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LABOR UTILIZATION IN SCHOOL FOODSERVICE SYSTEMS

by

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TABLE OF CONTENTS

	Page
ACKNOWLEDGMENTS	ii
LIST OF TABLES	vi
INTRODUCTION	1
REVIEW OF LITERATURE	3
Foodservice Systems	3
Types of Systems	3
Conventional Systems	3
Commissary Systems	3
Evaluation of Delivery Systems in School Foodservice	5
Job Design	6
Job Enrichment and Job Design	6
Job Redesign	7
Characteristics of Jobs	10
Job Characteristics Model	10
Job Diagnostic Survey	13
Studies Using the JDS	13
Job Design and Foodservice Organizations	16
Labor Cost Studies in School Foodservice	17
Environmental Conditions in the Workplace	21
Lighting	22
Noise	23
Effective Temperature	24
METHODOLOGY	27

Page

Research Site 27

Research Design 28

Research Instruments 29

Employee Information Form 29

Job Diagnostic Survey 29

Job Dimensions 30

Critical Psychological States 30

Affective Reactions: General Satisfaction and Internal Work Motivation 31

Affective Reactions: Specific Satisfactions 32

Individual Growth Need Strength 33

Employee Reactions to Physical Environment 34

Work Function Summary Form 35

Environmental Worksheet 35

Preliminary Work 36

Data Collection 36

Job Diagnostic Survey 36

Work Function Summary Form 37

Environmental Worksheet 37

Data Analysis 38

JDS Scores 38

Employee Information Form 44

Work Function Summary Form 44

Environmental Worksheet 47

RESULTS AND DISCUSSION 48

General Information 48

Page

Job Diagnostic Survey Results 50
Employee Reactions to Work 56
Physical Demands of Work 56
Temperature Dimension of Physical Environment 57
Lighting and Noise Dimensions of Physical Environment . . 62
Measures on Physical Environment 65
Effective Temperature 65
Lighting Levels 65
Noise Levels 67
Staffing Patterns and Cost of Labor 69
SUMMARY 75
REFERENCES 80
APPENDIXES 85
A. Correspondence 86
B. Research Instruments 89
C. Instructions for Job Diagnostic Survey 104
D. Supplemental Tables 107

LIST OF TABLES

Table		Page
1.	JDS scores	39
2.	Computation of JDS scores	40
3.	Motivating potential score (MPS) computation	42
4.	Scores for measuring employee reactions to physical environment of work	42
5.	Scoring for responses of employees on reactions to physical environment of work	43
6.	Characteristics of the sample	48
7.	Types of foodservice jobs in study schools	49
8.	Basis of employment of foodservice staff at study schools	51
9.	Scores on Job Diagnostic Survey (JDS) of school foodservice employees	52
10.	Means and standard errors in JDS scores by school and basis of employment	54
11.	Employee reactions to physical environment of work	56
12.	Employee responses to physical demands of work	58
13.	Employee responses to temperature dimension of physical environment	60
14.	Employee responses to lighting dimension of physical environment	63
15.	Employee responses to noise dimension of physical environment	64
16.	Effective temperature measurement in foodservice facilities in study schools	66
17.	Lighting measurements in foodservice facilities in study schools	67

Table | Page

18. Noise measurements in foodservice facilities in study schools 68

19. Mean hourly wage ($) of foodservice staff by type of position 70

20. Mean hours of foodservice staff by type of system 70

21. Labor minutes spent in various work functions in study schools 71

22. Labor minutes per meal for satellite, on-premise, and base kitchen schools 72

23. Labor cost per meal for satellite, on-premise, and base kitchen schools 73

24. Job responsibilities of school foodservice staff at various study schools 108

25. JDS scale scores by type of system from Shaffer's study of hospital foodservice employees 112

INTRODUCTION

A foodservice system has been conceptualized by David (1) as the effective use of the resources of food and supplies, capital, personnel, space facilities, and time to achieve the organizational objectives of quality food and service with a sense of achievement on the part of the personnel involved. An innovative change in school foodservices has been the concept of the central kitchen advanced as a solution to many of the problems facing foodservice (2).

An impetus for innovation in foodservice systems has been more effective utilization of available human resources. Job design is, therefore, an essential component of this change process (3).

Since Taylor's Philadelphia coal shoveling experiments at the beginning of the twentieth century (4), the industrial community has applied scientific management to every conceivable human task. Factors involved in determining job content were the process, machine, physical layout, time requirements, and traditions (5). Workers were considered only as they related to these factors.

In recent years managers have shown a growing interest in the relationship between structure and characteristics of jobs and productivity and job satisfaction. The basis of the Job Diagnostic Survey (JDS) developed by Hackman and Oldham (6) is a specific theory of how jobs affect employee motivation. The JDS measures three classes of variables:

1. the objective characteristics of jobs,
2. the personal affective reactions of individuals to their jobs and to the broader work setting, and

3. the readiness of individuals to respond positively to enriched jobs.

New foodservice technology has resulted in systems in which the production of food is separated from service, either in time or place. Central kitchens are an example of this new technology. Swartz and Vaden's (7) study of work values among female nonsupervisory hospital foodservice personnel indicated the importance of seeing the results of one's work. They suggested an uncertain future for seeing the final results of work in a food factory environment. Another implication was a desire for work that developed special abilities.

As the per hour cost of labor increases, Payne et al. (8) contended that the efficiency of different foodservice systems become more important. One of the advantages of central kitchens is the potential for labor savings (2). In central kitchens fewer employees are required and more importantly, fewer highly skilled employees. Also, productivity is believed to be higher in central operations (2).

This research project on labor utilization was conducted in conjunction with a study on food acceptability and consumption of food in on-premise and satellite school foodservice systems (9). The objectives of the labor utilization project were as follows:

1. compare the characteristics and motivating potential of jobs in on-premise and satellite school foodservice systems,
2. compare the labor minutes per meal and labor cost per meal of on-premise and satellite school foodservice systems, and
3. measure environmental conditions in the workplace and assess effects on personnel.

Literature topics relevant to the research included the following: foodservice systems, job design, labor cost studies in school foodservice, and environmental conditions in the workplace.

REVIEW OF LITERATURE

Foodservice Systems

Types of Systems

Conventional Systems. The objective of conventional foodservice is to produce and serve quality food within one foodservice operation while effectively utilizing all renewable resources (10). Rappole (11) identified a conventional system as traditionally including a butcher shop and bakeshop. Food is purchased raw and processed on the premises before serving (12). Foods prepared in the conventional system are distributed directly to an adjacent serving area (13). Advantages of the conventional system include flexibility in menu planning and minimal distribution costs (13). Searing (14) stated that he believes another advantage is that the conventional system permits individuality at the school level. Disadvantages include problems due to peaks and accompanying stress caused by meal period demands, uneven work distribution, low productivity, and high labor costs (13).

Commissary Systems. Current changes in foodservice systems have been aimed at either increasing productivity or decreasing food costs. Changes have occurred by applying innovative managerial concepts and developments in technology (10). Various names have been given to these types of systems: central commissary, satellite, and food factory (10).

In commissary foodservice systems, food procurement and production functions are centralized with distribution of prepared menu items to several remote areas for final preparation and service (10). The

functions of a central commissary vary greatly with regard to management, food purchasing, type of equipment, amount of food prepared at one time, and most other operations (15). The common feature of all commissaries is that the food production center and service areas are located in separate facilities. The function of food distribution, therefore, must receive considerable emphasis for the effective operation of these foodservice systems (13).

Several factors have impelled school foodservice directors to accept the challenge of a central kitchen, and most of these pertain to three changes in the nation's social structure (2).

- Leaders in education have realized the relationship between a good diet and the ability to learn in school.
- The increase in the number of working mothers and shifting from the neighborhood school concept do not allow children to go home for meals.
- The provisions for free or reduced cost meals by the government have increased demand for meals served in the schools.

The term satellite is sometimes erroneously used as synonymous with commissary (13). Satellite foodservice properly refers to an existing kitchen adapted to produce for several similar units in the same geographical area. It generally is smaller, less sophisticated, and not suitable for large scale production. Prepared food is delivered from the central kitchen to other schools (satellites) in the area.

The food factory produces only four to six items a day in repetitive, high-volume production using a progressive production shift. The food factory system enables the facility to operate with one shift of production personnel five days a week. This system separates production from service in time and place and therefore, eliminates the peak periods of food production before each meal (16).

Evaluation of Delivery Systems in School Foodservice

Under contract from the United States Department of Agriculture (USDA)/Food and Nutrition Service (FNS), a pilot study to evaluate four food delivery systems was undertaken by a research team from Colorado State University (17-21). Sixteen schools participated in the study, four schools using each of the four types of delivery systems. These systems were on-site preparation and service, central preparation with hot bulk delivery, central preparation with chilled preportioned delivery, and frozen preportioned delivery. The specific objective of the study was to compare the nutritional quality, microbiological content, and acceptability of food and costs of the four systems (17).

Overall, food prepared in on-site preparation and service systems had significantly higher acceptability than did chilled preportioned delivery or frozen preportioned delivery. Within each delivery system, food acceptability was better in some schools than in others. These differences point to potential improvements which could be made in all delivery systems (17).

Variations in nutrient levels associated with different food delivery systems rarely were significant. The results suggest that with all these delivery systems food with comparable nutritional value can be placed on the serving line (18).

Facility utilization for preparation and service varied among delivery systems. Frozen preportioned delivery systems had the lowest facilities utilization, while those in central preparation with hot bulk delivery had the highest. On-site preparation and central preparation with hot bulk delivery were similar in costs per meal and space requirements. The wide range of space and cost requirements per meal indicated

that efficient design, preplanning, and proper selection of equipment can lead to substantial improvements in school foodservice facilities (19).

The labor requirements for preparation and cleanup of on-site or hot bulk delivery meals were significantly higher than those of preplated meals. When total meal costs were calculated, including prorated facilities, labor, and food costs, no significant differences were found among the alternate delivery systems (20).

Job Design

Job Enrichment and Job Design

The term "job design" has been used to include job enrichment, job enlargement, job restructuring, and work reform (22). According to Kast and Rosenzweig (22), the goal of job design is to enhance productivity/performance and improve the quality of an employee's working life and job satisfaction.

Job enrichment was defined by Anderson (23) as a systematic attempt to restructure jobs with the objective of obtaining improved worker motivation. Sirota and Wolfson (24) interpreted job enrichment as the redesign of a job to provide a worker with greater responsibility, more autonomy in carrying out that responsibility, closure or a complete job, and more timely feedback about performance.

In differentiating job enrichment and job enlargement, Herzberg (25) described job enrichment as providing opportunities for the employee to grow psychologically, whereas job enlargement makes a job structurally bigger. Both job enrichment and job enlargement are ways for job expansion. Job enlargement provides for horizontal loading or increasing the tasks, while job enrichment involves vertical loading of jobs which

increases motivating factors. Konz (26) contended that adding variety to work has been termed job enlargement. Adding more responsibility has been given the name job enrichment.

An important theory relevant to work redesign theory has been the Herzberg two-factor theory (27), which proposes that the primary determinants of employee satisfaction are factors intrinsic to the work that is done. The factors include recognition for achievement, responsibility, advancement or growth, and the work itself. These factors are called "motivators" because they are believed to be effective in motivating employees to superior effort and performance. Dissatisfaction is seen as being caused by "hygiene" factors that are extrinsic to the job itself. The theory specifies that a job will enhance work motivation and satisfaction only to the degree that "motivators" are designed into the work itself. Changes that deal solely with "hygiene" factors should not lead to increases in employee motivation.

Job Redesign

Whitsett (28) discussed the problems of using job enrichment as a remedy for organizational difficulties. He stressed that job redesign can only be effective when positions are poorly designed. He suggested three characteristics of a well-designed job: (a) the job is a complete piece of work directly affecting someone; (b) the job permits a high degree of decision-making and control; and (c) the worker receives frequent feedback on his/her performance.

Walton (29, 30) stated that in work restructuring efforts all aspects of work should be considered with the aim of creating an internally consistent work culture or one that ideally enlarges workers'

scope for self-management, enhances their opportunity for learning new abilities, increases their identification with the product and production process, and promote their sense of dignity and self-worth. Walton recognized that work restructuring depends on the type of technology, the skills and predispositions of the work force, and economic factors. Based on experiments he conducted, Walton (29, 30) stressed that equal importance on business success and quality of life contributes to the success of these efforts.

Hackman (31, 32) emphasized the potential of work redesign to change jobs effectively. Unless managers take the challenge of implementation seriously, however, the opportunity to realize that potential may slip away. Hackman listed the ingredients for successful work redesign projects.

1. Key individuals responsible for the work redesign project attack the difficult problems from the beginning.
2. A diagnosis of changes needed in target jobs, based on work redesign theory, is conducted before implementation. A manager responsible for a work redesign project should consider several issues.
   - Can the jobs under consideration be meaningfully changed?
   - Are the employees reasonably ready for change and capable of handling their new duties afterward?
   - Is management itself ready to handle the extra burdens and challenges that will be created by the change?
   - How are supervisors, related peer groups, and clients likely to be affected by the change?
3. Management ensures that specific changes are discussed publicly and based explicitly in the diagnosis. Three advantages were cited by Hackman.
   - If plans are based on diagnostic results, the project is protected from boiling over into irrelevancies.

- When the diagnosis is carried out and discussed publicly, all parties involved have the chance to influence the redesign activities and become familiar with them.

- By tying changes explicitly to the diagnostic results, managers can increase the chances that principles helpful to future development of effective work redesign will emerge from the project.

4. Contingency plans are prepared ahead of time to deal with both the problems and the opportunities that emerge from work redesign activities.

5. Those responsible for the work redesign project are prepared to evaluate the project continuously throughout its life.

Hackman (31, 32) noted that discovering how to implement job enrichment effectively is a substantial managerial challenge but the gains are compensatory. One advantage is that job enrichment can improve the basic relationship between a person and his/her work. Job enrichment includes rearrangement of the work to move the worker from extrinsic toward internal motivation. Effective work redesign changes behavior directly in a way that maintains the change. The strategy of effective work redesign is to change the worker's behavior in such a way that the employee gradually acquires a positive attitude about work, the organization, and himself/herself. A third advantage is that work redesign offers the chance to initiate other organizational changes and to alter managerial style. Also, work redesign can help organizations rehumanize rather than dehumanize the employees.

Hackman (33) contended that organizations are presently in a work ethic "crisis." He indicated two different routes for the design and management of work in the next decade. One route, derived from the conclusion that many people are underutilized by the work they do, leads to increases in the level of challenge that is built into jobs and in the degree of control job holders have in managing their own work. In other

words, the jobs would be fitted to the people. The second route is based on the hypothesis that people generally adapt and adjust to almost any work situation, even one that initially seems to underutilize their talents greatly. In this route, people are fitted to the jobs. Hackman (33) indicated he favors fitting jobs to people; however, he contended that fitting people to jobs may be a good characterization of what work will be in the 1980s and beyond.

Smith (34) agreed that great dissatisfaction occurs with work, possibly with the design of work, and that the number of work "misfits" in organizations may be increasing. Smith (34) believed that job enrichment had the principal ingredients of institutional faddism and questioned whether a world of alienated workers is ripe for job enrichment.

Characteristics of Jobs

Turner and Lawrence (35) attempted to focus on the objective characteristics of jobs and identified six requisite task attributes: variety, autonomy, required interaction, optional interaction, knowledge and skill, and responsibility. They attempted to relate these to job satisfaction. Hackman and Lawler (36) suggested four core dimensions for jobs: variety, task identity, autonomy, and feedback. They found each one positively related to internal work motivation, general job satisfaction, and job involvement. Brief and Aldag (37) found similar results among employees working with inmate rehabilitation.

Job Characteristics Model. Hackman et al. (6, 38) later developed a job characteristics theory identifying five core dimensions of a job: skill variety, task identity, task significance, autonomy, and feedback. The job characteristics model illustrates relationships between five core

job dimensions, three critical psychological states of workers, and possible beneficial personal outcomes or affective responses and positive work outcomes. The model also illustrates how these relationships are moderated by individual growth need strength.

The Hackman et al. (38) theory is a strategy for the design of jobs. The psychological states believed to be critical for internal work motivation and job satisfaction are experienced meaningfulness of the work, experienced responsibility for outcomes of the work, and knowledge of the actual results of work activities. These were defined as follows:

- experienced meaningfulness - the person must perceive his/her work as worthwhile or important by some system of personal value;
- experienced responsibility - the person must believe that he/she personally is accountable for the outcomes of efforts; and
- knowledge of results - the person must be able to determine on some fairly regular basis, whether or not work outcomes are satisfactory.

Characteristics of jobs which provide for achievement of these psychologic states are referred to as "core dimensions." Three of the five core dimensions believed to contribute to a job's meaningfulness for the worker are:

- skill variety - the degree to which a job requires the worker to perform activities that challenge abilities;
- task identity - the degree to which the job requires completion of a "whole" and identifiable piece of work; and
- task significance - the degree to which the job has an impact on the lives of other people.

According to the theory propounded by Hackman (6, 38), the job characteristic or core job dimension that leads toward personal responsibility is autonomy. Autonomy is the degree to which the job gives the worker freedom, independence, and discretion in scheduling work and

determining methods. The final core dimension is feedback (6). Feedback is the degree to which a worker, in carrying out the work activities required by the job, receives information about the effectiveness of results. The most influential feedback is considered that which the worker obtains through self-checks against predetermined standards.

According to Hackman and Oldham (6), the overall potential of a job to prompt internal work motivation on the part of the employee should be highest when all of the following are true: the job is high on at least one of the three dimensions that lead to experienced meaningfulness, the job is high on autonomy, and the job is high on feedback. The motivating potential score (MPS) is a measure of the degree to which these conditions are met. MPS is computed by combining the scores of jobs on the five dimensions.

Hackman et al. (38) recognized that some people have strong needs for personal accomplishment, learning and developing, and challenging themselves. The authors contended this type of person to be high in "growth need strength." Growth need strength predicts who is likely to become internally motivated on a job. Hackman and Oldham (6) suggested two possible sites for this moderating effect: at the link between the objective job dimensions and the psychological states, and at the link between the psychological states and the outcome variables. The first would imply that people with high growth needs are more likely to experience the psychological states when the job is good than those with low growth needs. The second allows the possibility that nearly everyone may experience the psychological states when job conditions are right, but that individuals with high growth needs respond more positively to that experience. Hackman

and Oldham (6) suggested that growth need strength may occur at both points in the sequence.

Kiggundu (39) contended that initiated task interdependence is one other dimension that is related to a person's experienced responsibility for work outcomes. Autonomy leads to experienced responsibility for one's own work outcomes; whereas initiated task interdependence leads to experienced responsibility for the work outcomes of others for whom one initiates work. Autonomy and initiated task interdependence together lead to total experienced responsibility.

Job Diagnostic Survey. Hackman et al. (38) recommended using an instrument which they developed, the Job Diagnostic Survey or JDS, to diagnose the nature of "people problems" before enriching jobs. The JDS provides measures of all the variables with the exception of worker performance, absenteeism, and labor turnover. If the resultant data indicate job redesign is appropriate, they propose five implementing concepts: forming natural work units, combining tasks, establishing client relationships, loading jobs vertically, and opening feedback channels. Hackman and Oldham (40, 41) reported validation of the JDS by a test with 658 employees working on 62 different jobs at seven organizations.

Studies Using the JDS. The results of a study by Oldham (42) indicated that internal work motivation is an accurate predictor of an employee's performance. He also found that individuals who perceive their jobs to be high on the five job characteristics experience high internal motivation when they are well satisfied with their supervisor and co-workers and desirous of growth need satisfactions. When these satisfactions are low, however, the job characteristics seem to lead less

directly to high internal motivation. The results established growth need strength as a moderator of the job-internal motivation relationship.

Oldham et al. (43) administered the JDS to 201 bank employees in 25 different clerical jobs to study the moderating effects of growth need strength and the level of satisfaction with work context factors on employee responses to enriched jobs. Employees with strong growth needs and job context satisfactions responded more positively to enriched jobs than did employees with weak needs for growth and/or those dissatisfied with work context. Oldham and his co-workers concluded that prior to enriching jobs practitioners should assess both individual differences in needs and contextual sources of dissatisfaction carefully.

Katz (44) investigated the relationship between overall job satisfaction and the five core dimensions for employees at different stages of their careers. The analysis showed that employees new to their jobs responded positively, in terms of satisfaction, to the feedback dimension and to task significance. Also, newcomers reacted negatively toward autonomy in the initial job stage. Data from the employees with considerable job longevity (i.e., 10 years or more) showed no significant relationships between satisfaction and job characteristics. One possible implication of this research is that the efficacy of job design efforts, in terms of job satisfaction, may depend upon the job and career stages of the individual employees.

A study by Abdel-Halim (45) attempted to examine the moderating effects of employees' growth need strength and their satisfaction with supervisors and co-workers on the relationship between the motivating potential of the job, as an overall measure of job enrichment, and their intrinsic job satisfaction and job involvement. Individuals experiencing

high satisfaction with their supervisors and co-workers reported significantly more intrinsic satisfaction than those experiencing low satisfaction with these contextual factors under a condition of low MPS. Individuals experiencing low supervisory and co-worker satisfactions were greatly satisfied with their personal growth on the job and reported greater job involvement under a condition of high rather than low job complexity and enrichment.

The hypothesis of a study conducted by O'Reilly et al. (46) was that task characteristics assessed by the Job Diagnostic Survey would vary according to an individual's frame of reference, definition of the job, and general job satisfaction. They found that perceptual assessments of task characteristics vary with the individual's frame of reference and job attitudes. Questions exist about the degree to which perceptual assessments of job characteristics may reflect variations in different perceptions of the same job and a general affective set about the work. They contended that, conceptually, individuals may respond differentially to the same stimulus depending on factors such as background, experience, expectations, or mood.

Oldham and Hackman (47) compared two frameworks for explaining the relationship between the structural properties of organizations and employee reactions to the work and the work context. The attraction-selection framework suggests that the personal attributes of employees mediate the structure-reaction relationship. The job-modification framework posits that the characteristics of employees' jobs mediate this relationship. Results show that the job-modification framework better explains the relationship between organizational structure and employee reactions than does the attraction-selection framework. A combined

framework, which includes both personal and job characteristics as mediators, is more effective in explaining structure-reaction associations than frameworks using either the employees' personal attributes or job characteristics alone as mediators.

Oldham et al. (48) examined two related research issues: the extent to which employees compare the complexity of their jobs to the job complexity of referents; and the consequences of this comparison for employees' satisfaction, motivation, and productivity. Seventy-six percent of the respondents compared the complexity of their jobs to the job complexity of referents, and 63 percent of these employees selected referent jobs that were more complex than their own. Most individuals compared their current jobs to jobs they had in the past or would like to have in the future. Comparisons made by employees had substantial implications for their motivation and productivity. Individuals who used others as their referents were less motivated and less productive than those who use self referents, particularly self-future referents.

Job Design and Foodservice Organizations

Bobeng (3) reviewed the literature on job enrichment and illustrated how a conventional hospital foodservice with decentralized patient tray service might be centralized without sacrificing any of the five core dimensions of the workers' jobs. She concluded that a centralized system could be "de-enriching" if the initial design failed to include the five implementing steps suggested by Hackman (38).

Shaffer (49) compared the characteristics of jobs designed for conventional and for more highly technical (cook-chill/cook-freeze) hospital foodservice systems by sampling 270 nonsupervisory foodservice workers in five conventional and four highly technical systems. Results from the

JDS indicated that, overall, jobs in conventional and highly technical hospital foodservice systems did not differ greatly. The design of specific jobs, however, did have significant positive effects on personal and work outcomes. Cashiers, cooks, dietetic clerks, and storeroom workers by design of the behavioral characteristics of jobs showed higher personal and work outcomes than did general foodhandlers, general kitchen workers, cafeteria workers, patient tray attendants, and sanitation workers.

Shaffer (49) also studied the simultaneous effects of system (conventional versus technical) and job type (high MPS versus low MPS) on the critical psychological states, affective responses, and growth need strength. Employees in the technical systems experienced significantly more meaningfulness in their work and internal work motivation than did the employees in the conventional systems when effects of job type were controlled. The high MPS job holders experienced higher levels of meaningfulness and responsibility for the outcomes of their work, regardless of system type.

Labor Cost Studies in School Foodservice Systems

The cost of labor is a primary factor causing variation in the cost of a school lunch. As the hourly cost of labor increases, Payne et al. (8) contended that the relative efficiency of different systems in providing meals becomes more important. A study of labor hours and labor costs was conducted by Eifler and Harris (50) in 1952 in school cafeterias in Pennsylvania. They found that about two-fifths of the total labor hours were used in preparation, about one-seventh for counter service, and one-tenth in dishwashing. In 1958, Kroener and Donaldson

(51) substantiated the principle that labor time expended per meal decreases as the number of meals served increases. Dayton and Hitchcock (52) studied the labor time spent in a centralized school foodservice unit to evaluate the efficiency of the operation. Problem areas identified were the time spent in rest periods and nonproductive work such as putting away supplies and equipment, business procedures, and loading carts.

Payne et al. (8) undertook a major study to determine the economics of alternate school feeding systems. The results showed that the use of the central preparation-satellite service system reduced labor cost and increased labor efficiency. Labor efficiency was improved further by use of the preplated meals satellite system over bulk delivery. Meals per labor hour were calculated for self-contained units, production kitchens, hot bulk receiving schools, and preplate receiving schools. The average number of meals per labor hour for self-contained kitchens ranged from 10.1 to 14.7. In production kitchens, the range was from 6.1 to 14.4. The schools receiving hot bulk food ranged from 14.7 to 16.6 meals per labor hour. The preplated receiving schools ranged from 18.2 to 23.5. They also concluded that more than one satellite school was required for each central preparation site to show the labor productivity advantages of the central preparation systems. Labor requirements for serving or cleaning were substantially different, however, for central-satellite systems or on-site kitchens. When considering the merits of alternative school feeding programs, Payne et al. (8) concluded that accurate cost data were needed but that most school systems had an inadequate method determining true costs and little uniformity existed between school lunch accounting systems.

A survey was conducted by the editors of School Management (53) in an attempt to obtain reliable school foodservice data. Data from 415 school foodservice directors showed that the median cost of the meal increased when the size of the school district increased. This increase in meal cost also was associated with a reduction in labor efficiency. The lack of good accounting practices in the school reporting made it difficult to draw any conclusions from the study and no information was provided on the effect of differing foodservice systems.

An analysis was done at a large central kitchen in Pittsburgh (54) that served centrally prepared chilled preportioned meals consisting of a hot pack which was heated in a convection oven at the satellite and a cold pack served directly from the satellite refrigerator. Using this highly automated centralized approach, labor requirements were as low as two minutes per meal.

Harper and Jansen (55) found that central preparation led to reduced time to prepare a meal. These studies did not pinpoint a cause but economies of size in labor efficiency were considered to be responsible.

In a study comparing alternate school lunch delivery systems, Harper et al. (21) collected data for the determination of labor minutes by work function on a per meal basis. Work function summary sheets were completed by the individual workers. The differences in delivery systems were determined by the number of labor minutes per meal for each of the following work functions: preparation, serving, cleaning, transportation, supervision (administration), and other. For each school, labor minutes per meal by work function for each employee were totaled and divided by the number of meals prepared. The same data were compiled for satellite units, if they were involved, and these figures were combined to obtain

minutes per meal for each work function and also the total minutes of labor per meal. The mean minutes per meal by delivery systems were as follows:

Delivery system	Minutes/meal
On-site preparation and service	6.42
Central preparation, hot bulk delivery	5.84
Central preparation, chilled preplated delivery	3.38
Frozen preportioned delivery	2.40

Lough et al. (20) found labor costs to be the highest for on-site preparation and service and lowest for centrally prepared meals.

In another study by Harper and Jansen (56, 57) on comparison of alternate lunch patterns, labor requirements per meal decreased as more meals were served. They concluded that productivity was associated primarily with the larger scale operations. Therefore, since labor is a large part of the total meal cost, higher student participation in school lunch should mean lower cost per meal and thereby reduce the cost of the meal. Sixteen percent of all foodservice activities involved administrative functions, 37 percent preparation, 16 percent service, 25 percent clean-up, and 6 percent other, none of which varied with the menu pattern followed.

DenHartog et al. (58) tested an employee time log reporting system for a school foodservice system in a midwestern city. The purposes of the study were to determine: if it would be feasible to use a computer-assisted time management system to record staff time in a foodservice program; and the significance of the study in providing useful time information.

The process of using a coded log sheet and computer assistance was an effective means of collecting and reporting time information.

In a study conducted by Knickrehm et al. (59), the time log reporting system was utilized to determine how the menu affects the labor time of managers, assistant managers, and total labor in schools preparing school lunch meal patterns and a la carte lunches. Personnel recorded their work activities on a Time Reporting Matrix. Time for preparation tasks differed significantly among days. The amount of time spent on the tasks of pre-preparation, sanitation, and accounting were not significantly different among schools or days. This study indicated that managers, the highest paid school foodservice employees, actually spent the greatest percentage of their work hours in the more complex decision-making activities of the foodservice operation.

Environmental Conditions in the Workplace

The Hawthorne experiments (60), conducted at the Western Electric Company in Cicero, Illinois, began in the late 1920s as an attempt to determine the impact of working conditions on employee productivity. The specific purpose was to determine the relation of the quality and quantity of illumination to the efficiency of industrial workers. What evolved during nearly a decade of research, however, was the scientifically based realization that the effects of psychological and social factors on the work behavior of employees were as significant as the more traditional physiological factors.

Human engineering was defined by Kazarian (61) as the application of principles, philosophies, and scientific research to the design of machines and equipment, work areas, work methods, and the working

environment for human beings. The aim of human engineering is to provide a working environment in which the worker is as alert, accurate, able to think, and free of debilitating and endangering fatigue during the last hour of work as during the first (62). According to Avery (62), fatigue and resultant lowered productivity may be influenced by the following causes:

- high temperatures and/or humidity,
- low or glaring light,
- high noise level or sharp impact noises,
- long periods of mental or physical work where the body is held in a stooped or bent static position,
- standing too long,
- repeated major body changes,
- insufficient knowledge or unfamiliarity with the task or machine,
- heavy physical exertion,
- working at a disliked task,
- work requiring careful attention to detail,
- rushing to meet deadlines, and
- mental or emotional stress.

Lighting

West et al. (13) stated that good lighting in a foodservice provides adequate and pleasing illumination for comfortable seeing in the performance of various tasks. The prime requirements for industrial lighting are sufficient quantity and high quality illumination on all work planes (63). Under these conditions, personnel will be able to observe and control effectively the operation and maintenance of various types of machines and processes.

Three forms of electric lighting used in industrial areas are general, localized general, and supplementary. General lighting should provide uniform illumination throughout the area involved. Localized general lighting reinforces the general lighting in specific areas through the use of additional lighting equipment in the areas involved.

Supplementary lighting is used to provide higher illumination for small or restricted areas where such levels cannot readily be obtained by general lighting methods. Supplementary lighting also is used to furnish a specific brightness or color, or to permit special aiming or positioning of light sources.

Avery (62) stated that in foodservice operations good light and color conditioning has several beneficial effects. These include (a) improved production rates; (b) better quality products, fewer rejects, and unusable items; (c) reduced eyestrain and fatigue; (d) reduced accidents and misuse of equipment; (e) shortened worker training; (f) improved worker morale, lowered absenteeism, and reduced labor turnover; (g) better housecleaning and faster cleanup; and (h) better public relations.

The desirable quantity of light for any particular installation depends primarily upon the work that is being done. Investigations have shown that as the illumination of the task is increased, the ease, speed, and accuracy of accomplishing it also are increased (63). West et al. (13) stated that a light intensity of 30 to 40 foot candles is considered adequate for general lighting in food preparation and display units. This should increase up to 50 foot candles or more in intensity localized in work areas such as sinks, salad tables, and cookers; and where recipes are read, ingredients are weighed and measured, and gauges and thermometers are located. Avery (62) recommends the following foot candles: (a) storerooms--10-20; (b) areas where recipes are read--30-50; (c) clean end of dishwasher--70-100; and (d) service areas--50-100.

Noise

Some of the properties of noise are intensity (or pressure), frequency, and duration, all of which are important factors in evaluating

the effects of noise on people's hearing (64). The National Safety Council (63) stated that the louder the noise, the higher its intensity, that high frequency (high pitch) noises are more damaging to hearing than low frequency noises, and that the longer the noise exposure, the greater the damage to the human hearing mechanism.

Threshold limit values (TLV) for noise are based on a single overall decibel measurement on the "A" scale of a standard sound level meter of dBA. These threshold limit values refer to sound pressure levels that represent conditions under which all workers may be repeatedly exposed without adverse effect on their ability to hear and understand normal speech (63).

An Occupational Safety and Health Administration ruling established the noise limit to be 90 decibels averaged over an eight hour day. For four hours a day, it is 95 dBA and for two hours, 100 dBA. The sound level should not exceed 115 dBA for any duration (65). Noise may have psychological effects on a person; for example, noise can startle, annoy, and disrupt concentration (63). Also, interference with communication by speech is a possible result. As a consequence, job performance and safety may be affected negatively (66). Physiological effects include noise induced loss of hearing, aural pain, nausea, and reduced muscle control when the exposure is severe (63). Noise may be reduced by training workers to work quietly, by choosing or designing equipment that can be operated quietly, through use of sound-deadening or absorbing materials, and by isolating or closing off noisy areas (67).

Effective Temperature

The American Society for Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) (26) defined comfort as a state of mind which

expresses satisfaction with the thermal environment. Specifying a comfortable environment is difficult, however, since comfort is influenced by six major factors. Four are environmental (dry bulb temperature, water vapor pressure, air velocity, and radiant temperature) and two are individual (metabolic rate and clothing) (26).

The concept of effective temperature stands as one of the major contributions to the body of research on thermal comfort (68). Introduced in 1923 by Houghten and Yaglou (69), effective temperature is a single index that combines the wet bulb and dry bulb temperatures with barometric pressure and air velocity for predicting thermal comfort. Because it tended to overestimate the effects of humidity at cold temperatures and underestimate them at high temperatures, a new effective temperature was proposed by Gagge (70) which is based on constant body wetness caused by regulatory sweating.

The air temperature is measured with a thermometer, often referred to as a "dry bulb" thermometer. Humidity, or moisture content of the air, is generally measured with a psychrometer, which gives both dry bulb and wet bulb temperatures. Using these temperatures and referring to a psychrometric chart, the relative humidity can be established (63).

The effects of temperature on human performance may vary depending on the age, sex, amount and type of clothing worn, and the type of activity being performed (61). Rohles (71) contended that predicting a single temperature as comfortable is impractical. Generally speaking, people over 50 years of age prefer slightly higher temperatures than younger people (61). Women also prefer higher temperatures than men in similar situations. A person doing physical work can be comfortable in a cool environment while a person doing sedentary work in the same environment

will feel cold. Also, at higher effective temperatures, the physical output of workers decreases (60). Kazarian (61) listed the following effects of effective temperature of worker performance:

Effective temperature	Possible effects on worker performance
Below 55°F	Physical stiffness of extremities, increased accidents
55-65°F	Discomfort, morale problems, period of adjustment needed
65-73°F	Optimum worker conditions
73-80°F	Discomfort, morale problem, labor turnover
80-90°F	Reduced physical and mental output, increased errors and accidents
90-100°F	Marked reduction in work capacity, circulatory strain
100-110°F	Tolerable for very short periods of time

METHODOLOGY

Research Site

The two school lunch delivery systems studied were: (a) conventional on-premise food preparation and service; and (b) food preparation in a base kitchen in a secondary school followed by hot bulk transport to satellite schools. The study was conducted in eight elementary schools and two secondary schools of a school district in a medium-sized midwestern city. Four elementary schools and the two secondary schools had on-premise preparation and service and four were satellite schools. The school district has nine elementary schools, one middle school, and one high school. Three of the satellite schools received food from the middle school and one satellite received food from the high school.

The school foodservice director is responsible for overall administration and coordination at the district level. A cook manager at each school manages food production and service.

Data were collected during the fall semester of 1981. Prior to collecting data, approval was received from the district foodservice director and the elementary school principals. An explanatory memorandum (Appendix A) was prepared by the researcher and transmitted to the principals by the foodservice director with a request that they approve involvement in the study.

Subsequent meetings were scheduled with each principal at the eight elementary schools. The researcher explained the role of the foodservice

personnel in the study and examples of the instruments were given to the principals.

Research Design

The design characteristics of the labor utilization study are summarized as follows:

1. Eight elementary schools (four satellite, four on-premise), one middle school, and one senior high in the same school district were used.
2. Data collection occurred at one satellite and one on-premise school per test day.
3. Data were collected on two different days at each school.
4. Menus were constant across schools tested on the same day.
5. Foodservice personnel from the eight elementary schools, middle school, high school, and education center participated in the study.

Cook managers completed an employee information form prior to the collection of data. School foodservice personnel at the participating schools were asked to complete the Job Diagnostic Survey (JDS) developed by Hackman and Oldham (41). Also, the employees completed a work function summary sheet each day the research team was at their school. The middle and high school employees also completed this form on the same days as the corresponding satellite school. In addition, the researcher gathered data on the lighting level, effective temperatures, and the noise levels at specified intervals on one of the two data collection days at the elementary schools. These data were collected at

the two secondary schools at another time. A copy of all forms is in Appendix B.

Research Instruments

Employee Information Form

The employee information sheet was modified from a form used in the Harper and Jansen study of food delivery systems (21). Prior to data collection, the cook manager at each school was asked to provide the following information on each employee: (a) employee name, (b) job title or position, (c) full or part time, (d) daily hours of work, (e) total number of hours per week, (f) hourly wage, and (g) responsibilities including production (main dish and vegetables, cold items, and baked goods), serving, dishwashing, and administrative.

Job Diagnostic Survey

The JDS (41) is comprised of seven sections designed to measure job dimensions, critical psychological states, affective responses or general and specific job satisfaction, internal work motivation, and individual growth strength. In addition, a motivating potential score or MPS, is computed from the job dimensions scores, and provides an index that reflects the overall potential of a job to prompt high internal work motivation on the part of job incumbents. Two sections were added to the JDS to measure the employee's reaction to the physical environment in the workplace. Biographical information on the sex, age, and length of employment was also requested.

A total of 83 items were presented on a Likert-type scale in addition to three biographical items and 12 items on the physical

environment. The number of items ranged from as few as six in some sections to as many as 15 in one section.

Job Dimensions. The five core job dimension scores were obtained from items in Sections I and II. Sections I and II also provide scores for feedback from agents and dealing with others. These two dimensions have been found to be helpful in understanding jobs and employee reactions to them. Section I provided a single item for each job dimension in the following format:

1. How much variety is there in your job? That is, to what extent does the job require you to do many different things at work, using a variety of your skills and talents?

1---------2---------3---------4---------5---------6---------7

Very little; job requires me to do the same routine things over and over again.	Moderate variety	Very much; the job requires me to do many different things.

Respondents circled the number which best reflected the amount of variety in their jobs.

Section II provided two items for each of the seven job dimensions; one phrased direct or positively and one phrased reversed or negatively. Respondents were asked to indicate the accuracy of each statement in describing the objective characteristics of the job using a seven point scale, ranging from "very inaccurate" to "very accurate." A sample statement (in reversed format) for Skill Variety is:

_____ 1. The job is quite simple and repetitive.

Critical Psychological States. Scores for the three critical psychological states, Experienced Meaningfulness of the Work, Experienced

Responsibility for Work Outcomes, and Knowledge of Results, were obtained from Sections III and V of the JDS. In Section III, respondents indicated their agreement or disagreement with a number of statements about their work experience. A seven point scale ranged from "disagree strongly" to "agree strongly." A sample statement follows for Experienced Responsibility for Work Outcomes:

_____ 1. I feel I should personally take the credit or blame for the results of my work on this job.

A projective format was used in Section V. Respondents were asked to "think of other people in your organization who hold the same job as you do" and to indicate how accurate each of the number of statements described the feeling of those people about the job. The same seven point agree-disagree scale of Section III was used. The content was similar to those in Section III, except most items were prefaced by phrases such as "Most people on this job . . . ." An example of an Experienced Meaningfulness item is:

_____ 1. Most people on this job find the work very meaningful.

Four items tapped Experienced Meaningfulness of the Work (two in Section III and two in Section V); six items for Experienced Responsibility for Work Outcomes (four in Section III and two in Section V); and four items for Knowledge of Results (two in Section III and two in Section V). Eight items were stated positively and six negatively.

Affective Reactions: General Satisfaction and Internal Work Motivation. Sections III and V items also assessed general satisfaction and internal work motivation. The items for these scales were intermixed with those for Critical Psychological States, described previously. Five

items tapped general satisfactions (three in Section III and two in Section V) and six items tapped internal work motivation (four in Section III and two in Section V). Two general satisfaction items and one internal motivation item was in the reversed format. The same seven point agree-disagree scale of Section III was used.

A sample general satisfaction item (Section V, reversed format) is:

_____ 1. People on this job often think of quitting.

A sample internal work motivation item (Section III, direct format) is:

_____ 1. My opinion of myself goes up when I do this job well.

Affective Reactions: Specific Satisfactions. Five specific satisfaction scores were obtained from Section IV of the JDS to measure satisfaction with specific aspects of the jobs. Employees responded to "How satisfied are you with this aspect of your job?" for each item on a seven point scale ranging from "extremely dissatisfied" to "extremely satisfied." An item for each of the five job aspects is given below:

Job Security:

_____ 1. How secure things look for me in the future in this organization.

Pay and Compensation:

_____ 1. The amount of pay and fringe benefits I receive.

Social:

_____ 1. The chance to get to know other people while on the job.

Supervision:

_____ 1. The amount of support and guidance I receive from my supervisor.

Growth:

_____ 1. The amount of personal growth and development I get in doing my job.

Individual Growth Need Strength. Sections VI and VII measured the respondents' growth need strength using two types of formats: a "would like" format and a "job choice" format. In Section VI, respondents were asked to indicate the degree to which they would like to have each of eleven conditions present in their jobs. Five items (e.g., "very friendly co-workers") were not relevant to individual growth needs, and were not scored. A sample item is:

_____ 1. Chances to exercise independent thought and action in my job.

All eleven items referred to generally positive or desirable aspects of the workplace. To emphasize to the respondents that most items are seen as desirable to most people, the seven-point response scale ranged from "Would like having this only a moderate amount--or less" through "Would like having this very much" to "Would like having this extremely much." To reinforce further that these items were to be marked differently from those presented earlier in the instrument, the numerical values for responses ranged from four to ten. The item scores were transformed to a standard one to seven scale prior to analysis by subtracting a constant of 3.0 from each item.

Growth need strength was measured in Section VII by asking respondents to indicate their relative preferences for pairs of hypothetical jobs. A sample item is:

JOB A				JOB B
A job where you are often required to make important decisions.				A job with many pleasant people to work with.
1	2	3	4	5
Strongly Prefer A	Slightly Prefer A	Neutral	Slightly Prefer B	Strongly Prefer B

Respondents circled the number which reflected their own relative preference between the two jobs. Twelve items (i.e., pairs of hypothetical jobs) were in the section. In each item a job with characteristics relevant to growth need satisfaction was paired with a job which has the potential for satisfying one of a variety of other needs. In half the items (as the example above), the choice was between jobs which both have positive characteristics; in half the choice was between jobs which both have predominantly negative features (e.g., a job where there is a real chance of being laid off vs. a job with little chance to do challenging work). The growth relevant job was presented in half the items as "JOB A" and in half as "JOB B."

Employee Reactions to Physical Environment. Scores for the four employee reactions to physical environment (i.e., physical work, temperature, lighting, and noise) were obtained from Sections VIII and IX which were added to the JDS. Section VIII provided two items each for the physical work and temperature scores and one item each for the lighting and noise scores. Respondents were asked to indicate the accuracy of each statement in describing the objective characteristics of the workplace using a seven point scale, ranging from "very inaccurate" to "very accurate." A sample statement for physical work is:

_____ 1. This job requires me to stand for a long period of time.

Section IX also provided two scores each for the physical work and temperature scores and one item each for the lighting and noise scores. The same statements from Section VIII were used in Section IX. Employees responded to the question, "How often does this aspect of your job bother you?" for each item on a five point scale ranging from "bothers me almost always" to "really does not bother me."

Work Function Summary Form

The work function summary form was adapted from a form used in the Harper and Jansen study of food delivery systems (21). On data collection days, the employees at the on-premise school, satellite school, and secondary school (or base kitchen) completed the form. Each employee recorded the hours and minutes spent in each work function to the nearest 15 minutes. The work functions included preparation, serving, cleaning, transportation, supervision (administration), meals and breaks, other, and total. The total should equal the length of the employee's work day.

Environmental Worksheet

A form was designed with the assistance of an industrial engineer to record the physical conditions of the workplace. The lighting level, effective temperatures, and noise levels were measured in five areas of the kitchen. Effective temperature, which is a function of ambient temperature and humidity, was measured by a dry and wet bulb psychrometer[1] and converted to degrees Farenheit. A light meter[2] measured the quantity

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[1]Psychro-Dial, Model CP-147, Environmental Tectonics Corporation, Newtown, PA.

[2]Spectra Combi-500, Photo Research Corporation, Burbank, CA.

of light intensity in foot candles. Noise levels were measured in decibels on the "A" scale of a sound level meter.[1]

Preliminary Work

The foodservice director of the school district meets regularly with all cook managers every two weeks. The researcher attended two of these meetings prior to data collection. At one conference, copies of data collection instruments were reviewed by the cook managers and a memorandum was distributed which summarized the research procedures (Appendix A). Also, the researcher scheduled data collection times and visitations for establishing specific procedures at each school. The employee information form was explained and distributed to the cook managers. A date was determined for the researcher to collect the completed form at each school. At this time the researcher observed the layout of each school kitchen in order to determine the sites for the environmental measurements. The completed employee information forms were used to code the work function summary sheets and the Job Diagnostic Survey.

A pilot study was conducted to standardize procedures in one elementary school in the school system not used in the actual study. The pilot study provided additional practice for the environmental measurements.

Data Collection

Job Diagnostic Survey

The researcher administered the questionnaires to the foodservice personnel in groups of varying size and occasionally on an individual

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[1]Type 1565-B, General Radio Company, Concord, MA.

basis. The instrument and an envelope was given to each respondent. Standardized instructions, patterned after those used by Shaffer (49) in a related study, were given verbally each time the instrument was administered (Appendix C). As recommended by Shaffer (49), posters were used to clarify the format for two types of questions. Employees were assured that responses would not be seen by supervisors.

Each questionnaire was assigned an identification number. Each employee's name was printed on a card attached to the instrument. This identification system was necessary to link the various types of data collected on each employee. Respondents were asked to detach the card before answering the questionnaire. After completion, each respondent placed the questionnaire in the envelope provided to ensure confidentiality. A date was determined for the researcher to retrieve the completed questionnaires.

Work Function Summary Form

Each day the researchers distributed the work function summary forms at the elementary schools. The cook managers distributed the forms at the middle and high schools on the days corresponding to the satellite school. As described previously, each employee recorded his/her time spent on each of seven work functions to the nearest 15 minutes. These forms were collected by the researcher at the end of the work day. The cook managers at the middle and high schools held these forms until the end of the data collection period.

Environmental Worksheet

On one day at each school, the researcher recorded the effective temperature, lighting, and noise levels of five areas in the foodservice

department. These areas included: oven, steam equipment, preparation, serving, and dishwashing. The lighting level was measured once in each of the five areas, while the effective temperature and noise levels were measured every 30 minutes in each area. The physical conditions of the workplace were recorded by the researcher one day of the two spent at each school. An additional day was spent at the middle school and at the high school to record the conditions at these schools.

Data Analysis

JDS Scores

Nineteen scores were provided by the seven sections of the JDS (Table 1). These scores (Table 2) were computed as specified by Hackman and Oldham (41), the developers of the instrument. The Motivating Potential Score (MPS) also was computed (Table 3). According to Hackman and Oldham, the MPS was computed from the following five core job dimension scores to provide an overall index of the potential of a job to prompt high internal work motivation: skill variety, task identity, task significance, autonomy, and job feedback.

Four scores (Table 4) on employee reactions to physical environment of work were provided by Sections VIII and IX, the sections added to the JDS. A priority score was devised as a way of rationalizing the frequency and accuracy responses, which provided a unique way of considering both ratings simultaneously in a value judgment. In Table 5, the grid used for determining the priority scores is shown. The accuracy scale is the abscissa and the frequency scale the ordinate. To use the grid, the response related to the accuracy of a descriptor would enable selection of a column in the grid. In a similar manner, the frequency response would

Table 1: JDS scores[1]

section	score
I, II	job dimensions: skill variety task identity task significance autonomy feedback from the work feedback from agents dealing with others
III, V	critical psychological states: experienced meaningfulness experienced responsibility knowledge of results
III, V	affective responses to the work: general satisfaction internal work motivation
IV	affective responses to the work: pay satisfaction security satisfaction social satisfaction supervisory satisfaction growth satisfaction
VI, VII	individual growth need strength: "would like" format "job choice" format

[1]Source: (41).

Table 2: Computation of JDS scores

score[1]	section	items
job dimensions		
skill variety	I	4
	II	1, 5*
task identity	I	3
	II	3*, 11
task significance	I	5
	II	8, 14*
autonomy	I	2
	II	9*, 13
job feedback	I	7
	II	4, 12*
feedback from agents	I	6
	II	7*, 10
dealing with others	I	1
	II	2, 6*
critical psychological states		
experienced meaningfulness	III	4*, 7
	V	3*, 6
experienced responsibility	III	1*, 8, 12, 15
	V	4, 7
knowledge of results	III	5, 11*
	V	5, 10*
affective responses		
general satisfaction	III	3, 9*, 13
	V	2, 8*

[1]Scores computed by averaging items comprising each score. Items starred (*) were reverse scored in computations.

Source: (41).

Table 2: (cont.)

score	section	items
internal motivation	III V	2, 6, 10, 14* 1, 9
specific satisfactions		
pay	IV	2, 9
security	IV	1, 11
social	IV	4, 7, 12
supervisory	IV	5, 8, 14
growth	IV	3, 6, 10, 13
individual growth need strength		
growth score I	VI	2, 3, 6, 8, 10, 11
growth score II	VII	1, 2*, 3*, 4*, 5, 6*, 7, 8*, 9*, 10, 11, 12

Table 3: Motivating potential score (MPS) computation

$$\text{motivating potential score (MPS)}^{1} = \left[\frac{\text{skill variety} + \text{task identity} + \text{task significance}}{3}\right] \times [\text{autonomy}] \times [\text{feedback}]$$

[1]Source: (41).

Table 4: Scores for measuring employee reactions to physical environment of work

score[1]	section[2]	number[3]
physical work[4]	VIII	1
	IX	1
	VIII	2
	IX	2
temperature[4]	VIII	3
	IX	3
	VIII	6
	IX	6
lighting	VIII	5
	IX	5
noise	VIII	4
	IX	4

[1]Score items according to grid for matching items (Table 5).

[2]Sections added to JDS instrument (Appendix B).

[3]Refers to item on research instrument (Appendix B).

[4]Scores for physical work and temperature were an average of two scores extracted from the grid.

Table 5: Scoring for responses of employees on reactions to physical environment of work

frequency response[2]	accuracy responses[1]						
	very accurate	mostly accurate	slightly accurate	uncertain	slightly inaccurate	mostly inaccurate	very inaccurate
	← reactions to workplace scores[3] →						
almost always	1	1	2	2	3	4	4
frequently	1	1	2	2	3	4	4
some of the time	2	2	3	3	4	4	4
occasionally	3	3	3	3	4	5	5
not at all	4	4	4	5	5	5	5

[1]Employees were asked to indicate degree of accuracy of statements regarding the physical aspects of their jobs (Section VIII added to JDS instrument, Appendix B).

[2]Employees were asked to indicate how frequently they were bothered by various physical aspects of their jobs (Section IX, JDS instrument).

[3]An employee's frequency and accuracy responses were considered simultaneously in assigning a score to pairs of matched item related to physical aspects of work. Scale = 1, unfavorable to 5, favorable reaction.

identify a row. The number located at the junction of the accuracy column and the frequency row would identify the priority score for each item.

Frequency distributions were compiled on the three biographical items on the JDS. Initially, the scores from the JDS and the employee reactions to the physical environment were analyzed using the general linear model analysis of variance (72) with system and school as the independent variables. No differences were found according to system (on-premise or satellite) and only a few in relation to school. Therefore, a subsequent analysis utilized basis of employment (full- or part-time) and school as the independent variables to gain further insight into factors affecting the scores. Also, a one-way analysis of variance was computed to study the effect of basis of employment since this appeared to be the primary factor influencing the results.

Employee Information Form

Job titles were collapsed into four classifications according to those devised by Bowen et al. (73). These classifications included: (a) managers/supervisors, (b) cooks, assistant cooks, and bakers, (c) foodservice workers and cafeteria servers, and (d) other (maintenance, clerical, sanitation). Cross-tabulations were compiled for the types of positions by schools. Also, the number of employees working full- or part-time were compiled by school. The mean wage by type of position and the mean daily and weekly hours of work by type of system were computed from data provided by the employee information form.

Work Function Summary Form

The minutes spent on each work function for each of the two days of data collection were provided by each foodservice employee at the eight

elementary schools, two base kitchens (secondary schools), and the district educational center. A mean was computed for the two days for each employee for each work function. These means were used to calculate the labor minutes per meal and labor cost per meal. The equations used for computing labor minutes per meal and labor cost per meal for on-premise, satellite, and base kitchen schools were as follows.

On-premise

$$MM = \frac{\Sigma(1'_{jk} - b'_{jk})}{m} + E$$

$$CM = \frac{\Sigma\left[(1'_{jk} - b'_{jk}) \times \frac{w_j}{60}\right]}{m} + EC$$

Satellite

$$MM = \frac{\Sigma(1''_{jk} - b''_{jk})}{m} + E + B + T^1$$

$$CM = \frac{\Sigma\left[(1''_{jk} - b''_{jk}) \times \frac{w_j}{60}\right]}{m} + EC + BC + TC^1$$

Base

$$MM = \frac{\Sigma(1'''_{jk} - b'''_{jk} - s_{jk})}{m} + E$$

$$CM = \frac{\Sigma\left[(1'''_{jk} - b'''_{jk} - s_{jk}) \times \frac{w_j}{60}\right]}{m} + EC$$

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[1] T or TC applicable only to satellite schools for transportation work function and total time.

where:

MM = minutes/meal (lunch)

l_{jk} = min. spent by the jth worker on the kth work function

b_{jk} = min. spent by the jth worker on the kth work function for breakfast service/preparation

m = mean no. of lunches served for the two days of data collection

' = on-premise school

" = satellite school

''' = base kitchen

E = minutes/meal for foodservice employees at district educational center or $\frac{\Sigma l_{jk}}{TM}$, where TM = mean no. of lunches served in district on the two days of data collection

CM = labor cost/meal (lunch)

w_j = hourly wage ($) for the jth worker

EC = labor cost/meal for foodservice employees at district educational center, or $\frac{\Sigma(l_{jk} \times \frac{w_j}{60})}{TM}$

B = min./meal spent by foodservice employees at base kitchen for food preparation at satellite schools or $\frac{\Sigma l_{jk}}{SM}$, where SM = mean no. of lunches served on the two days of data collection in satellite schools served by base kitchen

BC = labor cost/meal for base kitchen employees for time spent on preparation for satellite schools or $\frac{\Sigma(l_{jk} \times \frac{w_j}{60})}{SM}$

T = min./meal spent by transportation employees for transporting food from base to satellite schools or $\frac{\Sigma l_j}{TSM}$, where TSM = mean no. of lunches served on the two days of data collection in all satellite schools in the district

TC = labor cost/meal for transportation employees or $\frac{\Sigma(l_j \times \frac{w_j}{60})}{TSM}$

s_{jk} = min. spent by the jth worker on the kth work function for food preparation for satellite schools served by the base kitchen

Environmental Worksheet

Means were computed for effective temperature, lighting, and noise for each area in the foodservice facility using the data recorded every 30 minutes on one data collection day. Also, an overall mean for the entire facility was computed for effective temperature, noise, and lighting.

RESULTS AND DISCUSSION

General Information

The age and years of employment distributions for school foodservice employees in the sample are shown in Table 6. All respondents were female and more than 75 percent were 40 years of age or older. Most (74.1 percent) had been employed in school foodservice for two or more years. Almost two-thirds had been employed six or more years.

Table 6: Characteristics of the sample

characteristic	response categories	N[1]	percent
age	under 20	0	0.0
	20-29	4	7.4
	30-39	9	16.7
	40-49	15	27.8
	50-59	15	27.8
	60 or over	11	20.4
years of employment	less than 2 years	14	25.9
	2-5 years	11	20.4
	6-10 years	10	18.5
	11-15 years	12	22.2
	16 or more years	7	13.0

[1]N = 54.

The distribution of type of jobs in the 10 schools in the study is shown in Table 7. The job categories described in the methods section were used; the number of employees varied among schools and systems, ranging from only one in one satellite school (school B) to 16 in each of the two base kitchens (schools I and J). In Appendix D (Table 24),

Table 7: Types of foodservice jobs in study schools

system[2]/school	job type[1] mgrs.	cooks/ bakers	fs workers/ servers	other
satellite schools, elementary				
A	1	-	1	-
B	1	-	-	-
C	1	-	3	-
D	1	-	2	-
on-premise schools, elementary				
E	1	1	1	1
F	1	1	1	1
G	1	-	1	-
H	1	2	1	1
base kitchen schools, secondary				
I	1	5	7	3
J	1	6	6	3
educational center[3]	1	-	-	4

[1]mgrs.--managers.
cooks/bakers--including assistant cooks.
fs workers/servers--foodservice workers and servers.
other--maintenance, sanitation, clerical.

[2]satellite--schools with service facilities only; food is delivered from base kitchens.
on-premise--schools with preparation and service facilities.
base--schools with preparation and service facilities and which also provide food to satellite schools.

[3]educational center--central administration unit for school district; offices for district-wide staff, including those in school foodservice.

the responsibilities of the various employees are summarized. This table indicates that at the satellite and on-premise schools, the managers spend time on functions other than supervision. They assist the other employees in production, serving, and cleaning. The managers at the base kitchens, however, are in charge of larger operations and therefore, spend more time in the administration category. Also, the employees at the larger secondary schools tend to have more specialized jobs than do those at the elementary schools.

Table 8 shows the number of employees working full- and part-time by school. In school foodservice, a full-time employee is defined as one who works six or more hours per day; part-time is considered less than six hours. The satellite schools were predominantly staffed with part-time employees; whereas, the employees at on-premise and base kitchen schools were divided between full- and part-time employment. All the personnel at the educational center are employed full-time.

Job Diagnostic Survey Results

Mean scores for the total sample of school foodservice employees completing the JDS are enumerated in Table 9. According to Hackman et al. (38), on a scale of one to seven core job dimensions having a value of six or above would be considered high; a moderate range is between three and six; and low dimension scores are below three. The motivating potential score ranges from one to 360; an average score is 125. An MPS of 260 was considered by Hackman to be high, whereas 30 was very low. When comparing the scores of foodservice personnel to Hackman's guidelines, the majority of the scores would fall within the moderate range. The

Table 8: Basis of employment of foodservice staff at study schools

school/center	basis of employment[1] full-time	part-time
satellite schools, elementary		
A	1	1
B	-	1
C	-	4
D	-	3
on-premise schools, elementary		
E	1	3
F	3	2
G	2	-
H	2	3
base kitchen schools, secondary		
I	7	9
J	8	8
educational center	5	-

[1]Full = $\geq$ 6 hrs./day.
Part = $<$ 6 hrs./day.

Table 9: Scores on Job Diagnostic Survey (JDS) of school foodservice employees

scores[1]	mean[2]	standard deviation
core job dimension		
skill variety	4.26 ±	1.49
task identity	5.76 ±	.91
task significance	6.08 ±	.85
autonomy	5.14 ±	.96
job feedback	5.53 ±	1.23
feedback from agents	4.86 ±	1.32
dealing with others	5.63 ±	.97
MPS	158.56 ±	61.27
critical psychological states		
experienced meaningfulness	5.00 ±	.54
experienced responsibility	6.05 ±	.58
knowledge of results	5.69 ±	.94
affective responses to job		
general satisfaction	5.60 ±	.76
internal work motivation	5.93 ±	.54
specific satisfactions		
pay	4.05 ±	1.68
job security	3.94 ±	1.81
social	6.01 ±	.61
supervisory	5.81 ±	.90
growth	5.41 ±	.88
growth need strength		
"would like" format	5.02 ±	1.31
"job choice" format	2.16 ±	.40

[1]Refer to Tables 2 and 3 for computation of scores.

[2]N = 54.

scores for task significance, experienced responsibility, and social satisfaction are above six and thus would be considered high scores.

The JDS scores from this study were compared to those from the Shaffer study[1] of hospital foodservice personnel (49). The scores were higher for the school foodservice personnel in several instances: task identity, task significance, autonomy, MPS, experienced responsibility, knowledge of results, and general satisfaction. Two scores lower than those from the Shaffer study were job security satisfaction and growth need strength "job choice" format.

No significant differences were found between systems on the basis of the JDS scores. Basis of employment, however, was found to have a significant effect on several scores (Table 10). Significant differences were found in the feedback from agents, experienced responsibility, general satisfaction, growth need strength "job choice" format and supervisory satisfaction scores.

The feedback from agents score at satellite schools was higher for employees in schools C and D than those for schools A and B. At most of the on-premise elementary schools, part-time employees had equal to or higher scores for feedback from agents than did full-time employees. At on-premise school F, the full-time employees had a higher score than the part-time employees. Employees at on-premise school H had the highest mean score. Employees at base kitchen I had the lowest scores.

Although significant effects of basis of employment and school were reflected in the analysis, the range for the experienced responsibility scores was small. This was true also for the general satisfaction scores

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[1]Refer to Table 25 in Appendix D.

Table 10: Means and standard errors in JDS scores by school and basis of employment

system/school	basis of employment	JDS scores: feedback from agents	experienced responsibility	general satisfaction	growth need strength "job choice" format	supervisory
		← mean and std. error →				
satellite schools, elementary						
A	full	3.67 ± 1.32	5.33 ± .58	4.40 ± .76	1.83 ± .40	4.00 ± .90
	part	4.00 ± 1.32	5.83 ± .58	5.80 ± .76	1.42 ± .40	6.00 ± .90
B	part	3.33 ± 1.32	5.50 ± .58	3.40 ± .76	3.25 ± .40	4.67 ± .90
C	part	5.00 ± .66	6.50 ± .29	5.95 ± .38	2.25 ± .20	6.17 ± .45
D	part	5.11 ± .76	5.94 ± .33	5.67 ± .44	2.14 ± .23	5.67 ± .52
on-premise schools, elementary						
E	full	4.67 ± 1.32	6.17 ± .58	6.00 ± .76	1.58 ± .40	6.33 ± .90
	part	5.83 ± .94	5.83 ± .41	5.80 ± .54	1.71 ± .28	6.50 ± .64
F	full	6.00 ± .76	6.33 ± .33	5.93 ± .44	1.72 ± .23	6.33 ± .52
	part	5.17 ± .94	6.25 ± .41	5.70 ± .54	2.08 ± .28	5.50 ± .64
G	full	5.33 ± .94	5.92 ± .41	6.40 ± .54	2.13 ± .28	6.00 ± .64

[1]Data shown for scores which differed significantly at or below .05 level in relation to the variable, basis of employment.

Table 10: (cont.)

system/school	basis of employment	JDS scores: feedback from agents	experienced responsibility	general satisfaction	growth need strength "job choice" format	supervisory
		← mean and std. error →				
H	full	6.83 ± .94	6.58 ± .41	6.60 ± .54	2.71 ± .28	6.83 ± .64
	part	6.83 ± .94	6.50 ± .41	6.50 ± .54	2.33 ± .28	6.83 ± .64
base kitchen schools, secondary						
I	full	3.33 ± .50	5.43 ± .22	5.23 ± .29	1.95 ± .15	4.57 ± .34
	part	3.42 ± .47	5.58 ± .20	5.05 ± .27	2.15 ± .14	5.21 ± .32
J	full	5.54 ± .47	6.51 ± .20	5.43 ± .27	2.52 ± .14	6.24 ± .34
	part	5.50 ± .50	6.40 ± .22	5.97 ± .29	2.17 ± .15	6.52 ± .34

with two exceptions. The full-time employees at school A and those part-time at school B had scores significantly lower than those from the other schools.

The growth need strength "job choice" format scores, which are on a five-point scale, varied from 1.42 for part-time employees at school A to 2.71 for full-timers at school H. Hackman and Oldham (41) indicated that preliminary work suggested an expected score would be close to the mid-point (3.0). Findings from this study suggest that the school employees have relatively low growth need strength.

The range of scores for supervisory satisfaction also was small, varying from 4.0 to 6.83. All scores were greater than 5.50 with three exceptions. Full-time employees at schools A and I and those part-time at school B were the least satisfied with the supervision they received.

Employee Reactions to Work

Physical Demands of Work

Table 11 indicates the mean scores on the measures of employee reactions to physical environment of work. The means ranged from 3.39 for

Table 11: Employee reactions to physical environment of work

physical environment dimension[1]	mean[2] and standard deviation
physical demands of work	3.55 ± .97
temperature	3.43 ± 1.02
lighting	3.46 ± 1.08
noise	3.39 ± 1.16

[1]Refer to Tables 4 and 5 for computation of scores.

[2]Scale = 1, unfavorable to 5, favorable reaction.

reactions to noise to 3.55 for reactions to physical demands of work on a five-point scale, indicating somewhat favorable reactions overall. Scores did not differ among schools or systems.

Table 12 shows the employee responses to the questions on physical demands of work. Most of the employees at all the schools indicated that the first statement, "Job requires standing for long periods," was very or mostly accurate. The employees indicated, however, that this aspect of work bothered them only occasionally or not at all.

The majority of employees at the satellite and on-premise school responded to the accuracy of the second item, "Job requires lifting heavy objects," in a neutral manner. Responses of employees at the base kitchens were varied. Base kitchen I employees responded that the statement was accurate while the majority of base kitchen J employees were neutral. The majority of employees in all the schools indicated that this aspect of work bothered them only occasionally or not at all.

Temperature Dimension of Physical Environment

The employee responses to the temperature dimension of the physical environment are summarized in Table 13. The responses to the first item, "Job requires working over hot equipment," were mixed. The employees at the satellite schools were divided between neutral and very or mostly accurate. The majority of the employees, however, were not bothered by this aspect of the physical environment. Most of the employees at the on-premise schools indicated that they were neutral about the accuracy of this statement, and they also responded that they were not bothered by this item. The employees at the base kitchens were mixed about the accuracy of this statement. Twelve of the total 30 employees at the base kitchens indicated that the hot equipment statement was accurate. The

Table 12: Employee responses to physical demands of work

item	system/ school	N	accuracy responses: very or mostly inaccurate	accuracy responses: neutral	accuracy responses: very or mostly accurate	frequency responses: almost always or frequently	frequency responses: some of the time	frequency responses: occasionally or not at all
Job requires standing for long periods	satellite							
	A	2	1	-	1	-	-	2
	B	1	-	-	1	-	-	1
	C	4	1	-	3	-	1	3
	D	3	1	1	1	-	1	2
	on-premise							
	E	3	1	-	2	-	-	3
	F	5	1	1	3	1	1	4
	G	2	-	-	2	-	-	2
	H	4	-	3	1	-	2	2
	base							
	I	15	2	2	11	-	3	12
	J	15	-	1	14	1	3	11
Job requires lifting heavy objects	satellite							
	A	2	-	1	1	-	-	2
	B	1	-	1	-	-	-	1
	C	4	1	2	1	-	-	4
	D	3	-	2	1	-	1	2

Table 12: (cont.)

item	system/ school	N	accuracy responses: very or mostly inaccurate	accuracy responses: neutral	accuracy responses: very or mostly accurate	frequency responses: almost always or frequently	frequency responses: some of the time	frequency responses: occasionally or not at all
	on-premise							
	E	3	-	3	-	-	-	3
	F	5	1	1	3	-	1	4
	G	2	-	1	1	-	1	1
	H	4	1	3	-	-	2	2
	base							
	I	15	4	1	10	1	3	11
	J	15	1	9	5	1	6	8

Table 13: Employee responses to temperature dimension of physical environment

item	system/ school	N	accuracy responses: very or mostly inaccurate	accuracy responses: neutral	accuracy responses: very or mostly accurate	frequency responses: almost always or frequently	frequency responses: some of the time	frequency responses: occasionally or not at all
Job requires working over hot equipment	satellite							
	A	2	-	2	-	-	-	2
	B	1	-	-	1	-	-	1
	C	4	1	1	2	-	-	4
	D	3	-	2	1	1	1	1
	on-premise							
	E	3	-	2	1	-	-	3
	F	5	3	2	-	-	1	4
	G	2	-	-	2	-	-	2
	H	4	-	4	-	-	-	4
	base							
	I	15	3	3	9	1	3	11
	J	15	6	6	3	-	2	13
The temperature at work is not comfortable	satellite							
	A	2	-	2	-	-	1	1
	B	1	-	1	-	-	1	-
	C	4	1	3	-	-	-	4
	D	3	-	-	3	2	1	-

Table 13: (cont.)

item	system/ school	N	accuracy responses: very or mostly inaccurate	accuracy responses: neutral	accuracy responses: very or mostly accurate	frequency responses: almost always or frequently	frequency responses: some of the time	frequency responses: occasionally or not at all
	on-premise							
	E	3	2	1	-	-	-	3
	F	5	2	3	-	-	2	3
	G	2	1	-	1	-	1	1
	H	4	1	3	-	-	-	4
	base							
	I	15	1	9	5	3	4	8
	J	15	8	2	5	2	6	7

majority of the employees responded, however, that the item in question bothered them only occasionally or not at all.

The employee responses to the second item, "The temperature at work is not comfortable," were mixed. The employees at the satellite schools were neutral and most indicated that they were not bothered by this aspect of the physical environment. The employees at the on-premise schools were divided between very or mostly inaccurate and neutral on this question, in addition, the majority were not bothered by the temperature. The base kitchen employees were almost evenly divided between the three accuracy categories, and most were bothered by this item either some of the time or not at all.

Lighting and Noise Dimensions of Physical Environment

Table 14 shows the employee responses to the lighting dimension of physical environment. Most of the employees indicated that the item, "There is inadequate lighting to perform this job," was very or mostly inaccurate. They also responded that they were bothered only occasionally or not at all by the lighting in their place of work.

The employee responses to the noise dimension are shown in Table 15. The employees at the satellite schools indicated that the statement, "Job requires working with noisy equipment," was very or mostly accurate. They also responded that noise did not bother them. The on-premise school employees were neutral about the accuracy of the noise statement and were not bothered by the noise. Base kitchen I employees were divided in their reactions but agreed that they were bothered only occasionally or not at all. Base kitchen J employees indicated that the noise item was an accurate statement and were divided between the frequency categories, "bothered some of the time" and "bothered occasionally or not at all."

Table 14: Employee responses to lighting dimension of physical environment

item	system/ school	N	accuracy responses: very or mostly inaccurate	accuracy responses: neutral	accuracy responses: very or mostly accurate	frequency responses: almost always or frequently	frequency responses: some of the time	frequency responses: occasionally or not at all
There is inadequate lighting to perform the job	satellite							
	A	2	-	2	-	-	2	-
	B	1	-	1	-	-	-	1
	C	4	4	-	-	-	-	4
	D	3	1	1	1	1	-	2
	on-premise							
	E	3	2	-	1	-	-	3
	F	5	5	-	-	-	1	4
	G	2	1	-	1	-	-	2
	H	4	4	-	-	-	-	4
	base							
	I	15	11	2	2	-	2	13
	J	15	14	-	1	1	-	14

Table 15: Employee responses to noise dimension of physical environment

item	system/ school	N	accuracy responses: very or mostly inaccurate	accuracy responses: neutral	accuracy responses: very or mostly accurate	frequency responses: almost always or frequently	frequency responses: some of the time	frequency responses: occasionally or not at all
Job requires working with noisy equipment	satellite							
	A	2	2	-	-	-	-	2
	B	1	-	-	1	-	-	1
	C	4	1	-	3	-	1	3
	D	3	-	1	2	1	1	1
	on-premise							
	E	3	-	2	1	-	-	3
	F	5	2	3	-	-	2	3
	G	2	-	1	1	-	-	2
	H	4	1	3	-	-	-	4
	base							
	I	15	5	6	4	2	-	13
	J	15	1	3	11	1	7	7

Measures on Physical Environment

Effective Temperature

Table 16 lists the mean effective temperatures (°F) for five areas of the foodservice area in each of the ten schools. The low and high effective temperature and the mean for the entire foodservice facility are also summarized. The mean effective temperature ranged from 70.4°F at base kitchen I to 79.9°F at satellite school D. Kazarian (61) indicated the range for optimal working conditions is 65-73°F. Of all the foodservice facilities, only in base kitchen J did the effective temperature fall into the recommended range. The remainder was from 74.3 to 79.9°F. Kazarian stated that the effects on worker performance of temperatures above the recommended range of 65 to 73°F include employee discomfort, morale problems, and labor turnover.

Lighting Levels

The lighting levels in five areas of the foodservice facility and the mean lighting levels for the entire kitchen in each of the ten schools in the study are shown in Table 17. The mean lighting levels ranged from 10.6 foot candles at on-premise school F to 75.5 foot candles at satellite school B. Avery (62) recommended that the lighting level be 30 to 50 foot candles in areas where recipes are read; 70 to 100 foot candles at the clean end of the dishmachine; and 50 to 100 foot candles in service areas. All the schools do not meet the criteria in all areas of the foodservice facility. Schools E, F, G, and J appear to have lighting problems that should be corrected for an optimal work environment.

Table 16: Effective temperature measurement in foodservice facilities in study schools

system/school	foodservice area					entire foodservice facility		
	oven	steam equipment	prepa-ration	serving	dish-washing	low	high	mean
	← °F →							
satellite								
A	74.6	--	74.6	74.6	74.6	72.5	76.1	74.6
B	74.4	--	74.4	74.4	74.4	71.6	76.1	74.4
C	75.8	--	75.8	75.8	75.8	73.4	78.8	75.8
D	79.9	79.9	79.9	79.9	79.9	77.0	81.5	79.9
on-premise								
E	74.3	74.3	74.3	74.3	74.3	70.7	78.8	74.3
F	75.1	74.8	74.2	74.5	75.4	72.5	77.0	74.7
G	74.9	--	75.0	74.8	75.8	71.6	76.1	74.9
H	74.3	--	74.3	74.3	74.3	73.4	76.1	74.3
base								
I	71.2	69.8	70.1	69.8	71.3	66.2	74.3	70.4
J	76.9	76.0	75.2	75.4	74.7	72.5	78.8	75.6

Table 17: Lighting measurements in foodservice facilities in study schools

system/school	area: oven	steam equipment	prepa-ration	serving	dish-washing	mean
	← foot candles →					
satellite						
A	90		56	54	40	60.0
B	68		110	64	60	75.5
C	54		54	24	38	42.5
D	55	48	55	94	55	61.4
on-premise						
E	20	16	32	32	10	22.0
F	20	12	8	8	5	10.6
G	14		20	48	32	28.5
H	36		64	64	58	55.5
base						
I	32	24	24	32	43	31.0
J	16	28	16	48	22	26.0

Noise Levels

The mean noise levels for each of the five foodservice areas are shown in Table 18. Also listed are the low and high noise level measurements and the mean level for the entire foodservice facility. The mean noise levels ranged from 64.5 dBA at satellite school B to 71.9 dBA at base kitchen school I. All schools were within the limit established by the Occupational Safety and Health Administration which is 90 decibels averaged over an eight hour day. Six schools, however, registered sound levels of 80 dBA or higher at some point during the day.

Table 18: Noise measurements in foodservice facilities in study schools

system/school	foodservice area					entire foodservice facility		
	oven	steam equipment	prepa-ration	serving	dish-washing	low	high	mean
	← dBA →							
satellite								
A	65.4	--	65.4	67.6	64.7	52	75	65.8
B	64.1	--	66.3	62.2	65.3	53	70	64.5
C	66.7	--	67.3	66.4	67.0	55	85	66.9
D	71.0	70.6	69.2	71.0	72.4	55	85	70.8
on-premise								
E	66.4	66.4	66.6	65.7	67.8	59	87	65.6
F	69.2	69.0	67.9	66.7	69.9	58	88	68.6
G	66.0	--	65.5	65.3	65.2	56	75	65.5
H	68.2	--	67.6	69.1	68.1	57	78	68.3
base								
I	73.5	72.2	72.6	69.3	72.1	61	82	71.9
J	72.7	73.8	70.4	68.2	63.6	50	83	69.7

Staffing Patterns and Cost of Labor

The mean hourly wage by type of foodservice job is given in Table 19. The mean wage ranged from $3.78 for foodservice workers and servers to $5.65 for managers. The mean wage for the other category was higher than the foodservice workers and servers category as it reflected the salaries of the personnel at the educational center. The mean hourly wage for all employees was $4.40.

The mean daily hours of the foodservice employees varied from 3.69 at satellite schools to 5.16 at base schools (Table 20). This reinforces the data that indicated a large number of part-time personnel are employed throughout the foodservice district. The mean hours per week ranged from 18.25 at satellite schools to 25.47 at the base kitchens.

Mean labor minutes spent in the seven work functions are shown in Table 21. The totals ranged from 270 at satellite school B to 10,620 at base kitchen J.

Table 22 lists the mean labor minutes per meal by work function for satellite, on-premise, and base kitchen schools. Means for the systems also are summarized. The total labor minutes per meal ranged from 6.24 at on-premise school F to 10.29 at satellite school C. The mean total labor minutes per meal at the on-premise and base kitchens were very similar. The satellite labor minute per meal was the highest.

The labor costs per meal by work function for satellite, on-premise, and base schools are provided in Table 23. The mean labor cost by system is also listed. The range of the total cost was small with two exceptions. Satellite school C had the highest per meal labor cost (.7587) and on-premise school F the lowest (.4653). The total labor cost per meal

Table 19: Mean hourly wage ($) of foodservice staff by type of position

type of position	mean hourly wage ($)
	mean and std. error
managers	5.65 ± .33
cooks/bakers	4.32 ± .27
foodservice workers/servers	3.78 ± .23
other	4.49 ± .29
all employees	4.40 ± 1.10

Table 20: Mean hours of foodservice staff by type of system

	per employee:	
system type	mean hrs/day	mean hrs/week
	← mean and std. error →	
satellite	3.69 ± .52	18.25 ± 2.64
on-premise	5.09 ± .41	25.24 ± 2.09
base	5.16 ± .29	25.47 ± 1.48

Table 21: Labor minutes spent in various work functions in study schools

system/school	no. of employees	total minutes in various functions[1]							
		preparation	serving	cleaning	transportation	supervision	meals/breaks	other	total
satellite schools, elementary[2]									
A	2	380	120	370		160	80		1110
B	1	60	40	80		90			270
C	4	260	330	410		420	240		1660
D	3	500	285	405		190	120		1500
on-premise schools, elementary									
E	3	1100	290	380		360	150		2280
F	5	1474	509	732		585	340		3640
G	2	720	140	420		240	120		1640
H	5	1185	360	645		450	160		2800
base kitchen schools, secondary[3]									
I	16	3730	2095	2690	390	665	930		10500
J	16	4430	1310	3130		850	900		10620
educational center	5	60		60	720	2370	370	1100	4680

[1]Mean for the two data collection days.

[2]Labor minutes at base kitchen devoted to preparation for satellites not included.

[3]Minutes spent on various functions at base kitchens were not adjusted for time devoted to preparation of food for satellite schools.

Table 22: Labor minutes per meal for satellite, on-premise, and base kitchen schools

system/school	mean meals[1]	work function					
		preparation	serving	cleaning	supervision	transportation	total[2]
		← labor minutes per meal[3] →					
satellite							
A	136.0	3.5479	0.2206	1.9152	1.2274	1.0521	8.2424
B	85.5	3.1099	0.4678	1.7120	1.6918	1.0521	8.3119
C	146.0	3.2986	1.1301	2.1796	2.0775	1.0521	10.2912
D	160.0	2.5000	0.7656	1.2031	1.0697	1.0521	6.9635
mean	131.9	3.0901	0.6777	1.7395	1.4901	1.0521	8.4328
on-premise							
E	140.5	3.9146	1.0320	1.3523	1.7590		8.4419
F	294.0	2.3027	0.8146	1.1429	1.4708		6.2481
G	114.0	2.9825	0.4825	0.7895	1.5285		7.1586
H	171.0	3.0994	1.0526	1.9000	1.7917		8.1235
mean	179.9	2.9145	0.9136	1.3077	1.6125		7.2665
base							
I	572.5	2.8122	1.7249	2.1398	1.0567		8.3010
J	670.2	1.9173	1.0668	1.9099	1.0205		6.3281
mean	621.4	2.3296	1.3700	2.0158	1.0372		7.2370

[1]Mean number of meals served per day for the two days of data collection.

[2]Total includes all work functions listed, in addition to an additional category, other.

[3]Refer to Data Analysis section in METHODOLOGY for computation.

Table 23: Labor cost per meal for satellite, on-premise, and base kitchen schools

system/school	mean meals[1]	work function					
		preparation	serving	cleaning	supervision	transportation	total[2]
		← labor cost ($) per meal[3] →					
satellite							
A	136.0	.2596	.0151	.1366	.1268	.0915	.6600
B	85.5	.2210	.0331	.1180	.1516	.0915	.6456
C	146.0	.2331	.0720	.1410	.1730	.0915	.7587
D	160.0	.1786	.0502	.0765	.1031	.0915	.5358
mean	131.9	.2214	.0444	.1166	.1364	.0915	.6473
on-premise							
E	140.5	.2732	.0687	.0894	.1464		.6052
F	294.0	.1574	.0526	.0789	.1298		.4653
G	114.0	.2321	.0375	.1324	.1401		.5863
H	171.0	.2303	.0731	.1259	.1468		.6068
mean	179.9	.2092	.0582	.1006	.1387		.5454
base							
I	572.5	.2121	.1202	.1446	.1095		.6374
J	670.2	.1492	.0702	.1315	.1058		.5035
mean	621.4	.1782	.0932	.1375	.1075		.5652

[1]Mean number of meals served per day for the two days of data collection.

[2]Total includes all work functions listed, in addition to an additional category, other.

[3]Refer to Data Analysis section in METHODOLOGY for computation.

was similar in the base kitchens and on-premise system, as was true also for the labor minutes per meal (.5454 and .5652, respectively). The satellite system had the highest labor cost per meal (.6473).

SUMMARY

An impetus for change in foodservice systems has been more effective utilization of available human resources. In recent years, managers have shown a growing interest in the relationship between structure and characteristics of jobs and productivity and job satisfaction. Hackman and Oldham (6) developed a theory of motivation proposing that positive personal and work outcomes result from three psychological states: experienced meaningfulness of the work, responsibility for work outcomes, and knowledge of actual results of activities. Their model proposes that the following five core job dimensions create these psychological states: skill variety, task identity, task significance, autonomy, and feedback from the work. Because all individuals have varying degrees of personal needs and values, growth need strength of an individual is proposed as a moderating variable on the relationship between core job dimensions, critical psychological states, and personal and work outcomes.

As the per hour cost of labor increases, the efficiency of different foodservice systems become more important. One of the advantages cited for central kitchens is the potential for labor savings. In central kitchens fewer employees may be needed and also, fewer highly skilled employees.

This labor utilization study was designed to compare the characteristics and motivating potential of jobs in on-premise and satellite school foodservice systems. Additional objectives were to compare the labor minutes per meal and labor cost per meal of the systems and to

measure environmental conditions in the workplace and assess the effects on personnel.

The two school lunch delivery systems studied were conventional on-premise food preparation and service and food preparation in a base kitchen in a secondary school followed by hot bulk transport to satellite schools. The study was conducted in eight elementary schools and two secondary schools of a school district in a medium-sized midwestern city. Four elementary schools and two secondary schools had on-premise preparation and service and four were satellite schools. Three of the satellite schools received food from the middle school and one satellite received food from the high school.

Data were collected during the fall semester of 1981. Foodservice personnel in the eight elementary schools, middle school, high school, and central district educational center participated in the study. Data collection occurred at one satellite and one on-premise school per test day; menus were constant across schools tested on the same day.

The research instruments included an employee information form, Job Diagnostic Survey (JDS), work function summary form, and environmental worksheet. Cook managers completed an employee information form prior to the collection of data. The JDS was completed by the foodservice employees at the eight elementary and two secondary schools. Two sections were added to the JDS which measured employee reactions to the physical environment of the workplace. The employees at the on-premise, satellite, and base kitchen schools also completed the work function summary form. On one day at each school the researcher recorded the effective temperature, lighting, and noise levels in five areas of the kitchen on an environmental worksheet.

Nineteen scores were provided by the seven sections of the JDS. These scores were computed as specified by Hackman and Oldham (41), the developers of the instrument. The JDS scores from this study were compared to those from the Shaffer study (49) of hospital foodservice personnel. The scores were higher for the school foodservice personnel in several instances: task identity, task significance, autonomy, motivating potential score, experienced responsibility, knowledge of results, and general satisfaction. These data suggest that school foodservice employees generally are more satisfied than hospital foodservice employees in respect to these aspects of their jobs.

Initially, the scores from the JDS and the employee reactions to the physical environment were analyzed using the general linear model analysis of variance with system and school as independent variables. No differences were found according to system (on-premise or satellite) and only a few in relation to school. A subsequent analysis utilized basis of employment (full- or part-time) and school as the independent variables to gain further insight into factors affecting the scores. Significant differences were found in the feedback from agents, experienced responsibility, general satisfaction, growth need strength "job choice" format, and supervisory satisfaction scores.

At most of the elementary schools, part-time employees had equal to or higher scores for feedback from agents than did full-time employees. Although significant effects of basis of employment and school were reflected in the analysis, the ranges for experienced responsibility and general satisfaction scores were small. The low growth need strength "job choice" format scores suggest that the school employees have relatively low growth need strength. The range of scores for supervisory

satisfaction also was small. All scores were greater than 5.50 with three exceptions. Full-time employees at schools A and I and those part-time at school B were least satisfied with the supervision they received.

Employee reactions to the physical environment of work indicated somewhat favorable reactions overall to the dimensions of physical work, temperature, lighting, and noise. Most of the employees responded that whether the statements concerning the physical environment were accurate or not, those aspects of the workplace did not bother them in the day to day routine of their jobs.

The mean effective temperature of one school was within the range identified to be optimal working conditions. The effective temperatures of the other schools were above the recommended range of 65 to 73°F and the effects on worker performance include employee discomfort and morale problems.

The mean lighting level in all the schools did not meet the criteria recommended by Avery (62) for foodservice departments. Four schools appeared to have lighting problems that should be corrected for an optimal work environment. The mean noise levels of all the schools were within the limit established by the Occupational Safety and Health Administration (65) which is 90 decibels averaged over an eight hour day.

The mean labor minutes per meal ranged from 6.24 to 10.29. The mean total labor minutes per meal were slightly higher at the satellite schools (8.43) than at the on-premise (7.27) or base kitchen schools (7.24), when adjusted for the time spent at the base kitchens on preparation for satellites. The range of the labor cost per meal was small with two exceptions. Satellite school C had the highest labor cost per meal (.76)

and on-premise school F had the lowest (.47). The total labor cost per meal was highest at the satellite schools (.65); whereas, the total labor cost per meal was similar in the base kitchens and on-premise system (.55 and .57, respectively). These data suggest that in this school district, satellite schools are not as labor efficient as the on-premise schools. The transportation costs and personnel at the satellite schools increased the cost per meal at the satellite schools.

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APPENDIXES

APPENDIX A

Correspondence

(Letterhead)

October 28, 1981

TO: (Elementary Principals)

FROM: Cheryl S. Johnson
Mary Frances Nettles, R.D.
Allene G. Vaden, Ph.D., R.D.

Acceptance and consumption of foods affects the nutritional contribution of the school lunch to the student. In cooperation with Mrs. Sue Greig, District Director of Food Service, we plan to collect data in the elementary schools in USD 383 during November and early December to determine acceptability (consumption) of foods in the school lunch program. This project will provide information for the school foodservice to evaluate the students' acceptance of menu items in schools where food is prepared on-site and in those schools with food transported from the Middle or High School.

The fourth and fifth grade classes have been selected to participate in the study. According to our plans, we will measure several aspects of food acceptance. Limited data collection at the Middle and High Schools will involve recording times of food delivery to elementary schools.

Plate waste will be measured after the students have finished eating. This will involve weighing the leftover foods on students' trays in the foodservice area. Prior to students coming to the lunchroom, we will need the classroom teachers to distribute a form to students in the participating classes.

Following the lunch period, we will request students to complete a few questions related to how much they believed they ate and how much they liked the food. We will need to collect data on only two different days in each school. This should take only about 10 minutes each day.

Also, we will be collecting data related to the foodservice area and from the foodservice employees. This information will be collected in all schools in the district. This aspect of the study will not affect the school operations or interfere in any way with the instructional program. We did however, want you to be thoroughly aware of the total scope of the project.

We wish to express our appreciation in advance for your cooperation.

We will contact you within the next week to schedule an appointment to explain details of the project and answer any questions you may have. Thank you again for your assistance and help.

cc: Mrs. Sue Greig

(Letterhead)

November 3, 1981

TO: Managers, School Foodservice
USD 383

FROM: Cheryl Johnson
Mary Frances Nettles, R.D.
Allene G. Vaden, Ph.D., R.D.

Attached is additional information for the School Foodservice Study:

1. Schedule of data collection dates
2. Employee Information Form
   - Please complete by next week. Mary Frances will pick up forms.
3. Work Function Summary Form-Example
   - Please review form with your employees prior to the first data collection date at your school.
   - The form will need to be completed on each of the two days at each of the elementary schools.
   - The form will need to be completed on 6 of the 8 data collection days at the Middle School (all days except November 18 and December 16).
   - The forms will need to be completed at the High School on November 18 and December 16, when Theodore Roosevelt is scheduled.
4. Physical Measurements Form-Example
   - This data will be collected by Mary Frances Nettles on one of the two data collection days at each of the elementary schools. Mary Frances will alert you prior to that time.
   - The data on noise, lighting and temperature will be collected every 30 minutes throughout the work day.
   - A separate day will be scheduled for collection of these data at the Middle and High Schools.

APPENDIX B

Research Instruments

KANSAS STATE UNIVERSITY
Department of Dietetics, Restaurant and Institutional Management

EMPLOYEE INFORMATION

NAME OF SCHOOL: _____ NAME OF FOODSERVICE MANAGER: _____

Please list each foodservice employee and provide all information requested.

NAME	JOB TITLE OR POSITION	FULL OR PART TIME	DAILY HOURS OF WORK	TOTAL NO. OF HOURS PER WEEK	HOURLY WAGE	RESPONSIBILITIES					
						PRODUCTION					
						MAIN DISH, VEG.	COLD ITEMS	BAKED GOODS	SERV-ING	DISH-WASHING	ADMINIS-TRATIVE

[Use additional form if needed, to list all employees.]

KSU
KANSAS STATE UNIVERSITY

Department of Dietetics, Restaurant and Institutional Management

Justin Hall
Manhattan, Kansas 66506
913-532-5521

JOB DIAGNOSTIC SURVEY

This questionnaire was developed at Yale University to study jobs and how people react to them. We are doing it to study the design of jobs in school foodservices.

On the following pages you will find several different kinds of questions about your job. Specific instructions are given at the start of each section. Please read them carefully. It should take no more than 25 minutes to complete the entire questionnaire. Please move through it quickly.

The questions are designed to obtain <u>your</u> perceptions of your job and <u>your</u> reactions to it.

There are no "trick" questions. Your individual answers will be kept completely confidential. Please answer each item as honestly and frankly as possible.

Thank you for your cooperation.

GENERAL INFORMATION

1. Sex:

   _____ (1) Male
   _____ (2) Female

2. Age (check one):

   _____ (1) under 20
   _____ (2) 20-29
   _____ (3) 30-39
   _____ (4) 40-49
   _____ (5) 50-59
   _____ (6) 60 or over

3. How long have you worked here? _____ years _____ months

1

SECTION I

This part of the questionnaire asks you to describe your job, as objectively as you can.

Please do not use this part of the questionnaire to show how much you like or dislike your job. Questions about that will come later. Instead, try to make your descriptions as accurate and as objective as you possibly can.

A sample question is given below.

A. To what extent does your job require you to work with mechanical equipment?

1----------2----------3----------4----------5----------6----------7

Very little; the job requires almost no contact with mechanical equipment of any kind.

Moderately

Very much; the job requires almost constant work with mechanical equipment

You are to circle the number which is the most accurate description of your job.

If, for example, your job requires you to work with mechanical equipment a good deal of the time--but also requires some paperwork--you might circle the number six, as was done in the example above.

If you do not understand these instructions, please ask for assistance. If you do understand them, please begin.

---

1. To what extent does your job require you to work closely with other people (either clients, or people in related jobs in your own organization)?

1----------2----------3----------4----------5----------6----------7

Very little; dealing with other people is not at all necessary in doing the job.

Moderately; some dealing with others is necessary

Very much; dealing with other people is an absolutely essential and crucial part of doing the job.

2. How much autonomy is there in your job? That is, to what extent does your job permit you to decide on your own how to go about doing the work?

1----------2----------3----------4----------5----------6----------7

Very little; the job gives me almost no personal "say" about how and when the work is done.

Moderate autonomy; many things are standardized and not under my control, but I can make some decisions about the work.

Very much; the job gives me almost complete responsibility for deciding how and when the work is done.

3. To what extent does your job involve doing a "whole" and identifiable piece of work? That is, is the job a complete piece of work that has an obvious beginning and end? Or is it only a small part of the overall piece of work, which is finished by other people or by automatic machines?

1----------2----------3----------4----------5----------6----------7

My job is only a tiny part of the overall piece of work; the results of my activities cannot be seen in the final product or service.	My job is a moderate-sized "chunk" of the overall piece of work; my own contribution can be seen in the final outcome.	My job involves doing the whole piece of work, from start to finish; the results of my activities are easily seen in the final product or service.

4. How much variety is there in your job? That is, to what extent does the job require you to do many different things at work, using a variety of your skills and talents?

1----------2----------3----------4----------5----------6----------7

Very little; the job requires me to do the same routine things over and over again.	Moderate variety	Very much; the job requires me to do many different things, using a number of different skills and talents.

5. In general, how significant or important is your job? That is, are the results of your work likely to significantly affect the lives or well-being of other people?

1----------2----------3----------4----------5----------6----------7

Not very significant; the outcomes of my work are not likely to have important effects on other people.	Moderately significant.	Highly significant; the outcomes of my work can affect other people in very important ways.

6. To what extent do managers or co-workers let you know how well you are doing on your job?

1----------2----------3----------4----------5----------6----------7

Very little; people amost never let me know how well I am doing.	Moderately; sometimes people may give me "feedback"; other times they may not.	Very much; managers or co-workers provide me with almost constant "feedback" about how well I am doing.

7. To what extent does doing the job itself provide you with information about your work performance? That is, does the actual work itself provide clues about how well you are doing--aside from any "feedback" co-workers or supervisors may provide?

1----------2----------3----------4----------5----------6----------7

Very little; the job itself is set up so I could work forever without finding out how well I am doing.	Moderately; sometimes doing the job provides "feedback" to me; sometimes it does not.	Very much; the job is set up so that I get almost constant "feedback" as I work about how well I am doing.

SECTION II

Listed below are a number of statements which could be used to describe a job.

You are to indicate whether each statement is an accurate or an inaccurate description of your job.

Once again, please try to be as objective as you can in deciding how accurately each statement describes your job--regardless of whether you like or dislike your job.

Write a number in the blank beside each statement, based on the following scale:

How accurate is the statement in describing your job?

1	2	3	4	5	6	7
Very Inaccurate	Mostly Inaccurate	Slightly Inaccurate	Uncertain	Slightly Accurate	Mostly Accurate	Very Accurate

_____ 1. The job requires me to use a number of complex or high-level skills.

_____ 2. The job requires a lot of cooperative work with other people.

_____ 3. The job is arranged so that I do not have the chance to do an entire piece of work from beginning to end.

_____ 4. Just doing the work required by the job provides many chances for me to figure out how well I am doing.

_____ 5. The job is quite simple and repetitive.

_____ 6. The job can be done adequately by a person working alone--without talking or checking with other people.

_____ 7. The supervisors and co-workers on this job almost never give me any "feedback" about how well I am doing in my work.

_____ 8. This job is one where a lot of other people can be affected by how well the work gets done.

_____ 9. The job denies me any chance to use my personal initiative or judgment in carrying out the work.

_____10. Supervisors often let me know how well they think I am performing the job.

_____11. The job provides me the chance to completely finish the pieces of work I begin.

_____12. The job itself provides very few clues about whether or not I am performing well.

_____13. The job gives me considerable opportunity for independence and freedom in how I do the work.

_____14. The job itself is not very significant or important in the broader scheme of things.

SECTION III

Now please indicate how you personally feel about your job.

Each of the statements below is something that a person might say about his or her job. You are to indicate *your own, personal feelings about your job* by marking how much you agree with each of the statements.

Write a number in the blank for each statement, based on this scale:

How much do you agree with the statement?

1	2	3	4	5	6	7
Disagree Strongly	Disagree	Disagree Slightly	Neutral	Agree Slightly	Agree	Agree Strongly

_____ 1. It's hard, on this job, for me to care very much about whether or not the work gets done right.

_____ 2. My opinion of myself goes up when I do this job well.

_____ 3. Generally speaking, I am very satisfied with this job.

_____ 4. Most of the things I have to do on this job seem useless or trivial.

_____ 5. I usually know whether or not my work is satisfactory on this job.

_____ 6. I feel a great sense of personal satisfaction when I do this job well.

_____ 7. The work I do on this job is very meaningful to me.

_____ 8. I feel a very high degree of personal responsibility for the work I do on this job.

_____ 9. I frequently think of quitting this job.

_____10. I feel bad and unhappy when I discover that I have performed poorly on this job.

_____11. I often have trouble figuring out whether I'm doing well or poorly on this job.

_____12. I feel I should personally take the credit or blame for the results of my work on this job.

_____13. I am generally satisfied with the kind of work I do in this job.

_____14. My own feelings generally are not affected much one way or the other by how well I do on this job.

_____15. Whether or not this job gets done right is clearly my responsibility.

SECTION IV

Now please indicate how satisfied you are with each aspect of your job listed below. Once again, write the appropriate number in the blanks beside each statement.

How satisfied are you with this aspect of your job?

1	2	3	4	5	6	7
Extremely Dissatisfied	Dissatisfied	Slightly Dissatisfied	Neutral	Slightly Satisfied	Satisfied	Extremely Satisfied

_____ 1. The amount of job security I have.

_____ 2. The amount of pay and fringe benefits I receive.

_____ 3. The amount of personal growth and development I get in doing my job.

_____ 4. The people I talk to and work with on my job.

_____ 5. The degree of respect and fair treatment I receive from my boss.

_____ 6. The feeling of worthwhile accomplishment I get from doing my job.

_____ 7. The chance to get to know other people while on the job.

_____ 8. The amount of support and guidance I receive from my supervisor.

_____ 9. The degree to which I am fairly paid for what I contribute to this organization.

_____10. The amount of independent thought and action I can exercise in my job.

_____11. How secure things look for me in the future in this organization.

_____12. The chance to help other people while at work.

_____13. The amount of challenge in my job.

_____14. The overall quality of the supervision I receive in my work.

SECTION V

Now please think of the other people in your organization who hold the same job you do. If no one has exactly the same job as you, think of the job which is most similar to yours.

Please think about how accurately each of the statements describes the feelings of those people about the job.

It is quite all right if your answers here are different from when you described your own reactions to the job. Often different people feel quite differently about the same job.

Once again, write a number in the blank for each statement, based on this scale:

How much to you agree with the statement?

1	2	3	4	5	6	7
Disagree Strongly	Disagree	Disagree Slightly	Neutral	Agree Slightly	Agree	Agree Strongly

_____ 1. Most people on this job feel a great sense of personal satisfaction when they do the job well.

_____ 2. Most people on this job are very satisfied with the job.

_____ 3. Most people on this job feel that the work is useless or trivial.

_____ 4. Most people on this job feel a great deal of personal responsibility for the work they do.

_____ 5. Most people on this job have a pretty good idea of how well they are performing their work.

_____ 6. Most people on this job find the work very meaningful.

_____ 7. Most people on this job feel that whether or not the job gets done right is clearly their own responsibility.

_____ 8. People on this job often think of quitting.

_____ 9. Most people on this job feel bad or unhappy when they find that they have performed the work poorly.

_____10. Most people on this job have trouble figuring out whether they are doing a good or a bad job.

7

SECTION VI

Listed below are a number of characteristics which could be present on any job. People differ about how much they would like to have each one present in their own jobs. We are interested in learning how much you personally would like to have each one present in your job.

Using the scale below, please indicate the degree to which you would like to have each characteristic present in your job.

NOTE: The numbers on this scale are different from those used in previous scales.

4	5	6	7	8	9	10
Would like having this only a moderate amount (or less)			Would like having this very much			Would like having this extremely much

_____ 1. High respect and fair treatment from my supervisor.

_____ 2. Stimulating and challenging work.

_____ 3. Chances to exercise independent thought and action in my job.

_____ 4. Great job security.

_____ 5. Very friendly co-workers.

_____ 6. Opportunities to learn new things from my work.

_____ 7. High salary and good fringe benefits.

_____ 8. Opportunities to be creative and imaginative in my work.

_____ 9. Quick promotions.

_____10. Opportunities for personal growth and development in my job.

_____11. A sense of worthwhile accomplishment in my work.

8

SECTION VII

People differ in the kinds of jobs they would most like to hold. The questions in this section give you a chance to say just what it is about a job that is most important to you.

For each question, two different kinds of jobs are briefly described. You are to indicate which of the jobs you personally would prefer--if you had to make a choice between them.

In answering each question, assume that everything else about the jobs is the same. Pay attention only to the characteristics actually listed.

Two examples are given below.

JOB A				JOB B
A job requiring work with mechanical equipment most of the day				A job requiring work with other people most of the day
1	2	(3)	4	5
Strongly Prefer A	Slightly Prefer A	Neutral	Slightly Prefer B	Strongly Prefer B

If you like working with people and working with equipment equally well, you would circle the number 3, as has been done in the example.

* * * * *

Here is another example. This one asks for a harder choice--between two jobs which both have some undesirable features.

JOB A				JOB B
A job requiring you to expose yourself to considerable physical danger.				A job located 200 miles from your home and family
1	(2)	3	4	5
Strongly Prefer A	Slightly Prefer A	Neutral	Slightly Prefer B	Strongly Prefer B

If you would slightly prefer risking physical danger to working far from your home, you would circle number 2, as has been done in the example.

Please ask for assistance if you do not understand exactly how to do these questions.

SECTION VIII

Listed below are a number of statements which could be used to describe a job.

You are to indicate whether each statement is an accurate or an inaccurate description of your job.

Once again, please try to be as objective as you can in deciding how accurately each statement describes your job--regardless of whether you like or dislike your job.

Write a number in the blank beside each statement, based on the following scale:

How accurate is the statement in describing your job?

1	2	3	4	5	6	7
Very Inaccurate	Mostly Inaccurate	Slightly Inaccurate	Uncertain	Slightly Accurate	Mostly Accurate	Very Accurate

_____ 1. This job requires me to stand for a long period of time.

_____ 2. This job requires me to lift heavy objects.

_____ 3. This job involves working over hot equipment.

_____ 4. This job requires me to work with noisy equipment.

_____ 5. There is not adequate lighting to perform this job well.

_____ 6. The temperature where I work is not comfortable.

SECTION IX

Now please indicate how you personally feel about your job.

Each of the statements below is something that a person might say about his or her job. You are to indicate your own, personal feelings about your job by marking how much each statement bothers you.

Write a number in the blank for each statement, based on this scale:

How often does this aspect of your job bother you?

1	2	3	4	5
Bothers me almost always	Bothers me frequently	Bothers me some of the time	Bothers me only occasionally	Really does not bother me

_____ 1. This job requires me to stand for a long period of time.

_____ 2. This job requires me to lift heavy objects.

_____ 3. This job involves working over hot equipment.

_____ 4. This job requires me to work with noisy equipment.

_____ 5. There is not adequate lighting to perform this job well.

_____ 6. The temperature where I work is not comfortable.

(Letterhead)

WORK FUNCTION SUMMARY FORM

NAME OF EMPLOYEE: _____ DATE: _____

JOB CLASSIFICATION OR TITLE: _____

NAME OF SCHOOL: _____

WORK HOURS: TIME IN _____ TIME OUT _____

Please read the attached instructions before completing this form.

WORK FUNCTIONS (refer to Instructions for explanation of functions)	DAY 1		DAY 2	
	HRS.	MIN.	HRS.	MIN.
PREPARATION				
SERVING				
CLEANING				
TRANSPORTATION				
SUPERVISION (ADMINISTRATION)				
MEALS AND BREAKS				
OTHER Description of this work:				
TOTAL - Total time spent at work including meals and breaks				

(Letterhead)

SCHOOL FOODSERVICE STUDY, USD 383

INSTRUCTIONS FOR WORK FUNCTION SUMMARY FORM

This form will be completed by all foodservice employees at all schools in the district. Include all time spent on all work functions and breaks.

Record your time spent on each work function for each day of the two day test period within the nearest 15 minutes. A description of the work functions is given below. Include all foodservice work not falling into any of the categories under "other" and describe the nature of the other work. Mark only functions in which you worked. The time should equal the length of your work day.

Preparation - time required to complete all the activities in getting the food ready for service. Would include obtaining items from storage, opening containers, mixing, heating or chilling, packaging food in bulk for delivery, and stocking the serving line.

Serving - time required by staff workers directly on the serving line including the cashier. Unless of extraordinary length, any delay in the serving line between groups of students should be included.

Cleaning - some of the time in this function will be estimated since small cleaning jobs are frequently interspersed with production and service duties. Time in activities such as the cleaning of cooking utensils and equipment, cleaning of the kitchen area, the serving line and utensils, and dishwashing time should be included.

Transportation - time required to convey bulk food from the preparation unit to the service unit.

Supervision (administration) - time spent by the school lunch director or manager, excepting any time spent in any of the above work functions. Time spent by cashiers or other personnel involved in cash control and record keeping will be considered administrative. Secretarial work and the work of business managers in a supportive role should also be prorated to the administrative function.

Meals and Breaks - time spent on meals and rest breaks.

Other - include any work not falling into the above categories. Describe this work in the space provided.

Total - time spent in all work functions, breaks, and meals; should equal total hours spent at work.

(Letterhead)

NAME OF SCHOOL: _____ DATE: _____

	Time	Area				
		Oven	Steam Equipment	Preparation	Serving	Dishwashing
Lighting						

		TEMPERATURE					NOISE				
		OVEN	STEAM EQUIPMENT	PREPARATION AREA	SERVING AREA	DISHWASHING AREA	OVEN	STEAM EQUIPMENT	PREPARATION AREA	SERVING AREA	DISHWASHING AREA
TIME PERIOD	ACTUAL TIME										
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											

APPENDIX C

Instructions for Job Diagnostic Survey

INSTRUCTIONS TO EMPLOYEES

I am Mary Frances Nettles, a graduate student in the Department of Dietetics, Restaurant, and Institutional Management at Kansas State University. We are conducting a survey concerning the design of jobs in school foodservice. All the school foodservice employees in USD 383 are being asked to participate in this study. I would like you to help in this survey by completing the questionnaire as honestly and accurately as possible.

Do not put your name on the questionnaire. All information will be kept strictly confidential. No one at the school will see the individual questionnaires. Only the staff at K-State involved in the coding will see the questionnaire and your name will not be linked with your answers--you will be identified by a number only. Before answering the questionnaire, detach the card with your name on it.

Answers from the questionnaire will be punched on a card like this (show card) and submitted to the computer. This is the form in which I will receive the information (show a sample printout).

Now, let me briefly describe the various parts of the questionnaire to assist you in answering the questions. There are nine separate sections contained in the eleven pages. Each section begins with self-explanatory instructions; however, two sections of the questionnaire may be a little more difficult than the others.

Please turn to page seven. When you answer the questions on this page it is important that you indicate the degree to which you would like to have each of these things present in your job (show poster). For example, you might like having quick promotions extremely much, but friendly co-workers only a moderate amount or less. You would then give quick promotions a 10 and very friendly co-workers a 4.

On page eight we are asking you to choose between two different jobs in each question. Even though the two jobs may appear to be unrelated it is important that you choose the one that you prefer. Assume that everything else about the job is the same. Pay attention only to the characteristics actually listed (show poster). For example, Job A might be a job which requires work with mechanical equipment most of the day and Job B might be a job requiring work with other people most of the day. If you like working with people and working with equipment equally well, you would circle number 3--neutral.

It is important to answer all the questions if possible. Please answer the questions independently--do not discuss them with other people, either co-workers, friends, or families, as you are responding. Place the completed questionnaire in the envelope and seal it. I will return to pick up the questionnaire on __(say date)__.

I appreciate your help and cooperation in this study.

POSTERS USED IN EMPLOYEE INSTRUCTION

Poster #1

4	5	6	7	8	9	10
Would like having this only a moderate amount (or less).			Would like having this very much			Would like having this extremely much

10 . Quick promotions.

4 . Very friendly co-workers.

Poster #2

Job A				Job B
A job requiring work with mechanical equipment most of the day.				A job requiring work with other people most of the day.

1	2	3	4	5
Strongly Prefer A	Slightly Prefer A	Neutral	Slightly Prefer B	Strongly Prefer B

APPENDIX D

Supplemental Tables

(Tables 24 and 25)

Table 24: Job responsibilities of school foodservice staff at various study schools

system/school	job type	employee	job responsibilities: production: main dish	production: cold items	production: baked goods	serving	dish-washing	administrative/other[1]
satellite schools, elementary								
A	mgr.	1	X	X		X	X	X
	fs worker/server	1				X	X	
B	mgr.	1	X	X		X	X	X
C	mgr.	1		X		X		X
	fs worker/server	1				X		
		2				X	X	
		3		X				X
D	mgr.	1	X	X	X	X		X
	fs worker/server	1	X	X	X	X		
		2	X	X	X		X	
on-premise schools, elementary								
E	mgr.	1	X			X		X
	cook/baker	1			X			

[1]Other includes transportation and inventory control.

Table 24: (cont.)

system/school	job type	employee	job responsibilities					
			production					
			main dish	cold items	baked goods	serving	dish-washing	administrative/other
E (cont.)	fs worker/server	1		X		X	X	
	other	1						X
F	mgr.	1				X		X
	cook/baker	1			X	X		X
		2	X			X		
	fs worker/server	1		X		X	X	
	other	1						X
G	mgr.	1	X		X	X	X	X
	fs worker/server	1	X	X		X	X	X
H	mgr.	1	X		X		X	X
	cook/baker	1	X	X		X	X	
		2	X	X	X	X	X	
	fs worker/server	1				X	X	
	other	1						X
base kitchen schools, secondary								
I	mgr.	1						X
	cook/baker	1			X			X
		2		X				X
		3	X		X			X

Table 24: (cont.)

system/school	job type	employee	job responsibilities: production: main dish	production: cold items	production: baked goods	serving	dish-washing	administrative/other
I (cont.)	cook/baker	4		X		X		
		5				X		
	fs worker/server	1				X		
		2				X		
		3				X	X	
		4				X	X	
		5				X	X	
		6					X	
		7	X				X	
	other	1						X
		2						X
		3						X
J	mgr.	1				X		X
	cook/baker	1		X		X	X	
		2		X		X	X	
		3				X		X
		4	X			X	X	
		5			X	X	X	
		6			X	X	X	
	fs worker/server	1		X		X	X	
		2				X	X	
		3	X			X	X	
		4				X	X	

Table 24: (cont.)

system/school	job type	employee	job responsibilities: production: main dish	production: cold items	production: baked goods	serving	dish-washing	administrative/other
J (cont.)	fs worker/server	5				X	X	
		6				X	X	
	other	1				X	X	
		2				X		X
		3						X
educational center	fs director	1						X
	secretary	2						X
	nutrition coordinator	3						X
	menu/recipe developer	4						X
	truck driver	5						X

Table 25: JDS scale scores by type of system from Shaffer's study of hospital foodservice employees[1]

score	system: conventional mean	conventional s.d.	technical mean	technical s.d.	F ratio
core job dimensions					
skill variety	3.51	1.40	3.67	1.40	.83
task identity	4.95	1.25	4.77	1.20	1.26
task significance	5.44	1.10	5.62	1.16	1.58
autonomy	4.31	1.48	4.56	1.25	1.98
job feedback	4.67	1.38	4.80	1.16	.59
feedback from agents	3.98	1.62	4.22	1.48	1.53
dealing with others	5.31	1.12	5.47	1.14	1.36
MPS	100.43	59.22	105.91	54.99	.57
critical psychological states					
experienced meaningfulness	4.66	1.18	5.11	1.06	10.02**
experienced responsibility	5.08	1.05	5.56	.86	14.82***
knowledge of results	4.93	1.00	5.05	1.16	.81
affective responses to job					
general satisfaction	4.26	1.30	4.47	1.24	1.83
internal work motivation	5.06	1.06	5.33	.85	4.89*
specific satisfactions					
pay	4.03	1.79	3.97	1.51	.10
job security	4.41	1.54	4.74	1.49	2.91
social	5.49	1.01	5.62	1.03	1.13
supervisory	4.85	1.53	5.16	1.42	2.70
growth	4.52	1.35	4.74	1.13	2.01
growth need strength					
"would like" format	5.02	1.28	4.89	1.31	.67
job choice format	2.82	.50	2.89	.52	1.08

[1]Source: (49).

* $P \leq .05$
** $P \leq .01$
*** $P \leq .001$

LABOR UTILIZATION IN SCHOOL FOODSERVICE SYSTEMS

by

MARY FRANCES NETTLES

B.S., Mississippi State University, 1979

AN ABSTRACT OF A MASTER'S THESIS

submitted in partial fulfillment of the

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MASTER OF SCIENCE

Department of Dietetics, Restaurant
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ABSTRACT

An impetus for innovation in foodservice systems has been more effective utilization of available human resources. In recent years managers have shown a growing interest in the relationship between structure and characteristics of jobs and productivity and job satisfaction. As the per hour cost of labor increases, the efficiency of different foodservice systems becomes more important. One of the advantages of central kitchens is the potential for labor savings.

This labor utilization study was designed to compare the characteristics and motivating potential of jobs in on-premise and satellite school foodservice systems. Additional objectives were to compare the labor minutes per meal and labor cost per meal of the systems and to measure environmental conditions in the workplace and assess the effects on personnel.

The study was conducted in eight elementary schools and two secondary schools of a school district in a medium-sized midwestern city. Four elementary schools and two secondary schools had on-premise preparation and four were satellite schools. Three of the satellite schools received food from the middle school and one satellite received food from the high school.

Data were collected during the fall semester of 1981. Foodservice personnel from the eight elementary schools, middle school, high school, and educational center participated in the study. Data collection occurred at one satellite and one on-premise school per test day and menus were constant across schools tested on the same day.

The research instruments used included an employee information form, Job Diagnostic Survey (JDS), work function summary form, and environmental worksheet. Cook managers completed the employee information form prior to data collection. The JDS was completed by the foodservice employees at the eight elementary and the two secondary schools. The employees at the on-premise, satellite, and base kitchen schools completed the work function summary form. On one day at each school the researcher recorded the effective temperature, lighting, and noise levels on an environmental worksheet.

No significant differences were found between systems on the basis of the JDS scores. Basis of employment, however, was found to have a significant effect on several scores: feedback from agents, experienced responsibility, general satisfaction, growth need strength "job choice" format, and supervisory satisfaction scores.

Employee reactions to the physical environment of work indicated somewhat favorable reactions overall to the dimensions of physical work, temperature, lighting, and noise. Most of the employees responded that whether or not the statements concerning the physical environment were accurate those aspects of the workplace did not bother them in the day to day routine of their jobs.

The mean effective temperature of one school was within the range identified to be optimal working conditions. The effective temperatures of the other schools were above the recommended range of 65 to 73°F where the effects on worker performance include employee discomfort and morale problems. The mean lighting level in all the schools did not meet the criteria recommended by Avery for foodservice departments. Four schools appeared to have lighting problems that should be corrected for an

optimal working environment. The mean noise levels in all the schools were within the limits established by the Occupational Safety and Health Administration.

The mean labor minutes per meal were higher at the satellite schools (8.43) than at on-premise (7.27) and base (7.24). The labor cost per meal was also highest at satellite schools (.6473), which was approximately 10 cents higher than the on-premise or base kitchen labor cost.