WORK SIMPLIFICATION TRAINING FOR MULTI-UNIT SUPERVISORS IN OAKLAND COUNTY

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WORK SIMPLIFICATION TRAINING FOR MULTI-UNIT SUPERVISORS IN OAKLAND COUNTY

by

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A PROBLEM

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THE SCHOOL LUNCH PROGRAM IN MICHIGAN

The School Lunch Division in the State of Michigan has been a section of the Department of Public Instruction since 1946. The Division was headed by one man with a secretarial staff of three full time employees. One of the functions of the Chief of the Division was to offer, state wide, any assistance in training school lunch personnel that the local school district or county board of education offices might request. At the time of this study the size of the state, number of programs involved and budget limitations allowed only minimum time to cover the many requests for training programs.

The County Board of Education offices were an intermediate unit acting as a liaison between the State Department of Public Instruction and local school districts. In 1957 Oakland County, which was the second largest county in Michigan and a part of greater metropolitan Detroit, administered one-tenth of the total school business in the state. The county was composed of thirty-one school districts with a total of two hundred and fifty-two schools. Twenty-seven of the districts operated school food service programs under the auspices of the Federal School Lunch Act. Of the twenty-seven districts with food service, seventeen were organized under the direction of one person. Four of the seventeen units had professional directors, thirteen placed management of food service in the hands of a non-professional defined as a multi-unit supervisor.

The Oakland County Board of Education created the position of school lunch consultant in response to requests from local school

administrators. Establishment of the position afforded all school districts within the county access to professional service. The consultant offered individual and group consultation to cooks, cook-managers, supervisors and directors. Also, assistance was given administrators in planning kitchen layout and equipment selection; teachers were provided information and resource materials for nutrition education projects within the classroom; and on-the-job training was initiated for cooks, managers and supervisors. Prior to 1958 an effective training program had not been successfully organized for all school lunch personnel because of area size, number of persons involved and diversification of school food service responsibility.

Sixty per cent of the school lunch employees in Oakland County were directed by multi-unit supervisors. Responsibilities of the supervisor covered menu planning, purchasing, food service quality and quantity control, records, sanitation and training. Supervisory appointments were based on managerial ability and experience in school food service work. In most cases assigned duties were efficiently executed by the multi-unit supervisor. However, an apparent lack of self-confidence due to minimal professional education was a deterrent to organization of training programs.

The development of a curriculum to be used in conducting an educational program for multi-unit supervisors in work simplification methods training should provide basic information and the necessary stimulation for the implementation of a county-wide training program.

Participation in schedules classes should also give the multi-unit supervisors the confidence necessary to establish training programs for all food service personnel within respective local school districts.

WORK SIMPLIFICATION - PRINCIPLES AND PHILOSOPHY

Interest in management as a science began to develop near the close of the nineteenth century. Fredrick W. Taylor, known as the "father of scientific management", believed increased efficiency may be achieved through time study, by developing a scientific procedure for each worker and by management and employee assuming specific responsibilities (26). Taylor's background for his work in the field of time study came while employed as a laborer for the Midvale Steel Works in the latter part of the nineteenth century. His work experiences conditioned him to look for means to properly define a "fair day's work". The methods finally developed were called time study (20).

Frank B. Gilbreth, the father of motion study, was also interested in improvement of procedure. He sought by development of motion study principles in coordination with time study, the "one best way" of performing an operation (4). Gilbreth observed early in his career that individual craftsmen used different methods for laying bricks. This observation was the start of a lifetime of formalized motion study and extensive investigation of work methods (20).

Dr. Lillian M. Gilbreth, wife of Frank Gilbreth, added her training in psychology to her husband's engineering background. This combination brought consideration to such things as worker fatigue, monotony, training, transfer of skill and worker reactions as part of motion study. Mrs. Gilbreth has done much to humanize motion and time study (20).

Ralph M. Barnes made a significant contribution to the over-all

field of motion and time study by his formulation of the "Principles of Motion Economy". Marvin E. Mundel aided Barnes in many research projects on hand motions. Through better understanding of body motions, the concepts of controlled experimentation to motion and time study research were introduced (20).

During the first two decades of the present century Barth, Gantt, Emerson and Thompson began to expand the principles and philosophies introduced by Taylor and Gilbreth (4). It was extremely unfortunate that most of these early leaders in the field choose to overlook the importance of the human factor in their studies.

About 1937 Allan Mogensen, Erwin H. Schell, David B. Porter and Lillian Gilbreth formally recognized that one of the major problems connected with improvement of work methods was enlisting the assistance of the workers. Principles of motion study were combined with the concept of worker participation in the development of jobs. From this study, the term work simplification was adopted and interpreted to include the training of production workers and supervisors in the use of basic tools of methods study for the purpose of improving their own jobs (20).

The reallocation of man power needs, made necessary by World War II, brought government assistance to the problems of scientific management. The War Production Board established a joint management and labor committee known as the War Manpower Commission to encourage and foster development of production (2). From this beginning grew the Training

Within Industry Program (T.W.I.) (4). The concept of this program was to teach supervisors and managers how to instruct. The plan known as Job Instruction Training (J.I.T.) consisted of an eighteen hour training course given to plant representatives (2). To carry out the nation wide program industrialists collected, standardized, streamlined and developed techniques for use in training programs which utilized the principles of scientific management and work simplification developed earlier in the century (2).

The principles governing methods improvement and use of work standards are as applicable to school food service as to industry. Work simplification and measurement are being recognized as a means of improving productivity of work activities wherever work is done (26). The term work simplification denotes activity primarily concerned with methods and procedures of accomplishing work (4) and shall be used in this paper for that purpose.

Scientific management as defined by Lesperance (20) is a philosophy which permits better utilization of personnel, materials and capital with minimum cost to employers and maximum satisfaction for labor, owner and consumer. Motion and time study or methods improvement is an essential part of scientific management. Barnes (2) explained motion and time study as the analysis of methods, materials, tools and equipment used in the performance of a job. This analysis is carried on with the purpose of finding the most economical way of doing work, by standardizing methods, materials, tools and equipment. It affords accurate

determination of time required by a qualified worker at a normal pace to do the task, and offers assistance in training workers in new methods.

The philosophy of motion and time study as stated by Mundel (26) involves two assumptions. There are various ways to perform any job, but with the knowledge obtainable at any one time, one method is usually superior to others. Also, the scientific method of solving problems is more productive of better work methods than is undisciplined ingenuity. Mundel further defined motion and time study as that branch of knowledge dealing with scientific determination of preferable work methods. An appraisal is in terms of time, value of work involving human activity and development of materials required to make practical use of these data. This definition may be broken into two component parts. Motion study is fully defined as a procedure for scientific analysis of work methods. Factors to be considered in order to determine preferable simplified work methods are (a) raw materials, (b) order of work, (c) design of proudct, (d) tools, work place and equipment and (e) hand and body motions (26). Time study is the process of analyzing an operation into elementary steps and observing the time required to perform each (45).

Work simplification, as discussed by Lehrer (19), is a systematic analysis of the factors that influence job performance, the application of principles of improvement and the design of correct procedures. Improvement results in the elimination of wasteful application of human

effort, materials, equipment and facilities and gives maximum return for each unit of effort, money or time expended. A simplified restatement of this viewpoint defines work simplification as the systematic use of common sense to make work easier, cheaper and quicker. Development of simplified work procedures may be carried out by a relatively inexperienced person adhering to specific actions.

Lesperance (20) stated that understanding the basic rules of motion economy is essential to initiation of a work methods simplification program. These rules are:

1. Rules of minimum effort: tools and hands should be used in an arc of easiest reach.
2. Rule of symetrical and simultaneous motion: use two hands for working.
3. Rule of safety conscious motion and natural movements.
4. Rule of minimum change of direction of motion: use of arc or straight line motion.

For more comprehensive understanding, the four rules may be expanded in their relation to body motion, work place and tool design.

1. Rules of motion economy as related to the body.
    a. Two hands begin and complete motions at the same time.
    b. Two hands should not be idle at the same time.
    c. Use simultaneous motions of hand and arms in opposite and symetrical directions.
    d. Hand motions should be confined to the lowest classifi-

cations when possible.

e. Employ momentum where possible.

f. Hand motions should be smooth and continuous.

g. Ballistic movements are faster, easier and more accurate.

h. Rhythm is essential in movements.

i. Motion paths should be kept within the normal working area.

2. Rules of motion economy as related to work place.

a. Definite and fixed place for all tools.

b. Tools and materials should be located close in and in front of the operator.

c. Gravity feed bins and containers should be used.

d. Drop deliveries used when possible.

e. Materials and tools located to permit best sequence of motion.

f. Good visual conditions necessary.

g. Work heights proper for standing and sitting.

h. Chair should be provided for every worker.

i. Circular workplace arranged in arc of normal reach of both arms and hands.

3. Rules of motion economy as related to tool design.

a. Hands should be relieved of work if possible.

b. Combine two or more tools when possible.

c. Pre-position tools and materials.

d. Distribute load of hand movements.

e. Handles of tools designed to fit hand easily.

All components of work simplification are important. Consideration of the human factor in terms of motivation is by far the most significant and is often overlooked (38). Motivation, derived from the Latin word meaning "to move", is primarily a matter of feeling, not logic, and is that within a man which moves him to action. Motives manifest themselves outwardly as attitudes and are the basic reasons for the use or non-use of existing knowledge and skills. Motivation is that which brings to expression the skill or knowledge an employee possesses. Lack of proper consideration also destroys that expression (30).

The University of Michigan Survey Research Center found motivation more effective when some degree of freedom in work was granted as well as an opportunity given to make decisions. Better response was observed when persons were treated as personalities and not machines (41). Other research, as pointed out by Regan (30), has shown that all personnel have five basic needs which vary in degree from individual to individual. These needs are security, recognition, influence, opportunity to do challenging work and group acceptance.

The supervisor with respect to the labor situation has four tasks. They are changing incorrect habits, increasing useful knowledge, adding skills and improving attitudes. Without positive motivation of the employee these goals cannot be accomplished. Thus, from the standpoint

of management, motivation has two aspects. One is need or desire and relates to a condition within the person. The other relates to life goals and is effective only to the extent it meets basic needs (30).

Two reasons prevent prompt acceptance by workers of the philosophy of work simplification. Increasing production through improved work habits may create a fear of unemployment. Also, persons tend to resent what appears to be criticism of personal work habits (26). However, the common sense interpretation of work simplification principles has had considerable impact on all types of work organizations today.

Frequently more economical work methods are available, but have not been adopted because employer and employee did not learn to work cooperatively (26). Work simplification study and program development are based on the theory that achievement depends upon participation of all employees. Success lies in organized sharing of all levels within the organization in the improvement process. Establishment of a work methods study program within the frame of friendliness, understanding and teamwork emphasizes the importance of the individual. Through this mutual confidence, motives of the employees involved become more clearly related to the objectives of the enterprise (38). Each individual may then become identified with work of the organization. To achieve this cooperation, competent management will find it necessary to help workers harmonize personal and organizational objectives (30).

Management would find more support in conducting a successful program if emphasis were placed on advantages to man, not equipment, mater-

ials or methods (12). The employee should be shown through improved training that he will become more highly skilled, consequently increasing job satisfaction as well as security. Proficient workers have increased opportunity for advancement and improved earning power. Application of simplified work methods speeds production rates, but lessens fatigue (28). Pay rates are more easily compared and fairly assessed, thus assuring the employee a fair monetary return for his labor. Working together insures increased cooperation and understanding between labor and management. Time invested by the employer in creating acceptance to change is better spent than time spent attempting to overcome resistance to change (8).

WORK SIMPLIFICATION PROGRAM FOR OAKLAND COUNTY

Prior to 1958 there were virtually no training programs for food service employees in Oakland County except in those areas employing professional food service directors. Multi-unit supervisors had expressed little interest in organizing programs in respective districts. The reduction in surplus commodities during the 1957-58 school year brought increased impetus for more efficient utilization of the labor dollar. A workshop conducted by the State School Lunch Division Office for Multi-Unit Supervisors and Directors in July, 1958 also stressed the need for improvement of work habits. The participants, at the conclusion of the workshop, expressed a desire for information and assistance with training programs for kitchen personnel. This interest encouraged the consultant to plan a series of lessons for supervisors to offer background information in work simplification and motion economy. It was hoped that those participating would feel qualified to work with kitchen managers and other food service personnel to organize local district training programs.

Curriculum planning for work simplification and motion economy instruction involved adherence to established scientific procedure through adaptation of simple, non-technical methods. A combination of steps in work simplification programming suggested by Lesperance, Mundel, Barnes and Fitzsimmons was utilized in constructing the program for Oakland County. In 1958-59 a curriculum was planned to include the basic princ-

iples and philosophy of motion economy as well as to demonstrate the use of techniques and tools of work simplification. The outline for this curriculum follows:

Work Simplification Methods Training Program
for Multi-Unit Supervisors
Oakland County 1958-59

September	Work Simplification	Mary Slater School Lunch Consultant Oakland County, Michigan
October	Methods, Techniques, and Tools of Work Simplification	James A. Apple Industrial Consultant East Lansing, Michigan
November	Use of the Electric Mixer and Attachments	Hal Bolin School Lunch Specialist U.S.D.A. Area Office Chicago, Illinois
January	Recipe Standardization and Portion Control	Edna Cook Director Food Service Bloomfield Hills Schools Bloomfield Hills, Michigan Mary Slater
February	Pre-preparation of Raw Vegetables	Nila Laidlaw Coordinator Food Service Dearborn Public Schools Dearborn, Michigan
March	Salad Preparation	Jean McFadden Department of Institution Administration Michigan State University East Lansing, Michigan
April	Sandwich Production	Marguerite Robinson Home Economist American Institute of Baking Chicago, Illinois
May	Bakeshop Production	Mary Slater School Lunch Consultant Oakland County, Michigan

A plan of the program for the year was sent to all supervisors in the county. Each meeting was scheduled for five hours. Two hour demonstrations were arranged to study in detail key production jobs, time consuming tasks or bottleneck areas. Group participation for the next two hours included discussion and the preparation of process charts, flow diagrams or operation analyses for the right and left hand. Where it was applicable, all techniques were utilized. The remaining time was spent by the consultants working with individuals or the group on adaptation of the information to local situations.

The September session was planned to emphasize history, philosophy and fundamentals of work simplification with brief mention of tools and techniques. These principles were reviewed briefly in October. Techniques and tools necessary to develop systematic common sense work habits were introduced and demonstrated in detail.

Work flow, utilization and proper placement of equipment were discussed at the November meeting. Multiple use of an item of equipment common to school lunch kitchens was illustrated in the demonstration of the electric mixer and its attachments.

Recipe standardization and portion control introduced to the supervisors the need for and ways to control production quantity and quality. Equipment necessary for control of portions was demonstrated in January.

The March session on salad preparation was planned to review, refresh and expand the techniques demonstrated in February on pre-preparation of raw vegetables. Economy of motion, proper selection and use of

small equipment, drop deliveries, materials flow and work area arrangement were emphasized.

Selection and pre-positioning of tools and supplies as well as work area arrangement were stressed in the sandwich production demonstration. Rules of motion economy were discussed in connection with this lesson.

Bakeshop production reviewed pre-positioning and selection of proper tools, equipment placement and work flow. Design of the finished product and its relationship to production was introduced. The actual demonstration was conducted by cooks from the county who were known to have developed skill, speed and dexterity in production.

Material presented in the last six meetings strengthened basic information introduced in September and October. Following are summaries of the first two sessions of the training program:

1. Lesson plan for September meeting introducing principles of work simplification.
2. Description of methods, techniques and tools of work simplification developed by industrial consultant, Mr. Apple, in October.

SESSION I - WORK SIMPLIFICATION PRINCIPLES

MULTI-UNIT SUPERVISORS TRAINING PROGRAM

September 25, 1958 - 9:30 A.M.

Oakland County Board of Education Office - Conference Room

Presented by Mary Slater

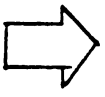
TEXT	AIDS
I. You and work simplification.	
A. What is work simplification?	
1. Definition.	
Work simplification is the systematic study of all factors, affecting work being done, or all factors that will affect work to be done, in order to save time, effort and money (4). It is the organized step by step application of plain common sense to the problem of finding better ways of doing things. Or it may be called a technique for identifying and eliminating the uneconomical employment of time, equipment, materials, space or human effort.	
2. Philosophy of work simplification.	
There is always a better way to do a job. The "one best way" is never truly achieved; it is a goal to be worked toward under a given set of conditions. Work simplification can be applied by systematic orderly approach to any work problem if there is a desire to save time, effort or money.	
3. Factors affecting work.	EXAMPLES CITED
Lighting, heating and ventilation have a definite effect upon the physical comfort and mental attitude of the worker. Kitchen layout, equipment and tools determine output and fatigue. Design of finished product and the process or	Kitchen layout Equipment placement Equipment design Flow of materials

TEXT	AIDS
procedure used influences production speed through hand and body motion.	
B. Why work simplification is a supervisor's program.	
1. Line of authority.	FLANNEL BOARD
The local board of education is the elected policy making body of each school district in Oakland County. A superintendent is employed by the board to administer school affairs. An assistant superintendent may be selected to execute educational policy or business affairs. The assistant in charge of business is accountable for all business functions of school operations. School food service, categorized as a business operation is a direct responsibility of the business administrator. A director or multi-unit supervisor is usually employed to coordinate food service operations in each building program with educational policies established by the building principal.	Organization chart illustrating line of authority in local school district
2. An average of 25,000 Type A lunches were served daily during the 1957-58 school year in Oakland County. Sixty per cent or 15,000 lunches were served in 17 districts employing multi-unit supervisors. This food service business required, in addition to the supervisors, 60 managers or cook-managers assisted by 350 additional kitchen personnel	
C. Why work simplification is important to you?	MOVIE
1. What makes a job difficult?	"Easier Ways"

TEXT	AIDS
The uninterested worker with little skill or knowledge of his job will find work exhausting. Poor working conditions, improper or makeshift tools or equipment and inadequate work space will create wasted motions.	Visual Aids Department, General Motors Building, Detroit, Michigan BLACKBOARD Questions: What makes your job as a supervisor difficult? What makes the manager's job difficult? What makes work difficult for your kitchen personnel? Which of the listed difficulties are concerned with work simplification?
2. Use of work simplification. Work to be done may be simplified by improvement of present or development of new and better methods. In addition, work analysis serves as a basis for wage payment and aids in the determination of labor cost. The orderly approach to everyday problems when properly practiced involves everyone.	BLACKBOARD Questions: Which of the problems listed can be solved with no investment? Which problems will take time or money to correct? Which problems will require school board actions to solve?
3. Advantages of work simplification. Establishment of standards offers superior quality and quantity	

TEXT	AIDS
control over products. Interest may be developed in the workers to eliminate unnecessary work and increase effectiveness of effort with a consequent saving of time and money. Improved relations between labor and management may develop from working together on common problems.	
II. What are you going to do.	
A. General procedure to be followed in finding an easier way.	
1. Select a job to be improved. Check operations for bottlenecks, time consuming routine or concentrated production points.	
2. Break the job into details by briefly listing each step.	
3. Question each detail. What is done and for what purpose? What would happen if any part of the job was not performed? Who does the work? Is this a job that requires skill or can an unskilled person carry out the duties? When and where is the work done?	
B. Tools and techniques you will need.	
1. An open mind and questioning attitude are essential for developing new methods.	
2. Analytical techniques to be learned.	SHEETS FOR DISTRIBUTION
a. Process symbols are used as an industrial shorthand to represent the various steps in a process as an aid to planning and analyzing work methods.	Process Chart symbols (Figure 1)
b. The process chart is a tabular record of steps in a process, made with the aid of process	Process Chart (Figure 2)

Operation - An operation occurs when an object is intentionally changed in any of its physical or chemical characteristics, is assembled or disassembled from another object, or is arranged for another operation, transportation, inspection or storage. An operation also occurs when information is given or received or when planning or calculating takes place.



Transportation - A transportation occurs when an object is moved from one place to another, except when such movements are a part of the operation or are caused by the operator at the work station during an operation or an inspection.

Inspection - An inspection occurs when an object is examined for identification or is verified for quality or quantity in any of its characteristics.

Delay - A delay occurs to an object when conditions, except those which intentionally change the physical or chemical characteristics of the object, do not permit or require immediate performance of the next planned action.

Storage - A storage occurs when an object is kept and protected against unauthorized removal.

Combined Activity - When it is desired to show activities performed either concurrently or by the same operator at the same work station, the symbols for those activities are combined, as shown by the circle placed within the square to represent a combined operation and inspection.

Figure 1. Process chart symbols. Maynard, H. B. Industrial engineering handbook. New York, McGraw-Hill Book Co. 1956. p. 2-19.

Page ___ of ___

PART NAME _____

PROCESS DESCRIPTION _____

DEPARTMENT _____

PLANT _____

RECORDED BY _____ DATE _____

SUMMARY	
	NO.
○ OPERATIONS	
⇨ TRANSPORTATIONS	
□ INSPECTIONS	
D DELAYS	
▽ STORAGES	
TOTAL STEPS	
DISTANCE TRAVELED	

STEP	Operation Transport Inspect Delay Storage	DESCRIPTION OF _____ METHOD				
	○⇨□D▽					
	○⇨□D▽					
	○⇨□D▽					
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Figure 2. Process Chart. Maynard, H. B., Industrial engineering handbook. New York, McGraw-Hill Book Co., 1956. p. 2-19.

TEXT	AIDS
process symbols. Process charts may be used as preliminary tools for process improvement, planning plant layout or recording of a process for presenting information to others. The chart also forces detailed planning which may indicate a need for auxiliary equipment. Analysis of the process chart is a step by step procedure. Unnecessary work may be eliminated by combining or changing sequence of operations.	
c. Flow diagraming is a graphical presentation of the steps in a process made on a layout of the area, with the aid of process symbols. The diagram may be used as an aid in analyzing or planning materials handling methods, rearranging or analyzing relationships between work areas. Also, it offers a method of presenting plans to others.	
d. Operation analysis charts or right and left hand flow charts are graphic pictures of movements of both hands on a single operation or activity. Motions of each hand are studied in search of an easier method of performing a specific activity.	Operation Analysis Chart (Figure 3)
e. Check lists for process chart-product analysis, process chart-man analysis and the flow diagram are used by the analyst as a check in the search for simplified work methods.	Check lists for: Process chart-product analysis (Appendix A) Process chart-man analysis (Appendix A) Flow diagram (Appendix A)

PART NAME _____ PART NO._____

OPERATION NAME _____ OPER.NO._____

DATE_____ DEPARTMENT_____ OBSERVER _____

PROD'N. STD. _____ YEARLY PROD'N._____

WORK PLACE LAYOUT

1 sq. = 1 ft.

LEFT HAND			RIGHT HAND

Figure 3. Operation analysis chart. Maynard, H. B. Industrial engineering handbook. New York, McGraw-Hill Book Co. 1956. p. 2-19.

TEXT	AIDS
3. **Principles of motion economy** An understanding of motion economy in relationship to use of the human body, arrangement of work place and design of tools and equipment is essential to the development of easier work methods.	SHEETS FOR DISTRIBUTION **Principles of motion economy (Appendix B)**

SESSION II - TOOLS AND TECHNIQUES OF WORK SIMPLIFICATION

MULTI-UNIT SUPERVISORS TRAINING PROGRAM

October 18, 1958 - 9:30 A.M.

Oakland County Board of Education Office - Conference Room

Presented by Mr. James A. Apple, Industrial Consultant

I. Principles of work simplification - a review.

A. Definition.

Work simplification is the organized step by step application of common sense to the problem of finding an easier way of doing a job. Physical working environment, work place arrangement, product design, work procedure and available tools all affect the method or procedure of work. Effort, time and money may be saved through eliminating unnecessary processes and by adding dignity and challenge to work activity. Basic tools of work simplification are simple and direct balanced work flow, standardization of procedure, proper installation of equipment and continued job instruction.

Slides shown by the consultant:

1. Definition of work simplification.
2. Advantages of work simplification.

B. Discussion of job factors and work improvement.

1. Factors listed by the consultant.

a. Lack of skill or knowledge.
b. Lack of interest.
c. Interruptions.
d. Improper tools or makeshift equipment.
e. Inadequate working space.

2. Suggestions given by the group.

a. Personality.
b. Poor communications.
c. Too many or not enough workers.
d. Improper organization of work.

3. Classification of factors.

   a. Changes involving little or no expense which each supervisor could make without permission from higher authority.

   b. Changes which required permission from a superior even though they involved little or no expense.

   c. Changes which required Board of Education action and which might involve considerable monetary expenditure.

C. General procedure for simplifying work.

A job should be selected for study that has an extremely poor work method sequence. Needed improvements which are readily apparent provide more satisfaction and greater reward for the novice. Each operation in the job should be studied, all steps in the work sequence should be listed and each step questioned.

1. WHY - is this step done? why this way?
2. WHAT - is the purpose of this step? what if it was not done?
3. WHERE - is it done? why here? where else?
4. HOW - is it being done? is there a better way?
5. WHO - is doing it? should someone else?
6. WHEN - should it be done? why now? better earlier or later?

These questions are asked to see if it is possible to:

1. ELIMINATE - a step or steps.
2. COMBINE - steps into one, to reduce handling.
3. CHANGE SEQUENCE - to improve flow or performance.
4. IMPROVE - any step in any way.

The consultant supported his discussion with the following cartoon slides:

1. Can we eliminate?
2. Can we combine?
3. Can we change the sequence?
4. Can we simplify?
5. We resist change.
6. We resist new ideas.

II. The tools of work simplification - a demonstration.

A. The case study - a method.

A "case" is a written record or description of a business situation which has actually been faced by an administrator. The facts, opinions and prejudices on which the executive had to base a decision are carefully presented to the reader. The student is required to analyze the case in order to determine what is going on and what the problem is. After an open discussion by the group, the participants make individual decisions as to what can and should be done in the situation which has been described. In the case system of instruction there is no one "right" answer; each problem which is presented must suggest two or more alternative plans of action.[1]

B. The case - A Day in the Life of a Potato.

Mr. X arrived at Maple Ridge High School in a burlap bag with one hundred pounds of other potatoes. He was lifted from the delivery truck to the receiving dock by the truck driver. The school janitor roughly dragged Mr. X and friends from the dock to storage room where they were left on the floor.

The next day two ladies in white uniforms entered the storeroom and lifted Mr. X and his friends onto a cart. The potatoes were wheeled to the vegetable peeler in the kitchen and placed on the floor. One lady picked up Mr. X and twenty pounds of his companions by hand and dropped them into the peeler. They spun around and around; finally the door opened; Mr. X and his friends fell into the vegetable sink. Each potato was inspected, eyed and placed in a perforated steamer pan on the sink drainboard.

The pan was lifted from the drainboard to a cart and transported to the steamer. After the container of potatoes was placed on the steamer shelf, the door was closed for a forty minute cooking period. Mr. X and his friends were then removed from the steamer, wheeled on a cart to the steamer and rudely dumped into the mixer bowl. One of the

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[1]Radke, Margaret E. The case approach; an educational venture in the development of an administrative point of view in the dietetic internship. Unpublished M.S. Thesis. East Lansing, Michigan. Michigan State University Library. 1958.

ladies in white added dry milk, salt, butter and liquid to the potatoes, turned on the mixer and watched the beater whip the ingredients to the proper consistency. The motor was turned off and the lady dipped the mashed potatoes from the mixer bowl to the steam table pan on a nearby cart. The potatoes were then wheeled to the serving counter, placed in the steam table and served to the hungry boys and girls of Maple Ridge High.

Are you tired? Mr. X was exhausted by the time he arrived at the serving counter. But think of the poor lady in white!

C. The case solution - group participation.

Prior to starting the demonstration of tools and techniques for work simplification, the consultant distributed sheets containing the story A Day in the Life of a Potato, the process chart symbols, two sheets of process charts, floor plans of a kitchen layout under construction in Oakland County and operation analysis sheets. Slides were shown explaining the process symbols and preparation of a process chart.

As the consultant read the story A Day in the Life of a Potato, he directed the participants in the step by step procedure of preparing their process charts. After completion of the process charts, group members were given explicit directions for preparing a flow diagram on the kitchen layout sheet. Individual assistance was offered during this step of the procedure.

An analytical discussion of the process charts and flow diagrams prepared by the group indicated the bottlenecks in the flow of materials from receiving through production to serving at Maple Ridge High School.

Following this discussion, group members prepared operation analysis charts to study work area arrangement and right and left hand motions for eyeing potatoes.

Step I. Process chart construction.

The process chart has been one of the widely applied techniques for analyzing problems involving the flow of materials or people. Application can be made to activities and movements of objects or people whether in factory, farm or kitchen.

Preparation of a process chart from the case study. See Figure 4.

a. Fill in headings to identify the process: part or machine name; process description; department; plant; date and name of recorder.

b. Decide on type of information desired. Label columns on the right with descriptive terms such as distance or method.

FLOW PROCESS CHART

PART NAME Potato

PROCESS DESCRIPTION Preparation for service

DEPARTMENT Kitchen

PLANT Maple Ridge High

RECORDED BY Mary Slater DATE 11-12-58

SUMMARY	
	NO.
○ OPERATIONS	4
⇨ TRANSPORTATIONS	18
□ INSPECTIONS	
D DELAYS	
▽ STORAGES	15
TOTAL STEPS	37
DISTANCE TRAVELED	169

STEP	Operations / Transport / Inspect / Delay / Storage	DESCRIPTION OF Present METHOD	Distance	Method		
1	○⇨□D▽¹	In bag on truck				
2	○¹⇨□D▽	Truck to dock	15'	Hand		
3	○⇨□D▽²	On dock				
4	○²⇨□D▽	Dock to storage	15'	Hand		
5	○⇨□D▽³	Storeroom				
6	○³⇨□D▽	Floor to cart	2'	Hand		
7	○⇨□D▽⁴	On a cart in storeroom				
8	○⁴⇨□D▽	To peeler	44'	Cart		
9	○⇨□D▽⁵	On cart at peeler				
10	○⁵⇨□D▽	To floor	2'	Hand		
11	○⇨□D▽⁶	On floor by peeler				
12	○⁶⇨□D▽	From bag to peeler	4'	Hand		
13	○¹⇨□D▽	Peel				
14	○⁷⇨□D▽	Peeler into sink	2'	Gravity		
15	○⇨□D▽⁷	In sink				
16	○⁸⇨□D▽	Operator pick up potato	1'	Hand		
17	○²⇨□D▽	Eye and inspect				
18	○⁹⇨□D▽	Into steamer pan	2'	Hand		
19	○⇨□D▽⁸	In steamer pan on drainboard				
20	○¹⁰⇨□D▽	Drainboard to cart	2'	Hand		
21	○⇨□D▽⁹	On cart in pan				
22	○¹¹⇨□D▽	Sink to steamer by operator	20'	Cart		

Figure 4. Process chart for potato preparation.

FLOW PROCESS CHART

PART NAME _____

PROCESS DESCRIPTION _____

DEPARTMENT _____

PLANT _____

RECORDED BY _____ DATE _____

SUMMARY	NO.
○ OPERATIONS	
⇨ TRANSPORTATIONS	
□ INSPECTIONS	
D DELAYS	
▽ STORAGES	
TOTAL STEPS	
DISTANCE TRAVELED	

STEP	Operation / Transport / Inspect / Delay / Storage	DESCRIPTION OF _____ METHOD	Distance	Method		
23	○⇨□D▽ 10	At steamer on cart in pan				
24	○ 12 ⇨□D▽	Into steamer	2'	Hand		
25	3 ○⇨□D▽	Cook				
26	○ 13 ⇨□D▽	Steamer to cart	2'	Hand		
27	○⇨□D 11 ▽	On cart at steamer				
28	○ 14 ⇨□D▽	Steamer to mixer by operator	8'	Cart		
29	○⇨□D 12 ▽	On cart at mixer				
30	○ 15 ⇨□D▽	Dump into mixer bowl	2'	Hand		
31	4 ○⇨□D▽	Mash and inspect				
32	○ 16 ⇨□D▽	Mixer bowl to steam table pan	2'	Hand		
33	○⇨□D 13 ▽	In pan on cart				
34	○ 17 ⇨□D▽	Mixer to serving counter	42'	Cart		
35	○⇨□D 14 ▽	On cart at serving counter				
36	○ 18 ⇨□D▽	Cart to serving counter	2'	Hand		
37	○⇨□D 15 ▽	In serving counter				
	○⇨□D▽					
	○⇨□D▽					
	○⇨□D▽					
	○⇨□D▽					
	○⇨□D▽					
	○⇨□D▽					
	○⇨□D▽					

Figure 4. Continued.

c. Enter step number starting with one.
d. Number the symbol representing the activity: operation one or transportation one. The next operation would be designated two.
e. Indicate explanation briefly in Description column, if it is not explained in other columns.
f. Record pertinent data in right hand column: fifteen feet by hand; ten feet by cart.
g. Follow either a person or an object. Record what actually happens, not what should happen.
h. Compile information for summary box by counting: operations 4; transportation 18; storage 15.

Statement of findings.

As the consultant read the case study, group members prepared process charts. These activities were transferred to a flow diagram. Constructive criticism of the work procedure was delayed until the flow diagram had been completed. An improved method was developed from the group criticism. This information was recorded on a second process chart for comparison with the original method.

Step II. Flow diagram construction.

The flow diagram is a graphic presentation of the flow pattern taken from the process chart. The diagram is helpful in analysis because actual flow of man or materials is charted.

Preparation of a flow diagram from the process chart. See Figure 5.

a. Transfer symbols and numbers from the process chart to the flow plan.
b. Connect numbers in sequence with a line. Use arrows on flow lines to indicate direction of movement.
c. Analyze the problem, alter methods and test improved procedures.

Statement of findings.

Participants were given an opportunity to criticize job procedure, kitchen layout and work methods. Principles of materials handling were referred to frequently during this discussion. Following are suggested improvements and the

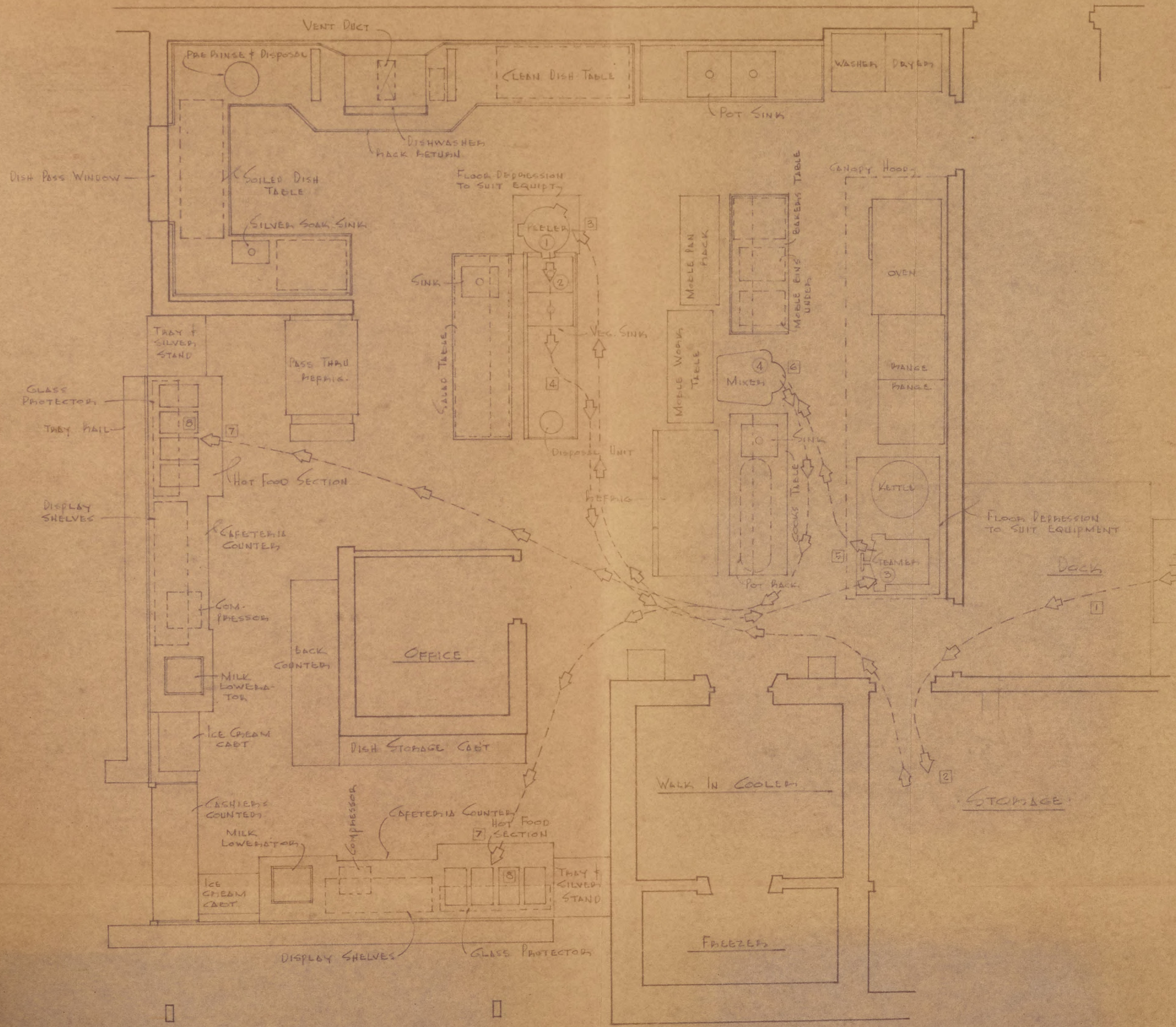

figure 3 · FLOW DIAGRAM·

materials handling principles involved:

Suggested improvements.

a. Move vegetable preparation area nearer to storage area.
b. Make an island arrangement of range area.
c. Purchase portable bins for vegetable storage.
d. Use measure or bucket for placing potatoes into peeler.
e. Purchase dehydrated potato flakes rather than the raw product.
f. Ask manufacturer to develop a mixer bowl which will tilt.

Principles of materials handling.

a. Minimize materials handling.
b. Move materials in straight line.
c. Move greatest weight or bulk least distance.
d. Do not use floor for storage.
e. Purchase equipment to replace heavy physical effort.
f. Combine operations when practical.
g. Eliminate re-handling.

Step III. Operation analysis construction.

Operation analysis is a convenient method of recording in sequence the steps of a job in which most of the work is accomplished with the hands. This right and left hand charting technique describes all activity by means of six terms. Three terms are descriptive of movements, three are supplementary terms.

Movements for operation analysis.

a. Get - movements required to move or gain control of an object.
b. Place - movements required to move and release or hold an object in position.
c. Dispose - movements necessary to move an object in a given direction and release it without reference to position.

Supplementary terms for operation analysis.

a. Process - the portion of an operation in which mechanical, chemical or other means are applied to an object for the purpose of changing physical conditions.
b. Wait - time during which the hand is not making useful movements.
c. Hold - period in which the hand is holding an object in a definite position.

Preparation of operation analysis charts for eyeing potatoes. See Figure 6.

a. Sketch work place layout.
b. Fill in heading to identify the operation and operator.
c. Select a spot in the operation where both hands begin motion simultaneously.
d. List specific acts (get, place or dispose) in the act column; record the object handled and where placed in the explanation column.
e. Classify the next act that occurs. The recorder may find it easier to chart hand movements separately, then combine the information.
f. Summarize the operation analysis. Develop, analyze and compare improved work methods. Comparison of two methods is made by computing the number of movements made per unit produced.

Statement of findings.

The consultant established an awkward work area layout for demonstrating the present work method. Group members offered suggestions for rearrangement of tools and equipment for testing the new method. After charting both methods comparisons were made:

	Method	
	Present	New
Number of potatoes	1	1
Number of acts	6	3
Acts per potato	6	3

This comparison pointed out advantages of the new method. In quantity food production three motions saved per unit prepared would reflect economy of the labor dollar as well as reduced physical fatigue.

PART NAME _____

OPERATION NAME Eyeing potatoes OPERATOR _____

DATE 10-13-58 DEPARTMENT Kitchen OBSERVER Slater

PRESENT METHOD

LEFT HAND	ACT	ACT	RIGHT HAND
------	W	G	Potato from sink
Potato from right hand	G	W	------
Potato	W	G	Knife from drainboard
Potato	O	O	Eye potato
Wash potato in left sink	O	P	Knife on drainboard
Potato in pan on drain	P	W	------
------	W	G	Potato from sink
Potato from right hand	G	W	------

IMPROVED METHOD

LEFT HAND	ACT	ACT	RIGHT HAND
Potato from sink	G	G	Knife from drainboard
Potato	O	O	Eye potato
Potato in pan in sink	P	G	Potato from sink
Potato from right hand	G	W	------
Potato	O	O	Eye potato

Figure 6. Operation analysis chart for potato eyeing.

The presentation made by the industrial consultant afforded a living situation familiar to every supervisor. The dynamic demonstration of tools available for finding better ways of performing a process or activity illustrated the need for involving all personnel in a training program. Much interest was shown by the participants through questions, comments and discussion throughout the session. Approval was expressed at the conclusion of the meeting and enthusiasm shown for starting work simplification studies in the local districts.

The need for improved methods of training food service personnel is evident throughout the country today. High food and labor costs combined with reduced federal assistance have created a tremendous problem for non-profit school food service operations. Minimal menu standards have prevented reduction of food costs. Consequently, labor costs must be studied, more efficient work methods devised and training programs organized.

Industrial leaders for many years have been faced with a similar problem. Through scientific study, labor saving methods of operation have been developed and supervisory instructional training courses have been given.

Industrial techniques have been surveyed and applied for increasing labor efficiency in order to develop training methods for school food service personnel in Oakland County. One important theory from industry is the inclusion of all personnel in the job of improving work methods. The planning of this work methods study program has been based on this theory. The application of this program should continue to benefit all school food service personnel in Oakland County.

A/ APPENDIX CHECK LISTS

CHECK LIST FOR PROCESS CHART-PRODUCT ANALYSIS[1]

Basic Principles

A. Reduce number of steps
B. Arrange steps in best order
C. Make steps as economical as possible
D. Reduce handlings
E. Combine steps if economical
F. Shorten moves
G. Provide most economical means for moving
H. Cut-in-process inventory to workable minimum

1. Can any step be eliminated?
   a. as unnecessary
      (Ask: Why is it done?)
   b. by new equipment
      (Ask: Why is present equipment used?)
   c. by changing the place where it is done or kept
      (Ask: Why is it done there?)
   d. by changing the order of work
      (Ask: Why is it done in its present order?)
   e. by changing the product design
      (Ask: Why is it done as it is?)
   f. by changing the specifications of the incoming supply
      (Ask: Why is it ordered in its present form or used at all?)

2. Can any step be combined with another?
   Are there any possible changes that would make this feasible in
   a. workplace
   b. equipment
   c. order of steps
   d. product design
   e. specification of supply or any raw material

3. Can the steps be rearranged so as to make any shorter or easier?

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[1]Mundel, M. E. Motion and time study principles and practice. New York, 1955. Prentice-Hall, Inc.

A/ APPENDIX

4. Can any step be made easier?
(If this looks like a possibility, make further detailed analysis of this step. Analyses for this purpose will be discussed in later chapters.)

A/ APPENDIX

CHECK LIST FOR PROCESS CHART-MAN ANALYSIS[2]

Basic Principles
- A. Eliminate all possible steps
- B. Combine steps
- C. Shorten steps
- D. Place in best sequence
- E. Make each step as economical as possible

1. Can any operation be eliminated, combined, shortened or made easier?
   - a. as unnecessary
   - b. by changing the order of work
   - c. by new or different equipment
   - d. by changes in the layout; by grouping equipment better
   - e. by changing the form of the product sent out
   - f. by more knowledge on part of the worker

2. Can any movement be eliminated, combined, shortened or made easier?
   - a. by leaving out operations
   - b. by changing the places where things are kept
   - c. by shifting some operations to another job into which they fit more conveniently
   - d. by changing the layout
   - e. by changing equipment
   - f. by changing the order of work
   - g. by conveyors (make sure they are economical)

3. Can delays be eliminated, combined or shortened?
   - a. by changing the order of work
   - b. by changing the layout
   - c. by new or different equipment

4. Can countings or inspections be eliminated, combined, shortened or made easier?
   - a. Are they really necessary; what happens after they are done and the information obtained
   - b. Do they provide unnecessary duplication

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[2]Mundel, M. E. Motion and time study principles and practice. New York, Prentice-Hall, Inc. 1955.

A/ APPENDIX

c. Can they be performed more conveniently by another person
d. Are they done at the best point in the sequence
e. Can sample inspection or statistical control be used

5. Can any step be made safer?
a. by changing the order of work
b. by new or different equipment
c. by changing the layout

A/ APPENDIX

CHECK LIST FOR FLOW DIAGRAM

Basic Principles

A. Reduce number of steps
B. Arrange steps in best order
C. Make steps as economical as possible
D. Reduce amount of handling
E. Combine steps where possible
F. Shorten moves of body parts
G. Provide economical means for moving materials
H. Use minimum number of central points

1. Can any step be eliminated?
   a. as unnecessary procedure
      (Ask: Why is this step done?)
   b. by new equipment
      (Ask: Why is present equipment used?)
   c. by changing place where it is done
      (Ask: Why is it done there?)
   d. by changing order of work
      (Ask: Why is it done in present order?)
   e. by changing product design
      (Ask: Why is it done as is?)
   f. by changing specifications of incoming supply
      (Ask: Why is it ordered in present form?)

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[1]Mundel, M. E. Motion and time study principles and practice. New York, 1955. Prentice-Hall, Inc.

B/ APPENDIX DESCRIPTIVE SUMMARY

PRINCIPLES OF MOTION ECONOMY[3]

A. USE OF THE HUMAN BODY

1. The two hands should begin as well as complete their therbligs at the same instant.
2. The two hands should not be idle at the same time except during rest periods.
3. Motions of the hands and arms should be in opposite and symmetrical directions, instead of in the same direction, and should be made simultaneously.
4. Hand motions should be confined to the lowest classifications with which it is possible to do the work satisfactorily.
5. Momentum should be employed to assist the worker whenever possible, and it should be reduced to a minimum if it must be overcome by physical effort.
6. Continuous curved motions are preferable to straight-line motions involving sudden and sharp changes in direction.
7. Ballistic motions are faster, easier, and more accurate than restricted or "controlled" movements.
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 wherever possible.
9. All motion paths should be kept within the normal working area.

B. ARRANGEMENT OF THE WORKPLACE

1. Definite and fixed stations should be provided for all tools and materials.
2. Tools, materials and controls should be located around the workplace and as close in front of the operator as possible.
3. Gravity feed bins and containers should be used to deliver the material as close to the point of assembly or use as possible.
4. Provide ejectors and drop deliveries wherever possible, for removal of finished pieces.
5. Materials and tools should be located to permit the best sequence of therbligs. Parts required at the beginning of the work cycle should be close to the point of release of the finished piece from the preceding cycle.
6. Provision should be made for adequate conditions for seeing. Good illumination is the first requirement for satisfactory visual perception. Wherever possible, color of the workplace

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[3]Barnes, R. M. Motion and time study. New York, John Wiley and Sons, Inc. 1958.

should be carefully selected for maximum visual perception and minimum eye fatigue.

7. The height of the workplace and the chair should preferably be so arranged that alternate sitting and standing at work are easily possible.
8. A chair of the type and height to permit good posture should be provided for every worker.
9. Circular workplace should be provided for bench operations, and workplace materials arranged in an arc within normal reach of both arms and hands.

C. DESIGN OF TOOLS AND EQUIPMENT

1. The hands should be relieved of all work that can be performed more advantageously by the feet or other parts of the body. Holding should be avoided by the use of vises or fixtures, freeing the hands to move parts.
2. Two or more tools should be combined wherever possible.
3. Tools and materials should be pre-positioned wherever possible.
4. 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.
5. Handles such as those used on cranks and large screwdrivers should be designed to permit as much of the surface of the hands to come in contact with the handle 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 the top.
6. Levers, crossbars and handwheels 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.
7. Double sets of jigs or fixtures should be provided wherever possible to permit use of both hands.

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