the entire semester and are responsible for your assigned job and schedule throughout that time.

On the job:

1. The dietitian will discuss your duties with you when you first start to work. It is not possible, however, to show you all details of a job at the start, because, the type of menu, service, number of employees on duty, and many factors vary from day to day. Be alert and observing and fill in wherever it is necessary.
2. Wash your hands before you begin work, and after eating, using your handkerchief, touching your face, hair or clothing, and on returning from the toilet.
3. Clean hands, fingernails and clothing are required.
4. Do not comb your hair or replace makeup in the kitchen or dining room. Before reporting for duty, check for loose hairs that might fall into the food.
5. Gum chewing and smoking on duty are prohibited.
6. Unnecessary talking while on the job is discouraged. It is impossible to concentrate on two things at once. Conversation while serving residents (cafeteria or dining room) is prohibited. Never lean against the wall during meal service.
7. The serving counter, work areas and floors should be kept as clean and neat as possible. Put garbage in garbage cans, Papers in waste basket or the incinerator, soiled laundry in the proper place. Wipe up any spilled food or liquid with clean cloths (or mops if spilled on the floor). Empty cans and cartons should be put in the designated places.

8. Handle dishes carefully — they are expensive. Breakage due to carelessness will be charged to you.

Sanitation:

1. Only employees who are free from colds or other infections can safely handle food. Please do not report for work if you have a cold or other contagious disease, but notify dietitian that you are unable to work and, if possible, provide a substitute.
2. Extreme care in handling food and equipment used in food preparation and service is a health requirement.
3. Cups should be picked up only by the handle. Never allow fingers inside cups nor glasses, nor over the rims of plates and serving dishes.
4. Silverware should be handled in such a manner that fingers do not touch the part that comes in contact with food.
5. A tea towel is never a substitute for an apron or a pot holder. Tea towels are to be held in the hand or placed on the table when not in use. Never throw them over the shoulder, on the window sill or other unsanitary places. Hang soiled ones up to dry; then place in laundry basket.
6. Towels, napkins and aprons should not be used for cleaning cloths. Cloths are available for that purpose.
7. Tasting during meal preparation or service is not permitted except by those responsible for the cooking, and then only for the purpose of testing quality. Food being prepared or served must not be sampled by dipping fingers into it.

To avoid accidents:

1. Use equipment correctly. Ask for instruction if you are in doubt.
2. Pick up at once anything dropped on the floor.
3. Wipe up anything spilled - immediately.
4. Do not use cooks area as a passage way.
5. Keep to right when going through doors. Be especially careful of swinging doors.
6. Bandages, antiseptic, cotton and burn salve are kept on hand. All accidents, even though minor, should be reported to the dietitian.

Your pay check:

1. You will be paid by check on or near the 15th of each month for the previous month's work. For example, on or near October 15, you will receive a check for your work during September. However, the time cards are picked up and calculated several days before the end of the month, so that you will be paid for the last few days on the next month's check.
2. Meals are not a part of your wages, except for boys. You are paid for your work by the hour and are expected to pay regular residence hall board fees. Eating in the kitchen is not permitted.
3. If you have questions about your check, see the dietitian in charge. Do not go to the Comptroller's office.
4. You are eligible for a five cent per hour increase in wages at the end of the first semester if you have fulfilled your agreement satisfactorily. Quality of work, tidiness, and infrequency of absence or eating in the kitchen will receive special consideration as a basis for pay increases.

EMPLOYEE AGREEMENT
For
Men Student Employees
Women's Residence Halls
Kansas State College
Semester 195__

1. Hours of Work:

- a. Students will work a minimum of $2\frac{1}{2}$ hours each day for 3 meals during the week and $1\frac{1}{2}$ hours work for 2 meals on Sunday during the time college is in session.

Summer School: Students will work a minimum of $1\frac{3}{4}$ hours each day for 2 meals.

- b. Hours of work will be scheduled by the dietitian based on the student's schedule of classes and need for his services.
- c. Hours worked will be recorded on the time clock. At the end of the month, student employees will be paid at the minimum rate of \$.65 an hour for any time in excess of that required in exchange for meals. If the total number of hours worked during the semester is not equal to the agreed number of hours of work (as listed in paragraph a), the student will pay the Food Service for the deficient hours either in work or in cash.
- d. There will be no adjustments made for meals not eaten.
2. An acceptable substitute will be provided by the student if he is unable to be at work at the appointed time.
3. Names of substitutes are to be posted, so the dietitian on duty will know who is on duty.
4. Examination week work schedules will be made out in cooperation with other student employees in the unit, and with the approval of the dietitian in charge.
5. Before vacation, student employees are expected to stay until the last meal is served and work is completed.
6. After vacation, student employees are expected to return for the first meal served.
7. Recreational facilities are not to be used by men student employees. These are for the use of the hall residents and their guests only.
8. Increase in pay may be made each semester, based on satisfaction of work and an acceptable number of absences during the previous semester.

Dietitian

Date

Student

\$.65 beginning rate & \$1.00 maximum

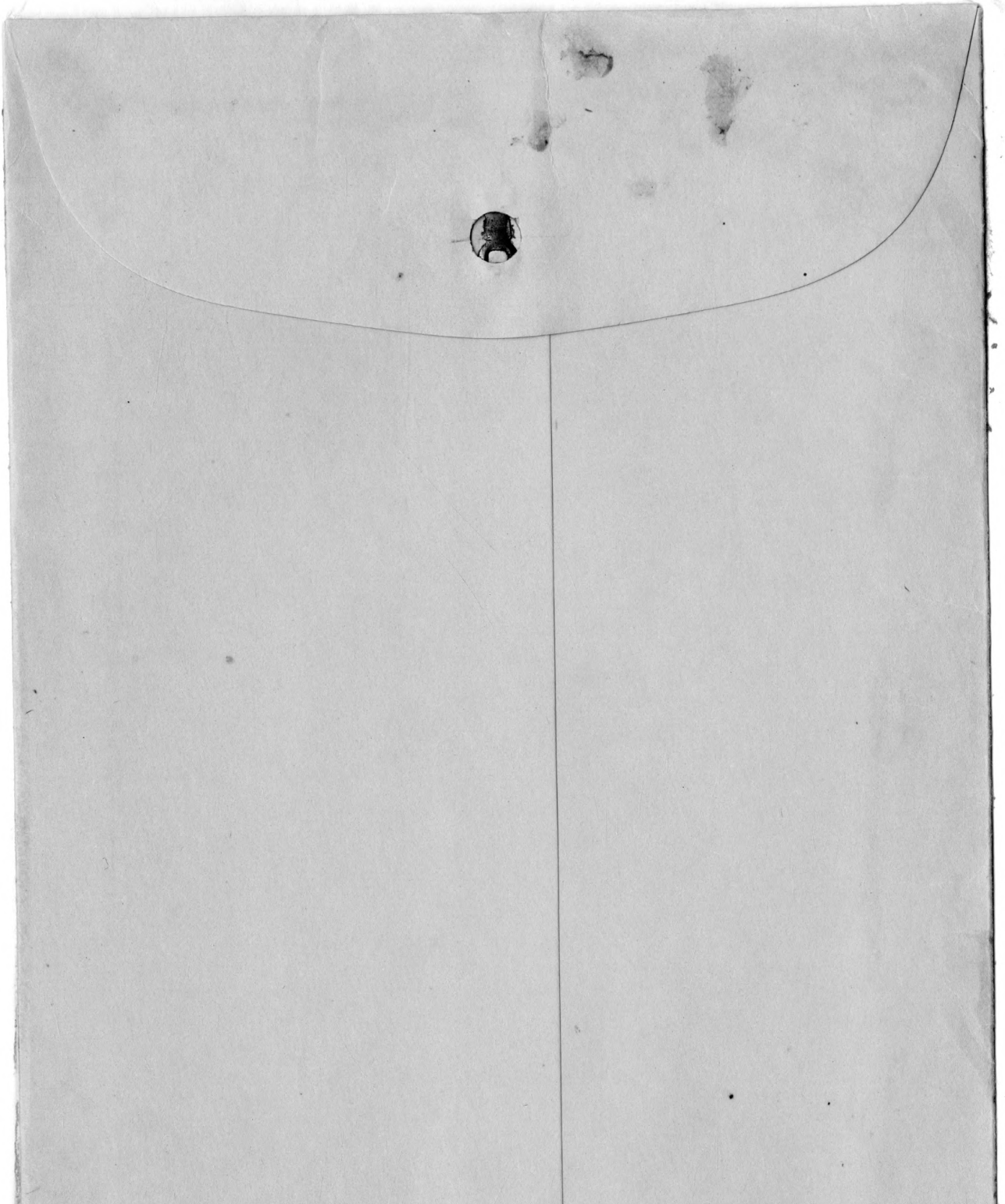


Fig. 3. Process chart showing the original method used in preparing tossed vegetable salad.

PROCESS STUDY CHART










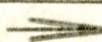









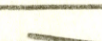

CHECK ONE:

Original Method x















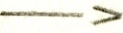





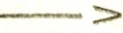

Task studied Dishing

Revised Method

vegetable salad

Step	Process explanation	:Process: :color: :symbols:	:Distance: :traveled: :in feet:	:Time
1	Read menu			10:00
2	To baker's rack		28	
3	Pick up 5 trays			
4	To salad table		12	
5	Set trays on table			
6	To baker's rack		12	
7	Pick up 5 trays			
8	To salad table		12	
9	Set trays on table			
10	To baker's rack		12	
11	Pick up 3 trays			
12	To salad table		12	
13	Set trays on table			
14	Open cabinet door			
15	Set down one stack salad bowls			
16	Close cabinet door			
17	Pick up 5 trays			
18	Carry trays to counter		8	
19	Spread trays on counter and cabinet table			
20	To salad table		4	
21	Pick up 5 trays			

Step	Process explanation	:Process: Distance:		
		:color	: traveled:	: Time
		:symbols:	in feet	
22	Carry to serving counter	⇒	10	
23	Spread trays on serving counter	○		
24	To salad table	⇒	2	
25	Spread 3 trays on salad table	○		
26	Pick up a stack of salad bowls	○		
27	Spread on trays on the salad table	○		
28	Open cabinet door	○		
29	Set down 144 salad bowls	○		
30	Close cabinet door	○		
31	Pick up stack of salad bowls	○		
32	Spread out on trays on the counter	▽		
33	Pick up stack of salad bowls	○		
34	Spread out on trays on the counter	▽		
35	Pick up stack of salad bowls	○		
36	Spread out on trays on the counter	▽		
37	Pick up stack of salad bowls	○		
38	Spread out on trays on the counter and cabinet top	▽		
39	Pick up stack of salad bowls	○		
40	Spread out on trays on the cabinet top	▽		
41	Pick up stack of salad bowls	○		
42	Spread out on trays on the cabinet top	▽		
43	Pick up stack of salad bowls	○		

Step	Process explanation	:Process: Distance:		
		:color : traveled:		
		:symbols:	in feet	Time
44	Spread out on trays on the cabinet top			
45	Pick up stack of salad bowls			
46	Spread out on trays on salad table			
47	Open cabinet door			
48	Set 8 salad bowls on trays on salad table			
49	Close the cabinet door			
50	To cabinet table top		2	
51	Pick up 2 cafeteria serving trays			
52	Set on cabinet table top			
53	Open cabinet door			
54	Set down 12 salad bowls			
55	Close cabinet door			
56	Set bowls on cafeteria trays			
57	To salad table		2	
58	Push salad bowl in position by salad table		2	
59	Fill salad bowls			
60	Push salad bowl along cabinet table		5	10:18
61	Fill salad bowls			
62	Push salad bowl along counter		5	
63	Fill salad bowls			
64	Push salad bowl around serving counter cabinet and salad table		5	
65	Put extra salad in salad bowls			

Step	Process explanation	:Process: Distance:		
		:color	: traveled:	: Time
		:symbols:	in feet	
66	To refrigerator	— >	8	10:20
67	Open door	○		
68	To salad table	— >	8	
69	Pick up tray	○		
70	To refrigerator set in tray	— > ▽	8	
71	To salad table	— >	8	
72	Pick up tray	○		
73	To refrigerator	— > ▽	8	
74	To salad table	— >	8	
75	Pick up tray	○		
76	To refrigerator	— > ▽	8	
77	To cabinet table	— >	9	
78	Pick up tray	○		
79	To refrigerator	— > ▽	9	
80	To cabinet table	— >	10	
81	Pick up tray	○		
82	To refrigerator	— > ▽	10	
83	Close refrigerator door	○		
84	Open refrigerator door	○		
85	To cabinet table	— >	10	
86	Pick up tray	○		
87	To refrigerator	— > ▽	10	
88	To cabinet table	— >	11	
89	Pick up tray	○		
90	To refrigerator	— > ▽	11	

Step	Process explanation	:Process: Distance:		
		:color	: traveled:	: Time
		:symbol	: in feet	
91	To cabinet table	— >	11	
92	Pick up tray	○		
93	To refrigerator	— > ▽	11	
94	To cabinet table	— >	12	
95	Pick up tray	○		
96	To refrigerator	— > ▽	12	
97	To cabinet table	— >	12	
98	Pick up tray	○		
99	To refrigerator	— > ▽	12	
100	Close refrigerator door	○		
101	Open refrigerator door	○		
102	To serving counter	— >	13	
103	Pick up tray	○		
104	To refrigerator	— > ▽	13	
105	To serving counter	— >	14	
106	Pick up tray	○		
107	To refrigerator	— > ▽	14	
108	To serving counter	— >	15	
109	Pick up tray	○		
110	To refrigerator	— > ▽	15	
111	To serving counter	— >	16	
112	Pick up tray	○		
113	To refrigerator	— > ▽	16	
114	To serving counter	— >	17	
115	Pick up tray	○		

:		:Process:	Distance:	
:		:color :	traveled:	
Step :	Process explanation	:symbol :	in feet :	Time
116	To refrigerator	→ ▽	17	
117	Close refrigerator door	○		
118	To cabinet	— >	8	
119	Pick up towel	○		
120	To sink	— >	6	
121	Turn on water	○		
122	Wet rag	○		
123	Turn off water	○		
124	Wipe off the salad table	○		
125	To cabinet table	— >	8	
126	Wipe off cabinet table	○		
127	To serving counter	— >	10	
128	Wipe off serving counter	○		
129	To sink	— >	14	
130	Lay towel on sink	○		
131	Pick up waste lettuce	○		
132	Carry waste lettuce to garbage disposal	— >	32	
133	Empty the container	○		
134	Turn on water	○		
135	Turn on switch	○		
136	Wait	D		
137	Turn off switch	○		
138	Turn off water	○		
139	Carry container to pot and pan sink	— >	52	

Step	Process explanation	:Process: Distance:		
		:color : traveled:	:symbol : in feet	: Time
140	To broom closet	— >	22	
141	Pick up broom	○		
142	Sweep around salad table	— >	28	
143	To broom closet	— >	28	
144	Pick up dust pan	○		
145	To salad unit	— >	28	
146	Pick up salad scraps in dust pan	○		
147	To garbage disposal	— >	32	
148	Empty dust pan	○		
149	To broom closet	— >	68	
150	Put away broom and dust pan	○		
151	To salad unit	— >	28	
152	Pick up container of lettuce	○		
153	To walk-in refrigerator	— >	48	
154	Open door	○		
155	Set down lettuce	○		
156	Close walk-in door	○		
157	To cart	— >	8	
158	Push cart to salad table	— >	56	
159	Pick up box of lettuce and set on cart	○		
160	Push cart to walk-in refrigerator	— >	48	
161	Open door	○		
162	Place box of lettuce on dollie	○		
163	Close door	○		

Step	Process explanation	:Process: Distance:		
		:color : traveled:		
		:symbol : in feet : Time		
164	To salad table	— >	48	
165	Pick up knife	○		
166	Open drawer in salad table	○		
167	Position knife	○		
168	Close drawer	○		
169	Push salad bowl and dollie to pot and pan unit	— >	32	
170	Place bowl in sink	○		
171	Push dollie to pantry	— >	22	10:45
Total			1143	45 min.

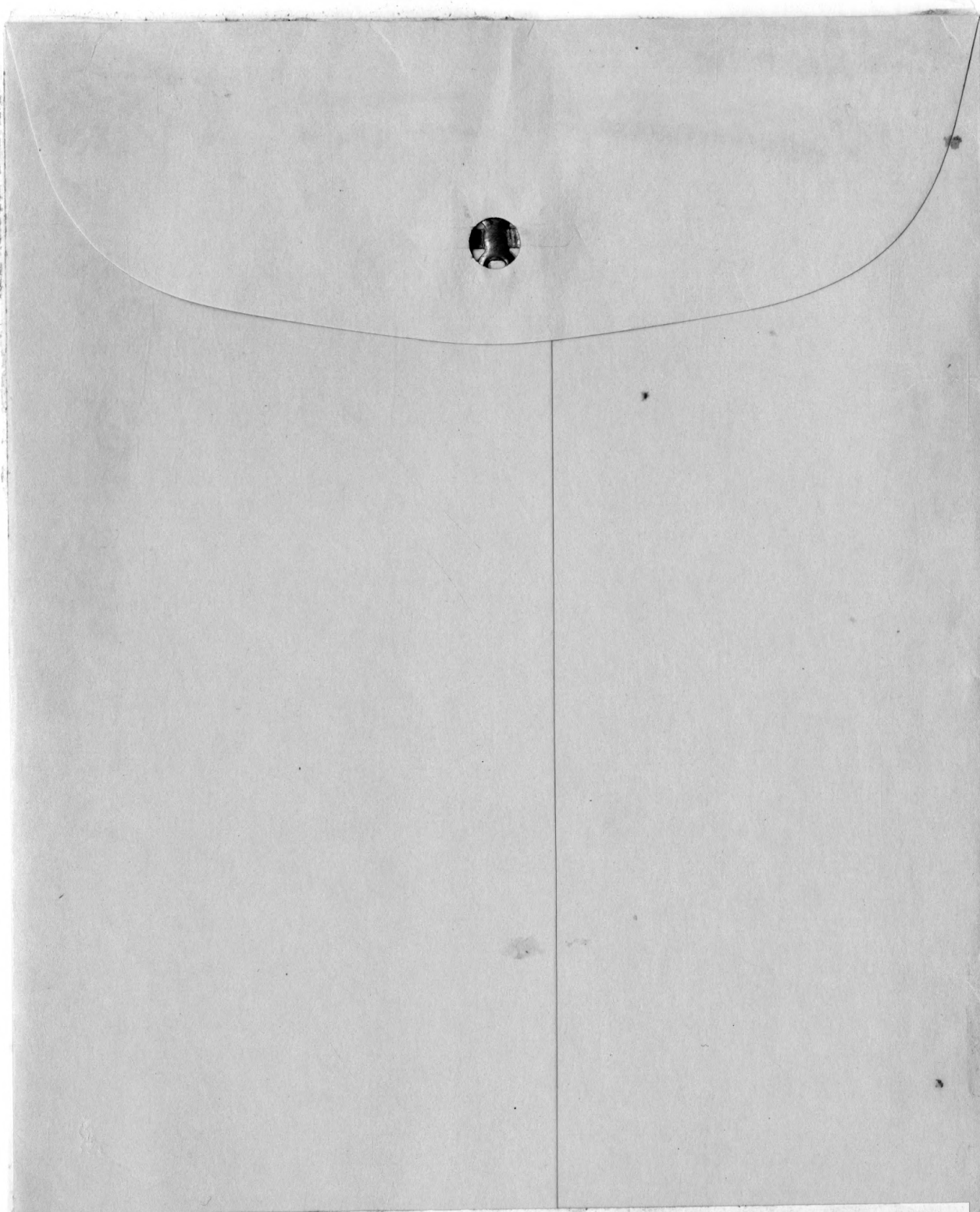


Fig. 4. Process chart showing revised method of preparing tossed vegetable salad.

PROCESS STUDY CHART

CHECK ONE:

Original Method _____

Task studied Dishing




















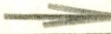






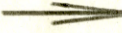

Revised Method x

Tossed vegetable salad

Step	Explanation of what is done in the process	:Process: :color : :symbols:	Distance: traveled: in feet	Time
1	Read menu	○		10:00
2	To baker's rack	→	28	
3	Pick up 6 trays	○		
4	To salad table	→	12	
5	Set trays on table	○		
6	To baker's rack	→	12	
7	Pick up 7 trays	○		
8	To salad table	→	12	
9	Set trays on table beside other trays	○		
10	To serving counter	→	10	
11	Pick up 2 cafeteria trays	○		
12	To salad table	→	10	
13	Set trays on table	○		
14	Open cabinet door	○		
15	Pick up a stack of salad bowls	○		
16	Place bowls on tray	▽		
17	Pick up a stack of salad bowls	○		
18	Place bowls on second tray	▽		
19	Fill bowls with salad (one Mary Ann cup)	○		
20	Open refrigerator door	○		

Step	Explanation of what is done in the process	:Process: Distance: :color : traveled: :symbols: in feet : Time		
21	Set in tray 1	—> ▽	12	
22	Set in tray 2	—> ▽	12	
23	Close refrigerator door	○		
24	Pick up a stack of salad bowls	○		
25	Place bowls on tray	▽		
26	Pick up a stack of salad bowls	○		
27	Place bowls on second tray	▽		
28	Fill bowls with salad	○		
29	Open refrigerator door	○		
30	Set in tray 3	—> ▽	12	
31	Set in tray 4	—> ▽	12	
32	Close refrigerator door	○		
33	Pick up a stack of salad bowls	○		
34	Place bowls on tray	▽		
35	Pick up a stack of salad bowls	○		
36	Place on second tray	▽		
37	Fill bowls with salad	○		
38	Open refrigerator door	○		
39	Set in tray 5	—> ▽	14	
40	Set in tray 6	—> ▽	14	
41	Close refrigerator door	○		
42	Pick up stack of salad bowls	○		
43	Place bowls on tray	▽		
44	Pick up stack of salad bowls	○		
45	Place bowls on tray	▽		

Step	Explanation of what is done in the process	:Process: Distance: :color : traveled: :symbol : in feet : Time		
46	Fill bowls with salad	○		
47	Open refrigerator door	○		
48	Set in tray 7	⇒ ▽	14	
49	Set in tray 8	⇒ ▽	14	
50	Close refrigerator door	○		
51	Pick up stack of salad bowls	○		
52	Place bowls on tray	▽		
53	Pick up stack of salad bowls	○		
54	Place bowls on tray	▽		
55	Fill bowls with salad	○		
56	Open refrigerator door	⇒ ○	16	
57	Set in tray 9	⇒ ▽	16	
58	Set in tray 10	⇒ ▽	16	
59	Close refrigerator door	○		
60	Pick up stack of salad bowls	○		
61	Place bowls on tray	▽		
62	Pick up stack of salad bowls	○		
63	Place bowls on second tray	▽		
64	Fill bowls with salad	○		
65	Open refrigerator door	○		
66	Set in tray 11	⇒ ▽	16	
67	Set in tray 12	⇒ ▽	16	
68	Pick up stack of salad bowls	○		
69	Place bowls on tray	▽		
70	Pick up stack of salad bowls	○		

Step	Explanation of what is done in the process	:Process: Distance: :color : traveled: :symbol : in feet : Time		
71	Place bowls on tray			
72	Fill bowls with salad			
73	Open refrigerator door			
74	Set in tray 13	 	16	
75	Set in tray 14	 	16	
76	Close refrigerator door			
77	Pick up stack of salad bowls			
78	Place bowls on tray			
79	Fill salad bowls			
80	Open refrigerator door			
81	Set in tray 15	 	16	
82	Close refrigerator door			
83	Close cabinet door			
84	Place waste lettuce on cart			10:24
85	Place clean lettuce on cart			
86	Place unused lettuce on cart			
87	Push cart to garbage disposal		32	
88	Empty container			
89	Turn on water			
90	Turn on switch			
91	Place container on cart			
92	Turn off switch			
93	Turn off water			
94	Push cart to walk-in refrigerator		16	
95	Open walk-in refrigerator door			

Step	Explanation of what is done in the process	:Process: Distance: :color : traveled: :symbol : in feet : Time		
96	Set clean lettuce on dollie	▽		
97	Set unused lettuce on dollie	▽		
98	Close walk-in refrigerator door	○		
99	Push empty lettuce container to salad table	—>	32	
100	Place salad mixing bowl on cart	○		
101a	Push cart to pot and pan sink	—>	32	
101b	Push dollie to pantry doorway at same time	—>	22	
102	Place bowl and lettuce container in sink	▽		
103	Push cart to position on way to pantry	▽		
104	Place dollie in position in pantry	▽		
105	Pick up broom and dust pan in pantry	○		
106	To salad table	—>	28	
107	Sweep around table	○		
108	Take up lettuce in dust pan	○		
109	To pot and pan sink	—>	32	
110	Empty dust pan in garbage unit	○		
111	To broom closet in pantry	—>	22	
112	Position broom and dust pan	▽		
113	To cabinet drawer for towel	—>	30	
114	Open drawer	○		
115	Select towel	□		
116	Close drawer	○		

Step	Explanation of what is done in the process	:Process: Distance:		
		:color : traveled:		
		:symbol	: in feet	: Time
117	To sink	⇒	10	
118	Turn on water	○		
119	Wet towel	○		
120	Turn off water	○		
121	Wipe off table and knife	○		
122	Open drawer to salad table	○		
123	Position knife	○		
124	Close drawer	○		
125	To towel basket	⇒	30	
126	Hang towel over edge of basket	○		10:29½
Total			586	29½ min.



Fig. 5. Operation chart showing original method of sorting and dipping silver.

OPERATION CHART

CHECK ONE:

Original Method x
 Revised Method _____
 Operation studied Sorting
 and dipping silver _____

Equipment used _____
 Metal basket 1 _____
 Silva dry bucket _____
 Silver box _____
 Table, rack _____

Step:	Left hand	:Sym-: :bol :	Step:	Right hand	:Sym-: :bol
1	Select knives	0	1	Select knives	0
2	To knives	o	2	To knives	o
3	Grasp knives	0	3	Grasp knives	0
4	Pick up knives	0	4	Pick up knives	0
5	To basket	o	5	To basket	o
6	Release knives	0	6	Release knives	0
7	Select forks	0	7	Select forks	0
8	To forks	o	8	To forks	o
9	Grasp forks	0	9	Grasp forks	0
10	To basket	o	10	To basket	o
11	Release forks	0	11	Release forks	0
12	Select knives	0	12	Select knives	0
13	To knives	o	13	To knives	o
14	Grasp knives	0	14	Grasp knives	0
15	Pick up knives	0	15	Pick up knives	0
16	To basket	o	16	To basket	o
17	Release knives	0	17	Release knives	0
18	Select forks	0	18	Select forks	0
19	To forks	o	19	To forks	o
20	Grasp forks	0	20	Grasp forks	0
21	To basket	o	21	To basket	o
22	Release forks	0	22	Release forks	0
23			23	To basket	o
24			24	Lift basket	0
25			25	To silva dry bucket	o
26			26	Place basket in bucket	0
27			27	Lift basket	0
28			28	Shake basket	0
29			29	Basket to table	o
30	To knives in basket	o	30	To knives in basket	o
31	Grasp knives	0	31	Grasp knives	0
32	Lift knives from basket	0	32	Lift knives from basket	0
33	To silver box	o	33	To silver box	o
34	Place knives in silver box	0	34	Place knives in silver box	0
35	To forks in basket	o	35	To forks in basket	o
36	Grasp forks	0	36	Grasp forks	0
37	Lift forks from basket	0	37	Lift forks from basket	0
38	To silver box	o	38	To silver box	o
39	Place forks in silver box	0	39	Place forks in silver box	0
40	To knives in basket	o	40	To knives in basket	o
41	Grasp knives	0	41	Grasp knives	0
42	Lift knives from basket	0	42	Lift knives from basket	0

Step:	Left hand	:Sym-: :bol :	Step:	Right hand	:Sym-: :bol
45	Grasp handle 1 cylinder 3	0	45	Grasp handle 1 cylinder 3	0
46	Remove handle 1	0	46	Remove handle 1	0
47	Handle 1 to tray	o	47	Handle 1 to tray	o
48	Release handle 1	0	48	Release handle 1	0
49	Grasp handle 2 cylinder 4	0	49	Grasp handle 2 cylinder 4	0
50	Remove handle 2	0	50	Remove handle 2	0
51	Handle 2 to tray	o	51	Handle 2 to tray	o
52	Release handle 2	0	52	Release handle 2	0
53	To empty cylinder 5	o	53	To full cylinder 1	o
54	Grasp cylinder 5	0	54	Hold cylinder 1	0
55	Cylinder 5 to cylinder 1	o	55		
56	Invert cylinder 5 over cylinder 1	0	56		
57	Invert cylinder 1 over cylinder 5	0	57	Invert cylinder 1 over cylinder 5	0
58	Empty cylinder 1 to cylinder 2	o	58	Cylinder 5 to cart	o
59	Invert cylinder 1 over cylinder 2	0	59	Hold cylinder 2	0
60	Invert cylinder 2 over cylinder 1	0	60	Invert cylinder 2 over cylinder 1	0
61	Empty cylinder 2 to cylinder 3	o	61	Cylinder 1 to cart	o
62	Invert cylinder 2 over cylinder 3	0	62	Hold cylinder 3	0
63	Invert cylinder 3 over cylinder 2	0	63	Invert cylinder 3 over cylinder 2	0
64	Empty cylinder 3 to cylinder 4	o	64	Cylinder 2 to cart	o
65	Invert cylinder 3 over cylinder 4	0	65	Hold cylinder 4	0
66	Invert cylinder 4 over cylinder 3	0	66	Invert cylinder 4 over cylinder 3	0
67	Empty cylinder 4 to tray	o	67	Cylinder 3 to cart	o

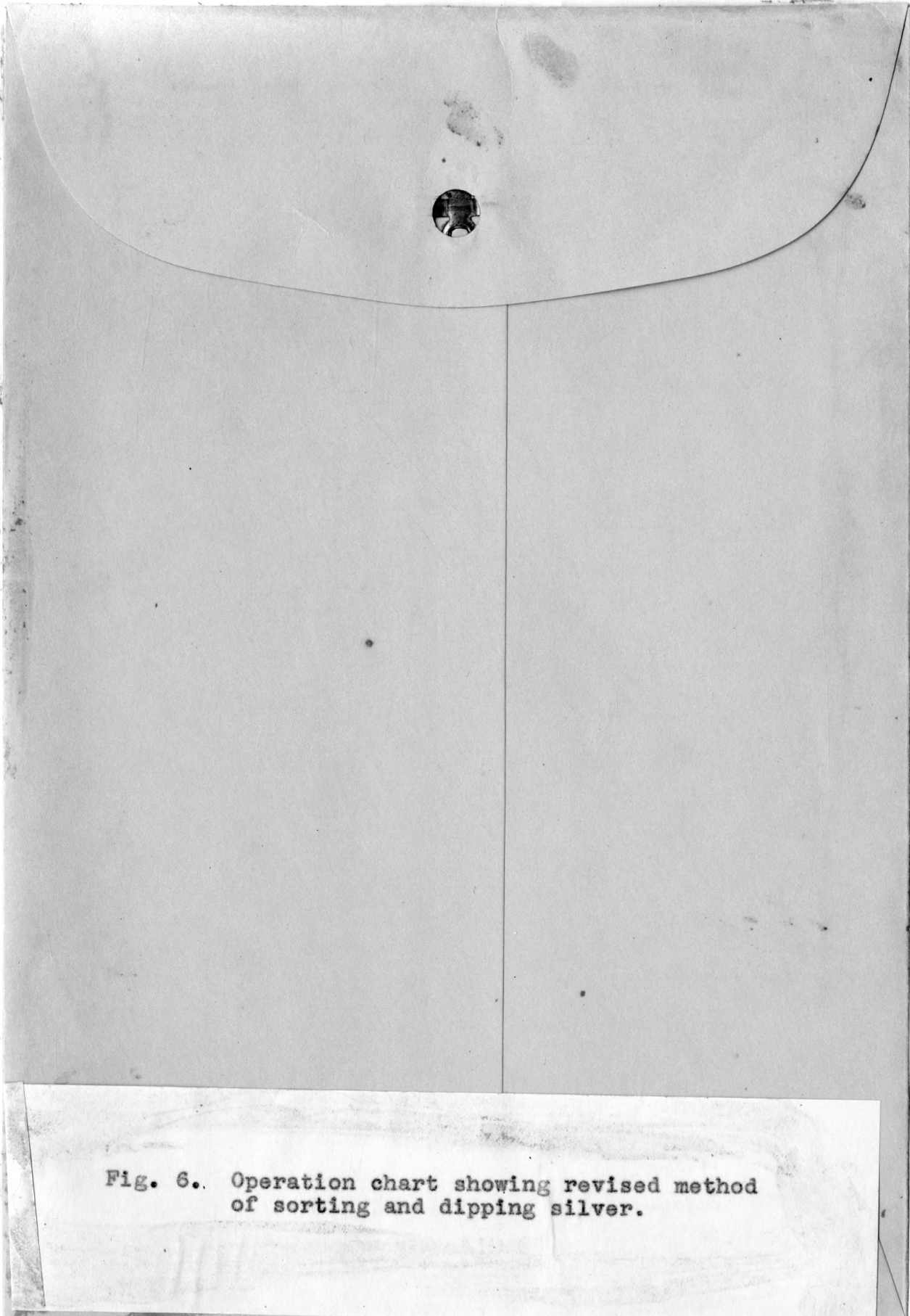


Fig. 6. Operation chart showing revised method of sorting and dipping silver.

OPERATION CHART

CHECK ONE:

Original Method _____
 Revised Method x
 Operation studied Sorting
 and dipping silver

Equipment used _____
Nylon cylinder 5
Cylinder handles 2
Silva dry bucket
Tray and cart

Step:	Left hand	:Sym-: :bol :	Step:	Right hand	:Sym-: :bol
1	Select handle 1	0	1	Select handle 1	0
2	To handle 1	o	2	To handle 1	o
3	Grasp handle 1	0	3	Grasp handle 1	0
4	Lift handle 1	0	4	Lift handle 1	0
5	Handle 1 to cylinder 1	o	5	Handle 1 to cylinder 1	o
6	Attach handle 1	0	6	Attach handle 1	0
7	Select handle 2	0	7	Select handle 2	0
8	To handle 2	o	8	To handle 2	0
9	Grasp handle 2	0	9	Grasp handle 2	0
10	Lift handle 2	0	10	Lift handle 2	0
11	Handle 2 to cylinder 2	o	11	Handle 2 to cylinder 2	o
12	Attach handle 2	0	12	Attach handle 2	0
13	Grasp handle 2 cylinder 2	0	13		
14	Lift cylinder 2	0	14		
15	Cylinder 2 to bucket	o	15		
16	Dip cylinder 2	0	16	To handle 1 cylinder 1	o
17	Lift cylinder 2	0	17	Grasp handle 1 cylinder 1	0
18	Shake cylinder 2	0	18	Lift cylinder 1	0
19	Cylinder 2 to tray	o	19	Cylinder 1 to bucket	o
20	Set cylinder 2 on tray	0	20	Dip cylinder 1	0
21			21	Lift cylinder 1	0
22			22	Shake cylinder 1	0
23			23	Cylinder 1 to tray	o
24	To handle 1 cylinder 1	o	24	To handle 1 cylinder 2	o
25	Grasp handle 1	0	25	Grasp handle 1	0
26	Remove handle 1	0	26	Remove handle 1	0
27	Handle 1 to cylinder 3	o	27	Handle 1 to cylinder 3	o
28	Attach handle 1	0	28	Attach handle 1	0
29	To handle 2 cylinder 2	o	29	To handle 2 cylinder 2	o
30	Grasp handle 2	0	30	Grasp handle 2	0
31	Remove handle 2	0	31	Remove handle 2	0
32	Handle 2 to cylinder 4	o	32	Handle 2 to cylinder 4	o
33	Attach handle 2	0	33	Attach handle 2	0
34	Grasp handle 2 cylinder 4	0	34		
35	Lift cylinder 4	0	35		
36	Cylinder 4 to bucket	o	36		
37	Dip cylinder 4	0	37	To handle 1 cylinder 3	o
38	Lift cylinder 4	0	38	Grasp handle 1 cylinder 3	0
39	Shake cylinder 4	0	39	Lift cylinder 3	0
40	Cylinder 4 to tray	o	40	Cylinder 3 to bucket	o
41	Set cylinder 4 on tray	0	41	Dip cylinder 3	0
42			42	Lift cylinder 3	0
43			43	Shake cylinder 3	0
44			44	Cylinder 3 to tray	o

Step:	Left hand	:Sym-: :bol :	Step:	Right hand	:Sym-: :bol
45	Grasp handle 1 cylinder 3	0	45	Grasp handle 1 cylinder 3	0
46	Remove handle 1	0	46	Remove handle 1	0
47	Handle 1 to tray	o	47	Handle 1 to tray	o
48	Release handle 1	0	48	Release handle 1	0
49	Grasp handle 2 cylinder 4	0	49	Grasp handle 2 cylinder 4	0
50	Remove handle 2	0	50	Remove handle 2	0
51	Handle 2 to tray	o	51	Handle 2 to tray	o
52	Release handle 2	0	52	Release handle 2	0
53	To empty cylinder 5	o	53	To full cylinder 1	o
54	Grasp cylinder 5	0	54	Hold cylinder 1	0
55	Cylinder 5 to cylinder 1	o	55		
56	Invert cylinder 5 over cylinder 1	0	56		
57	Invert cylinder 1 over cylinder 5	0	57	Invert cylinder 1 over cylinder 5	0
58	Empty cylinder 1 to cylinder 2	o	58	Cylinder 5 to cart	o
59	Invert cylinder 1 over cylinder 2	0	59	Hold cylinder 2	0
60	Invert cylinder 2 over cylinder 1	0	60	Invert cylinder 2 over cylinder 1	0
61	Empty cylinder 2 to cylinder 3	o	61	Cylinder 1 to cart	o
62	Invert cylinder 2 over cylinder 3	0	62	Hold cylinder 3	0
63	Invert cylinder 3 over cylinder 2	0	63	Invert cylinder 3 over cylinder 2	0
64	Empty cylinder 3 to cylinder 4	o	64	Cylinder 2 to cart	o
65	Invert cylinder 3 over cylinder 4	0	65	Hold cylinder 4	0
66	Invert cylinder 4 over cylinder 3	0	66	Invert cylinder 4 over cylinder 3	0
67	Empty cylinder 4 to tray	o	67	Cylinder 3 to cart	o

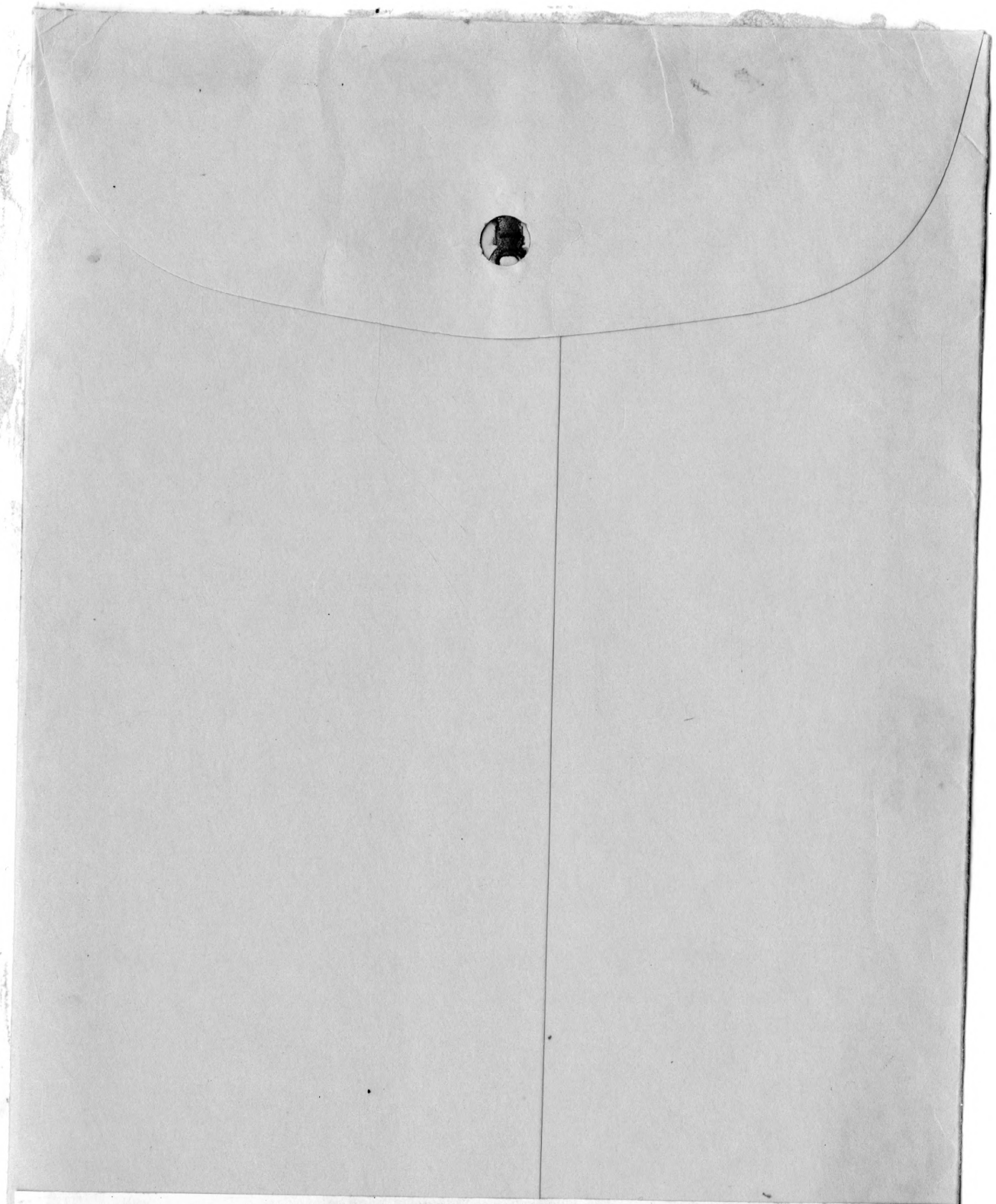


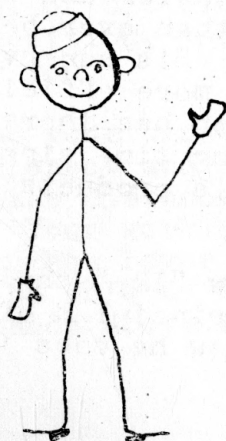
Fig. 7. Handbook for use in an employee training program in work simplification.

LET'S FOLLOW

IKE

THE

INSTITUTIONAL KITCHEN EMPLOYEE



Through The
Principles and Methods of
WORK SIMPLIFICATION

INTRODUCTION

Have you ever wondered how to make your job easier? There are certain tools to help you do this very thing. They are called PRINCIPLES OF WORK SIMPLIFICATION. Ike, an Institutional Kitchen Employee, thinks these tools are wonderful! His work has become easier and he goes home feeling peppier than ever before after a full day's work. His supervisor has noticed how much more efficient Ike is, and how his production has increased. Not only has it been a long time since Ike has had a failure, but his products are more uniform in quality.

Let's follow "Ike" through a work day of using these principles of work simplification and see how he does it!

PRINCIPLES OF WORK SIMPLIFICATION

The height of the work place and the chair should be arranged to permit alternate sitting and standing at work. Good lighting and ventilation are important. The worker should be as comfortable as possible.

Height of the Work Place and Chair

Ike picks out a table the right height for a person of his proportions. Without stooping, he stands with his arms comfortably relaxed from the shoulders. As he works, he doesn't have to raise his hands above the level of his elbows. If you can work in this position, your counter height is correct for you.

Let's find your proper work table height. Stand erect and have your supervisor measure the distance from your elbow to the floor. Your work counter should be **two or three inches lower** than this, so that you will be able to work without raising your hands above elbow level.



CORRECT



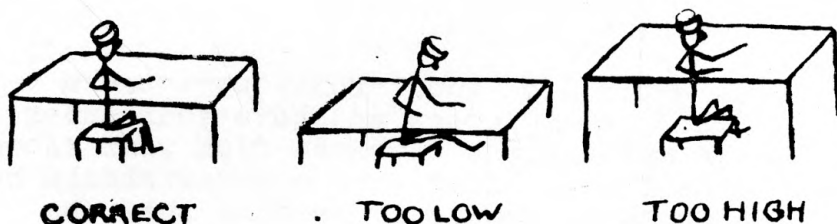
TOO LOW



TOO HIGH

When Ike sits at his work table, he selects a chair or stool that permits him to sit with his arms and shoulders relaxed, and, again, without raising his hands above the level of his elbows. For the most comfortable position, Ike has found that there should be from 6 to 10 inches of space between the chair seat and the under side of the table.

To find how high your work chair should be, use the measurement taken from your elbow to the floor when you were standing. Sit down and measure again, this time also from elbow to the floor. This distance should be the same whether you are sitting or standing.

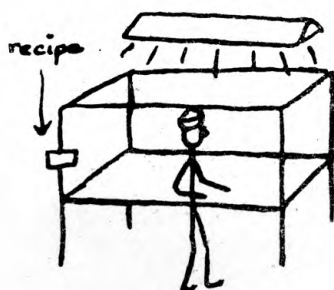


Not everyone is the same height. The stool that is right for one worker may cause the next person's feet to dangle. Why not get a small wooden box to use as a foot rest? Poor circulation in your legs will cause them to become tired and even go to sleep.

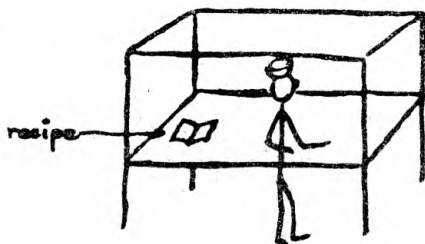
Lighting and Ventilation

Lighting is one of the most important working conditions in an institutional kitchen. Good lighting lessens eye strain and fatigue, reduces the number of errors in reading recipes, helps to prevent foreign objects from getting in the food, limits the number of accidents, and improves sanitation.

Ike has plastic clip clothespins fastened to the cook's table posts to hold recipe cards at eye level under adequate lighting. Not only are his eyes less tired because of better lighting, but also because he doesn't have to look up and down to read. He doesn't lose his place in the recipe as many times either. Ike is very fortunate in that when his kitchen was planned, good lighting was provided.



CORRECT



INCORRECT

Good ventilation is necessary in all institutional food services. Kitchens in which heat, steam, and fumes from cooking cannot escape may cause employees to fatigue very rapidly and sometimes even become ill. Ike remembers to turn on the ventilating fans the very first thing in the morning. In

the summertime, for better circulation of air, he opens the windows and doors which are properly screened. When he uses electric fans, he sees that they don't blow directly on the food or other employees.

Clothing

Ike has found that clothing which fits properly is important. It is easy to catch heels in trousers that are too long. Skirts that are too loose or full may catch in power equipment. Shoes in need of repair may cause a nasty fall. Ike doesn't believe in taking the chance of a bad accident! He doesn't want to stay in bed for a long time due to carelessness.

Our Institutional Kitchen Employee used to wear shoes which were too tight and didn't fit. Oh, how his feet hurt! In fact, he ached all over, and was he grouchy! He couldn't wait to get home to take those shoes off! Does this sound familiar?

Are you one that is constantly tugging and pulling on straps, belts, and girdles? Do you complain about your feet hurting? Are your clothes too tight? Be like Ike, and have your garments fit so well that once you put them on, you can forget them.

Muscles are tools. Use the right ones for the job being done.

Lifting

Ike uses his strongest muscles for heavy jobs. He bends his knees and sets his muscles before lifting a load. He has

found his back muscles are strongest when straight. If you keep your back muscles straight while lifting as Ike does, you will also be relieved of those miserable backaches.



Most jobs in large kitchens require some lifting and carrying. Ike has discovered that if he balances the weight, such as a load of trays, with both hands and carries them near the center of gravity of his body, his back is not strained. If a load is going to be too heavy for him to lift, he finds someone to help him. Ike suggests to all women employees, "Never lift over twenty-five pounds." To all Institutional Kitchen Employees, he recommends carrying a load which can be placed on a cart and pushed to the desired location.

Posture

Ike does not make his muscles work to hold his body in a strained position. You should also be willing to avoid the unnecessary weariness that comes from bad posture. Ike's motto is, "Don't blame anyone but yourself for your lazy posture habits."



CORRECT



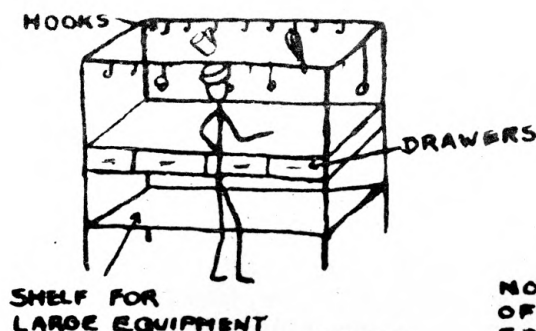
INCORRECT

You are probably beginning to see how these tools called PRINCIPLES OF WORK SIMPLIFICATION are designed to help YOU. Are you ready to wear the proper clothing, turn on those lights and ventilation fans, use the proper muscles and go to work? Let's go on and see what else Ike has in store for you.

There should be a definite and fixed place for all tools and materials.

Fixed Location for Tools and Materials

Ike stores his things at the point of first use and uses one-motion storage as much as possible. If you remember to do this, you will be like Ike and feel less fatigued at the close of the working day. Institutional Kitchens have tool racks above the work area and drawers under work table tops for the storage of tools. A real time saver for Ike is his habit of putting tools back where they belong. His reaching hand can then always find the right tool or material.



GOOD



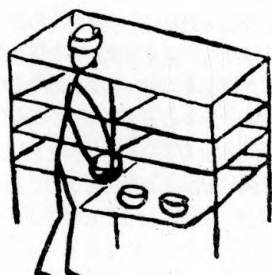
**NO STORAGE
OF TOOLS,
EQUIPMENT
OR MATERIALS.**

POOR

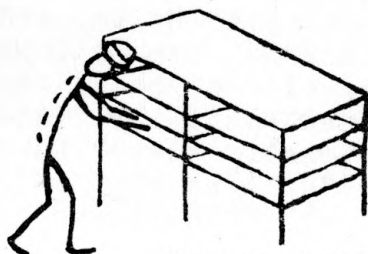
Many food service kitchens are now designed in work areas. Each area should have its own tools and materials whenever possible. This eliminates the many extra steps necessary to get tools and materials from another work area, not to mention the time spent looking for them or waiting while they are being used by another employee.

Sliding Shelves

He has found sliding shelves that bring their contents to him, require less muscle usage than stationary shelves which make him bend and reach.



CORRECT



INCORRECT

Labeling

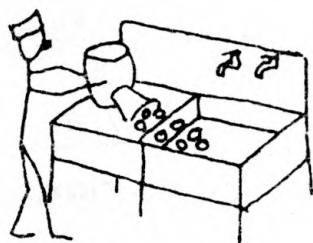
Labeling drawers, cabinets, and store-room shelves has saved Ike lots of time and temper. The bakers' table offers a golden chance for good labeling. The name of each spice should be on the right bin. This prevents Ike from getting the wrong ingredient in a recipe by mistake. He finds he no longer must look through the whole spice row for salt. Ike has also labeled the bins on wheels under the table and he always keeps them in the same order. This eliminates the extra time needed to read through all the labels.

Gravity feed bins and containers should be used to deliver materials close to the point of use. Bins and large containers should be on wheels.

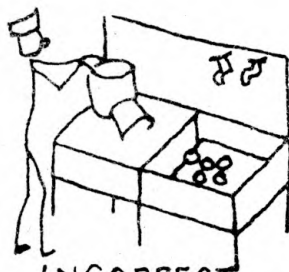
Gravity

The simplest use of gravity in the institutional kitchen, and one Ike uses many times a day, is the chopping board on which the knife moves downward to cut vegetables or meats. He places the board across the cooking utensil to be used, chops the food and pushes it off the board. As the chopped food is pushed off the board, Ike is using gravity. A vegetable peeler installed at the end of the vegetable preparation sink allows the potatoes to be emptied directly into the sink by gravity. Ike especially likes the water faucets directly above the steam jacketed kettles as well as the drains below which allow the kettles to be more easily washed and

emptied using forces of gravity. Spice bins which can be tipped instead of lifted also use gravity. Cereal, bread, and milk dispensers are other examples of gravity feed bins used in many institutional kitchens.



CORRECT



INCORRECT

Wheels

Ike sets the large mixer bowl on a dolly to push it to and from the mixer. The dolly is built low in order to set the bowl on it with a minimum of lifting. It can be moved with a few easy pushes of Ike's foot. You see, Ike can use several principles of work simplification at the same time in doing his jobs. Large mixing bowls used in making salads and desserts also set on dollies which can easily be rolled wherever needed. Since these dollies are much higher, Ike does not have to bend over while making his salad or dessert. He usually pushes these dollies into the walk-in refrigerator until time to dish up the food for the counter. Many carts, large and small, on which heavy items can be placed and pushed to the proper location are also used by Ike. Be like Ike, save your back and let gravity or wheels do your work!



CORRECT



INCORRECT

Tools and materials should be located close in and directly in front of the operator so as to be within easy reach of the hands. Transport distances should be as short as possible. All movements should be as short and few as possible.

Work Arrangements

By tracing your steps--you may find your work area needs rearrangement. This is what happened to Ike. He soon arranged his work area so his tools and materials which he uses most frequently are stored at waist level. For example, many large kitchens have cook's tables with a rack for utensils above, recipe holders at eye level, drawers for tools beneath the table top, and a shelf for pans below. You may, like Ike, want to arrange your knives in a special rack in the drawer or in an enclosed rack at the side of the table. His knives are stored at waist level and he is very particular that they are kept in order. Ike thinks it is wonderful to be able to select his knife without having to bend over

his drawer to look for it.

Short Distances Yield Fewer Movements

Ike has found that adequate racks and drawers in his work areas allow him to store his tools and materials within easy reach. In some cases, duplicate tools and materials shorten and decrease his movements. There are several tools which can be used for more than one job. These really save Ike time and motion. To dip vegetables, he uses his slotted spoon. The spoon drains as well as dips the vegetables. His cake spatula is made so he can cut and serve the cake with the same spatula. Always feel free, as Ike does, to discuss with your supervisor the need for duplicate or new tools and materials or possible rearrangement of your work area.

"Drop Deliveries" should be used wherever possible.

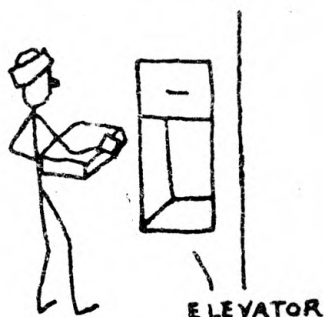
Drop Deliveries

Chopping boards used with containers in which food is going to be cooked utilize "drop delivery" as well as eliminate unnecessary transfer of food from one container to another. Ike believes in using methods like this to save himself time and energy. When he uses the electric shredder or slicer, the proper container for storage or immediate use is placed under it for drop delivery.

Ike certainly likes the new slanting shelves in the storeroom. The canned food automatically moves forward when he removes a can from the front. The storeroom keeper tells Ike these shelves are much easier to

keep refilled and neat.

Ike never carries food down stairs. He is afraid of falling and burning himself or one of his fellow workers. Ike uses dumb waiters and elevators to transport food from one floor to another.



GOOD



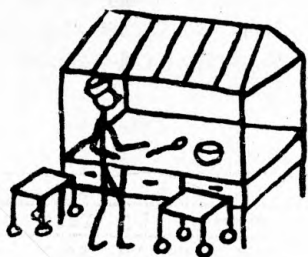
BAD

Materials and tools should be located or pre-positioned to permit the best sequence of motions.

Pre-Positioning

Pre-positioning for the next task may be done by storing the clean tools and equipment near or at the location of the next use. Ike saves lots of time by planning ahead and pre-positioning items on the cart as he is collecting them. He also pre-positions his work area before starting the job. For example, when making sandwiches, he pre-positions his butter, meat, salad, lettuce, bread, bun sheets, spreader, knife, and damp towels. He uses a cart on which he has pre-positioned the materials which will be needed for replenishment. His secret is that he stops a moment to organize his work, so that he can use the

fewest movements with easy smooth motions. Ike believes smooth movements with rhythm makes his work go twice as fast. You can also set up your meats, salads, and desserts just like Ike did his sandwiches. Remember to pre-position before starting to work. You may also want to do like Ike and cook the food in the container in which it is going to be served. This is also pre-positioning.



CORRECT



INCORRECT

Motions of the hands should be simultaneous and symmetrical. Rhythm is essential to a smooth easy work pattern.

Hand Motions

Ike is less tired if he kneads rolls by moving his arms toward the center from opposite directions. He also wipes tables, counters, and walls using these same motions. His work pattern has become smooth and easy. In fact, he wonders now why he hasn't always used his arm muscles simultaneously and symmetrically instead of over-taxing one arm's muscles while the other remained idle.

When using hand scrub brushes on the

floor or wall, Ike takes a brush in each hand and moves his arms toward the center from opposite directions. Ike not only maintains his balance and works from the center of gravity, but by using both hands, his work goes twice as fast.

One day Ike stopped to think and said, "Why let one hand do all the work while eyeing potatoes?" After trying several methods he decided on this one. Eye and trim the potato by pushing the knife into the potato with one hand while pushing the potato onto the knife from the opposite direction with the other hand. Try this method, and you will also feel relief in the one arm which before was doing all the work.

The two hands should begin as well as complete their motions at the same time.
The two hands should not be idle at the same time except during rest periods.

The Two Hands

Ike uses two hands to pan biscuits and rolls. His hands begin as well as complete their motions at the same time. Ike is very particular about using both hands to the best of his advantage. By working together, they save him lots of time.



CORRECT



INCORRECT

Ike serves food at the counter by reaching for the plate and bringing it into position with one hand, while the other hand is used to dip the food and carry it to the plate. To transfer a stack of plates from the truck to the serving counter, he uses both hands.

Do as Ike has learned to do, arrange your work area to allow free and easy movement of both hands in doing all work. For example, if your work area is properly arranged when dipping and flouring meat to be fried, you can develop a rhythm in your movements from meat, to batter, to deep fat frying which will automatically get rid of some of those extra useless motions.

Smooth continuous motions of the hands are preferable to zig zag motions or straight line motions involving sudden and sharp changes in direction.

Smooth Continuous Movements

Ike stirs a mass of food easily and with minimum fatigue by grasping the whip thumb down and stirring round and round rather than pushing the whip back and forth across the kettle. He is also taking advantage of momentum, which helps to move the food around the kettle.

Ike also uses smooth continuous motions to: set up salads and desserts; dish foods at the counter; pan rolls; roll pie crust; dip, coat, and deep fat fry meats and chop meats and vegetables.

Zig zag motions and sharp changes in directions in which muscles have to put on the brakes are much more tiring than you realize. Try planning your work arrangement, so you can avoid zig zag motions, straight line motions, and sudden sharp changes in direction.

The hands should be relieved of all work that can be done more advantageously by other means.

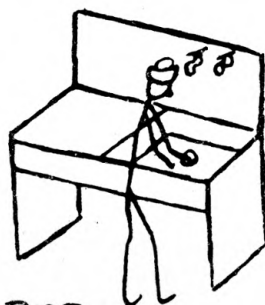
Relieve Hands of Work

Examples of devices which relieve the hands of work in the institutional kitchen are:

1. Foot-operated electrical switches.
2. Foot-operated drinking fountains.
3. Foot-operated refrigerator doors.
4. Spring handles on walk-in refrigerators.
5. Foot-valve operated hand sinks.
6. Knee action drains in sinks.
7. Marine edges on tables.
8. Power equipment such as mixers, slicers, choppers, etc.



GOOD



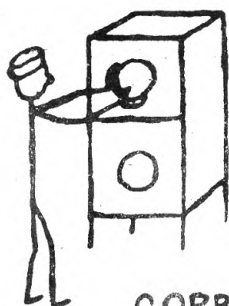
BAD

To avoid having to lift cartons of food, Ike slides them with his foot when possible. This is especially valuable to remember when the carton is located in an awkward position. He has found he can slide the carton into position for lifting. This eliminates awkward and excess strain on muscles which are not normally used in such positions for lifting. He also frequently uses his foot or hip to push open swinging doors when both of his hands are full.

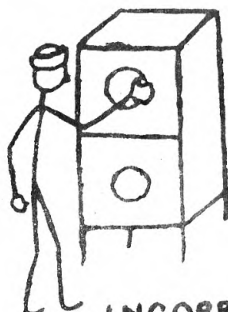
Hand wheels and handles such as those used on cranks should be designed to permit as much of the surface of the hand to come in contact with the handle as possible.

Hand Wheels

Ike uses both hands on the wheel to raise and lower mixing bowls and to open and close the steamer. These wheels are designed to permit as much of the surface of the hand to come in contact with the wheel as possible.



CORRECT



INCORRECT

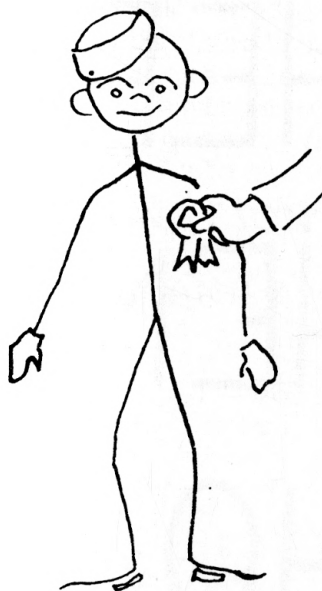
Some walk-in refrigerators and freezers have large handles to aid in opening. When

A
WORK SIMPLIFICATION
PROGRAM

OFFERS A GOLDEN CHANCE
TO PUT IDEAS ACROSS



EVERY SUPERVISOR
AND EVERY EMPLOYEE
SHOULD WANT TO FIND
BETTER METHODS



TO INCREASE EFFICIENCY
AND MAKE WORK EASIER

WHAT IS DONE?

WHY IS THIS STEP
NECESSARY?

WHERE SHOULD THIS
STEP BE DONE?

WHEN SHOULD THIS
STEP BE DONE?

WHO SHOULD DO THE JOB?

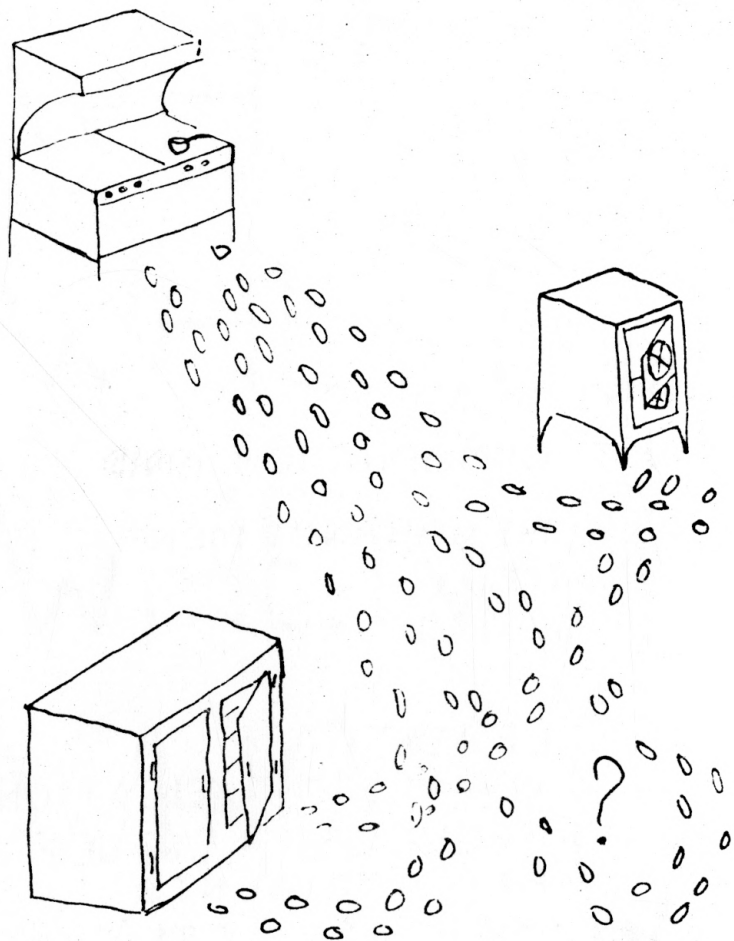
HOW SHOULD THE
JOB BE DONE?

WHAT LEAD TO
WHY ELIMINATION

WHERE LEAD TO
WHEN COMBINATION AND
WHO REARRANGEMENT

HOW LEADSTO
WORK SIMPLIFICATION
REDUCES FATIGUE
AND ACCIDENTS
INCREASES EFFICIENCY
INCREASES PRODUCTION
INSURES UNIFORM QUALITY

FOLLOW THE WORK—



— NOTE THE FACTS

A TRAINING PROGRAM IN WORK SIMPLIFICATION

by

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of Agriculture and Applied Science, 1956

AN ABSTRACT OF A MASTER'S THESIS

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1960

The purpose of this study was to survey the principles of work simplification and to relate them to the activities of the institutional kitchen, as well as to develop material suitable for use in an employee training program in work simplification. To determine the need for such a study, work simplification practices were observed in the following types of food services: hospital, industrial, commercial, high school, college union, and college residence hall.

A training program in work simplification was planned to be conducted in the kitchen of Van Zile Hall, a residence hall for 155 women at Kansas State University. The four full-time employees who cooperated in the training program were: the breakfast and lunch cook, the dinner cook, the baker, and the salad preparation worker. The knowledge of, understanding of, and ability to apply the principles of work simplification were ascertained for these four employees before starting the training program.

Thirteen principles of work simplification relating to the use of the body, arrangement of the work place, and design of tools and equipment, were organized and stated in easily understood terms. Individual interviews were scheduled with each of the four cooperating employees in order to: explain the program; present the 13 principles to be studied; and ask for employee suggestions.

One or more process charts, designed to present graphically the separate steps involved in a job through the use of colored

symbols for a specific process, were made in each work area. By this means, a study of the serving of tossed vegetable salad led to the reduction of steps in the procedure from 170 to 126, distance traveled from 1143 feet to 586 feet, and the amount of time used from 45 minutes to $29\frac{1}{2}$ minutes. Process charts were helpful in developing the best way of doing a task and in applying the new method.

Operation charts, which described work done at essentially one location, were made of tasks in the dishwashing area which utilized male student workers. Because of resistance to change encountered in this unit, suggested method improvements were not as readily applied as in other areas in the kitchen.

Travelgrams were constructed, depicting original and revised methods as described by process charts. The main function of these diagrams was to show visually the direction and distance traveled, as well as the amount of time used to do the job. An effective means of comparing two methods, the travelgrams were of greater interest to the employees than either the process or operation charts.

Thirty posters were designed and used throughout the training period. Some of the posters were intended to act as reminders of the tool, work simplification; whereas, others illustrated some of the principles being taught.

Using a simple camera with flash attachments, 84 photographs were taken during the course of the study. Employees served as models. Some of the pictures were used as illustrative material

for posters; others were posted on the bulletin board; and the rest were circulated among the workers for closer inspection.

A handbook, listing the 13 principles of work simplification forming the basis of the training program, was compiled. The employees participating in the program assisted in the development of the booklet, through their appraisal of the material as it was written. Such a manual was needed, in their opinion, to serve as a reference guide during the training period.

Much of the work simplification program was conducted by means of on-the-job training and individual instruction, which was possible because of the small size of the unit used. A large food service would have to resort to the use of group or employee meetings.

At the end of the training period, the four cooperating employees were asked to evaluate the project. They were in agreement that the program had increased their understanding of their jobs, increased their ability to apply the principles of work simplification to their jobs, and had enabled them to increase their work skill. They believed also, that the use of the visual aids had helped them to achieve a clear understanding of the principles of work simplification.