DETERMINATION OF PROJECTED DIRECT LABOR TIME FOR TWO METHODS OF SATELLITE FEEDING- INDIVIDUAL PREPACKAGED PLATE MEALS AND BULK TRANSPORT MEALS

by

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INTRODUCTION

Satellite food service systems are the results of a school system's feeding problems. Outdated food service facilities, no facilities at all, lack of funds for either improvement of present facilities or for the initial investment for a food service in a new school, low enrollment that does not justify expenditures for food service, and scarce labor are all problems facing our school administrators in the 1970's.

Currently 26 million school lunches are served daily, and 46 million children make some use of school food service. Twenty million children still do not use school food service facilities regularly (1).

As yet unpublished announcements by the United States Department of Agriculture will require all school systems participating in the National School Lunch Program to have a lunch program in every school by the end of the 1973-1974 school year. This fact, coupled with the possibility of free lunches for every child, will necessitate quick action to meet these needs (2).

Guidance is needed for school system's decisions on whether to institute satellite feeding programs in present schools or in schools to be built. If the decision is made to establish a satellite feeding system, the question must then be answered as to which type of satellite service system is most economical and acceptable. More data on which to make sounder decisions is a great need for school food service administrators (1).

To provide children with lunches at school requires capital investment for preparation and serving equipment, as well as providing the space and personnel for the food service operation. This must be accomplished at a time when food, equipment, and labor costs are spiraling upward and show little signs of improvement in the near future (3).

The Aluminum Association (4) reveals an initial capital investment in space and equipment of $70,000 for an elementary school feeding 200-300 meals per day. Adding a kitchen to an older school for 200 children requires an investment of $35,000.

Since monies for school food service systems are being budgeted conservatively, capital for new or remodeled facilities is scarce. The concept of satellite service systems is currently being used to serve meals to school children in schools without a kitchen as an alternative to financing food service facilities in each individual school. A satellite service system may be defined as a method of distributing prepared meals to children in schools with no food service facilities. One school within a school system with adequate kitchen equipment and facilities is the central kitchen. This kitchen prepares and delivers the food to nearby schools with little or no facilities, called satellite schools.

While the actual food preparation is completed in a central kitchen and transported to individual satellite schools, one system may place the food in bulk in insulated carriers at the central kitchen and serve the individual plates to students from a mobile service area in the satellite school. An alternative system preportions the meal into individually packaged plates at the central kitchen and then serves the finished meal at the satellite school.

Information is needed on labor requirements, and thus their cost, on service systems, and the acceptability of different types of service systems. The purposes of this study are:

(1) To determine the direct labor time spent by non-management labor for two service systems of satellite feeding--bulk and individual prepackaged plate--from the time the prepared food is ready to be processed for ultimate service to the school children through transportation, actual service and clean-up.

(2) To determine a direct labor cost for these two systems of service.

(3) To determine a direct labor time and/or cost for these two service systems for a specified number of serving units.

(4) To study student customer acceptability of the two service systems.

Economic decisions are important since the school food service system is managed on a strict budget in order to maintain a low cost meal service to children, but acceptability is also important. No matter how efficient or economical the system seems to the administrators; if the students will not eat the meal that is served, the program is defeated (2).

REVIEW OF LITERATURE

Methods of Satellite Service

Satellite feeding was instituted as a partial solution to school administrators' problems of how to feed their students economically. A satellite service system is composed of one school within a school system, town, or city with adequate kitchen facilities and nearby schools with little or no facilities. The kitchen of the adequately equipped school is known as the "central kitchen". The central kitchen prepares the food to be distributed to the schools without any food service facilities, which are called "satellites" (5).

Food service personnel in Philadelphia (6) suggest that satelliting has eliminated kitchen and serving facilities in new schools; increased bulk purchasing power, eliminated food waste; made efficient use of space, equipment, and labor; and has increased participation. An opposite opinion (7) states that satellite feeding is not very desirable since there is no choice of food, left-over food is wasted when satellite schools over-order, no separate menu is available for the faculty, and poor temperature control in the distribution process may lead to spoilage.

There are varied types of meals served to satellite schools which may be classified according to whether or not the foods are served hot or cold. For example, hot food variations could include individual hot lunches packed in styrofoam containers which are placed in heat retaining units (6), individual hot lunches prepackaged in foil or plastic containers in the central kitchen that are reheated in the satellite school (8), bulk hot lunches in pans that are put in preheated carriers until the food is placed on a steamtable in the satellite school (6), and hot lunches

from individual cans heated in the satellite school with a bread/butter and milk addition (9). Cold foods may be a bag lunch or a fiber tray with polythylene film containing all finger foods (10); and a cold "Vit-A-Lunch" pack which contains a salad or vegetable, a fruit or fruited gelatin dessert, and a cookie or cake (11). "Jet-Pack" lunches are a combination of hot and cold foods. An aluminum foil container with foods to be served hot is reheated in the satellite school. A plastic container with cold foods and eating utensils is added to complete the meal (6).

The number of methods for delivering these lunches is as varied as the types of lunches. Lunches may be prepared in the central kitchen and delivered by a van, a refrigerated truck, or a school bus with or without seats (12, 3, 13). These vehicles may or may not return to the satellite school on the same day depending on whether or not disposable serving dishes are used or if permanentware is used. As another alternative, food distributors may deliver the prepared convenience lunches directly to the satellite school as in the situation of the canned lunch or commercially prepared "Jet-Pack" (14).

There are two basic approaches to the service process in a satellite system. Bulk service involves placing the food which is on the steamtable on plates with immediate service to the child, while the prepackaged plate involves only giving a child his preportioned plate and eating utensils.

The bulk service system and the individual prepackaged plate service system being examined in this study have advantages and disadvantages as related to facility requirements, ease of transportation, portion control, and waste disposal.

Advantages which accrue from the prepackaged plate system include reduced equipment investment, reduced amount of labor needed for serving, fast serving, space saving, equalized portions, and ease of keeping up with the expansion of a growing school system. Limitations from this system include the disposal of plates, limited menu, difficulty in offering second helpings of a choice of food items, lack of personal touches, and difficulty when a school runs out of lunches (8).

Bulk service systems preserve the same procedure as food prepared on the premise, offer maximum flexibility in menu selection and cycling, provide for daily fluctuations in number of meals served and in class schedule variations (15). However, transporting food in bulk increases the chances for spillage of foods, and the weight of the food is greater for those having to carry it (13).

Applebaum (16) compared costs for five selected types of food systems: on-site preparation kitchen, simplified food preparation kitchen with convenience foods system, central kitchen with bulk transport system, central kitchen with prepackaged plate system, and a frozen meal system for schools with no eating facilities. Total operational costs, excluding equipment costs, were found to be greater for on-site kitchens and for the prepackaged plate systems using disposables than for the other three types of systems. Bulk transport was next in expense.

Of the problems or unknown facts about each of these two systems, there are three factors that need to be examined in order that management may better compare and determine which satellite system might best fit the needs of its school food service system. These factors include comparisons

between the two systems concerning (1) true labor needs (2) resulting labor costs, and (3) student acceptability.

Evaluation of Methods

Time Studies

Mundel (17) defined a time study as "a procedure for determining the amount of time required, under certain standard conditions of measurement for tasks involving some human activity". The most accurate method of determining labor needs is a time study, a function of which is to compare job methods. Mundel (17) further specifies a direct time study as "a procedure in which the performance of a task is observed directly and continuously for a limited period of time". Data are recorded for the work time and the work count with an appraisal for the performance.

Quam (18) identified and classified commonly performed quantity food production processes, and further divided these processes into standardized work elements common to all food preparation activities. She concluded that the time study techniques can be used in an actual food service operation to determine the labor time used to produce a menu item by different methods.

The work processes involved in any job or task are the separable steps that a person performs when doing a task that requires him to move from place to place, not the steps performed. The actual steps that are performed are defined as work elements. These steps, or work elements, are easily detected and have a definite beginning and ending point, as small as it is convenient to time and as unified as possible (17).

Further testing of quantity food production processes and work elements has been done in various areas of food service to determine labor time used

for different preparation methods. Huether and Ehrcke (19, 20) applied the same work processes and elements as Quam (18) to different preparation methods of menu items, freeze-dried foods and prepared desserts, respectively. Spencer (21) studied a traditional menu and convenience food menu, while Holloway (22) used a modified work sampling technique for developing a staffing guide for a combined Type A and a la carte food service system.

To record the time for work elements, Mundel (17) described three procedures: (1) continuous timing, (2) repetitive timing, and (3) accumulative timing. For continuous timing, a stopwatch runs from the beginning to the end of the data collection. The time is recorded at the end of each process. With repetitive or snap-back timing, the hands of the stopwatch are snapped back to zero at the end of each element, as compared to accumulative timing where two stopwatches are used to permit direct reading at the end of each element.

From the time study data, a representative time is determined for each element. Two methods for this calculation are defined by Barnes (23). The arithmetic average of the stopwatch reading for each element may be used or, the time occurring most frequently is selected for the representation time for that element.

After breaking a job down into work elements and selecting a representative time, the operator is rated in relation to his speed of work. "Rating is the process of comparing the performance of the operator under observation with the observer's own concept of normal performance". Since the opinion of the observer is used, an element of judgement becomes part of a time study (24).

Both the difficulty of the job and the effort of the employee doing the work are involved in the rating process. Rating is described as a two-step process by Mundel (17):

1. Judging the difficulty of the job and forming a mental picture of what the performance should be as defined by the organization.
2. Appraising the performance and placing a numerical value on the appraisal. Both difficulty of the job and the effort of the employee doing the work are involved in the rating process.

Effort is defined by Mundel (17) as "the apparent exertion and speed exhibited in doing the work". The speed, not the exertion, should be the primary observable characteristic; or it would also be necessary to take into account the type of operator. Two illustrations of "normal effort" or speed are dealing fifty-two playing cards into four piles in 0.50 minutes and walking at three miles per hour, taking twenty-seven inch steps. These standards are such that the average worker with incentive can exceed the normal by thirty percent.

This rating factor is applied to the representative time to obtain a normal time for the job. According to Barnes (23), the most widely used system of rating is the subjective rating of a single-factor-operator speed, which is expressed in percentage, in points per hour, or in other units. In the percentage system, normal performance equals 100 percent.

Labor Costs

The creation of a true managerial design is based upon projecting the required manpower inputs of the organization. From this data, planned or standard labor costs can be computed (17). Labor costs will continue to grow with an increase in the minimum wage to $2.00 or more an hour in the near future (16). Jernigan (25), even in 1968, realized the high rate of increasing labor costs by stating, "Every food service director must find the most efficient way to produce high quality foods in the shortest possible time and with the least possible effort".

Labor costs can be defined as direct or indirect. Direct labor costs are chargeable directly to the products produced (26). In food service it is the labor of those employees who work directly with the food to convert it into finished products. These direct labor costs can be estimated and increase directly with the volume produced (27). Indirect labor costs accrue from the labor time of all levels of supervision, custodians, and others who do not work directly on the finished products (26).

A food service survey of 1,562 school district food service directors across the nation was conducted by School Management (28). From 415 responses concerning average cost breakdown, food cost was indicated to be 55%; labor cost, 40%; and other expenses, 5%. Only 290 of the 415 responses supplied these statistics. The remaining responses stated that they did not have the information needed for this cost breakdown.

Nation's Schools (29) advocated having a centralized kitchen serving prepackaged lunches to cut food service costs, stating that a savings of 15% of the total operating costs could accrue from this system over an on-site kitchen. Dangelo and Medved (8) indicated also that labor costs

for prepackaged meals are less than the national average labor cost per plate for meals prepared and served on the premises.

Acceptability

A definition of acceptability is necessary before any evaluation of customer acceptance can be undertaken. Vawter and Konishi (30) cite Raub's definition of food acceptability as a question of what foods will be eaten. Pilgrim (31) combined objective and subjective indices of food acceptance by defining it as "consumption with pleasure".

The objective methods for quantifying acceptability are actually measuring food preference, which is the degree of like or dislike for a food (32). The criteria for measurement of preference, and thus acceptability, is consumption (31); with measurement ranging from the amount of food consumed to the frequency of choice of a food among competitive foods (33).

Vawter and Konishi (30) studied food acceptance of soldiers by calculating the percentage of people present at the meal who took a food item and the average quantity of food consumed. In a study by an Iowa school lunch program of the acceptability of lunches (34), acceptance of menu items was based upon the percentage of children accepting the menu item, the percentage of children returning for additional servings, and the percentage of children having plate waste.

A proposed school lunch menu pattern was tested in the Demonstration School of the University of Georgia by Miron and Harvey (35) for nutritional quality, acceptability according to age, and feasibility on cost and management. Acceptability was for three age groups based upon the percentage plate waste by weighing the amount of served food and the amount of food wasted.

The objective method for quality measurements of preference as a predictor of acceptance is the hedonic scale (36). The interpretation of the hedonic scale applied to food is that it is a measure of human behavior potential, not the characteristics of food (33).

The hedonic scale assumes there is a continuum of response and defines the categories of response. Thus, any scale which seeks to measure on a continuum could be termed an hedonic scale. Peryam and Pilgrim (33) conclude that there is no better way with which to check acceptance than by measuring preferences by the use of the hedonic scale, whether in a laboratory or in an actual feeding situation. The scale's simplicity makes it suitable for a wide range of populations; the subjects can respond meaningfully without experience; data can be handled by statistics of variables; and the results are meaningful for indicating general levels of preference.

The choice of the type of hedonic scale to use for measuring preference is wide. Jones, Peryam, and Thurstone (37), while developing a scale for measuring soldiers' preferences of particular foods, found no superior rating scale for the length of the continuum. A rating scale up to nine points makes no significant difference; but an important factor is the selection and placement of descriptive phrases. Sheppard (38) raised the question of the validity of the assumption that the distances on the continuum are equal when measuring preferences, but later in the article suggested that it is safe to assume that these distances are equal.

The hedonic scale has frequently been applied to food items. Tarver and Schenck (36) developed and used an hedonic scale from 0 to 5 with descriptive terms for scoring the color and clarity of a beverage product.

Peryam and Gutman's (39) hedonic scale from 1 to 9 was used by men in the army for indicating their preference for one, two, or four foods. Pilgrim (32) also utilized an hedonic scale from 1 to 9 to study food preferences and the effect of preparation, population characteristics, menu combinations, frequency of serving, and satiety on these preferences.

One study has been reported using the hedonic scale for rating the service of a meal. School food service administrators rated meals that had been prepared on the premises and meals that had been transported from the place of preparation. An hedonic scale of 1 to 5 was used for rating the meals. Analysis of the data by Russell (40) was an average of the ratings for each of the three days for each of the two types of meals. Percentages were then calculated for three categories: the percentage of people who thought the food was prepared on the premises, the percentage of people who thought the food was transported, and the percentage of the people who did not know. For two of the three days, taste ratings were higher for the transported meals; but the final conclusion was that no one could decide where the food was prepared.

MATERIALS AND METHODS

The methods used in this study were designed to fulfill the objectives as established:

1. To determine the direct labor time spent by non-management labor for two service systems of satellite feeding--bulk and individual prepackaged plate--from the time the prepared food was ready to be processed for ultimate service to the school children through transportation, actual service, and clean-up.
2. To determine a direct labor cost for these two systems of service.
3. To determine a direct labor time and/or cost for these two service systems for a specified number of serving units.
4. To study student customer acceptability of the two service systems.

Situtation

Data were collected from a central kitchen and two of its four satellite schools in the Roanoke City Public Schools system. Twenty-five of the thirty-five schools in this system have on-site preparation kitchens. Three of these schools have central kitchens serving the ten remaining schools in this system.

Each of these ten satellite elementary schools, grades one through six, received either the bulk food service system or the prepackaged plate service system. In two of the ten schools, there were dining facilities for the children in multipurpose rooms; while in the other schools, the children must eat their lunch in the classroom.

All food preparation for these satellite schools was completed in the central kitchens; and all satellite schools, as well as the on-site kitchens and the central kitchens, followed exactly the centralized monthly menu plans. A choice of a soup plate and/or a la carte items was also available in the junior and senior high schools. The menu pattern used was the usual Type A Lunch defined by the United States Department of Agriculture that meets one third of the child's daily nutritional requirements. The menus were planned in the central administrative food service office and produced under normal conditions.

Although the choices of combinations of food were planned to meet Type A requirements, much consideration was given in planning the menu to meet the constraints of the satellite service situation which included the convenience for packing. For example, when the menus were planned, all hot foods would be able to be arranged in a three-compartment styrofoam plate. In addition, one cold food item could be placed in a packing cup or waxed sandwich bag.

After the food for lunch was prepared in the central kitchen, there were two different sequences of activity for serving this meal by the prepackaged plate system or by the bulk service system.

For the bulk system, the panned prepared food was covered for transport and placed in mobile insulated stainless steel carriers. These carriers, metal containers of six-compartmental trays, metal containers of eating utensils were loaded into a van for transport to the satellite school by a male driver, who was hired by the food service department as a driver and a kitchen employee. In addition, another male kitchen employee accompanied the driver to assist in loading and unloading the van.

After the food conveyance equipment and utensil containers were unloaded at the satellite school, the steamtable pans of food were removed from their temporary storage and placed on the steamtable for service. The driver of the truck served in the last school at which he delivered with another central kitchen employee. At the other satellite schools, two central kitchen employees or one central kitchen employee and one part-time employee served the plates.

The children picked up their plates from the steamtable counter and their milk from the milk cooler that remained in the satellite school. After serving, the central kitchen employee and driver removed the unserved food to the carriers, repacked the trays and eating utensils, and cleaned the serving area. Then the food carriers and utensil containers were loaded into the van again for the return trip to the central kitchen.

The prepackaged plate system involved preportioning the prepared food into styrofoam plates, with permanently attached lids, by the use of a conveyor packing table in the central kitchen. Thirty-six plates could be loaded into one insulated plastic/styrofoam tote chest.

If earlier in the same morning one cold food item needed to be placed in a packing cup for transport, this was also done by central kitchen employees. The cups were placed in plastic insulated coolers. The tote chests and coolers were loaded into the truck with metal containers of eating utensils.

At the satellite school, the tote chests, coolers, and silverware containers were unloaded onto a cart and were transported to the mobile serving area of the school. A table and a milk cooler constituted the usual equipment available for service at the satellite school receiving the prepackaged plates. One part-time employee removed as many plates

at a time from the tote chest that were needed as each class filed by. After service, she repacked the used eating utensils and any unserved plates and cleaned the serving area. The tote chest, coolers, and silverware containers were again placed on a cart and were rolled back to the loading area of the school for pick-up by the van from the central kitchen.

All personnel received an explanation of the purpose and procedures of this time study before it began. They were reassured that the study would have no effect on their job security. Instructions were given to proceed with their work as normally as possible.

Data were collected for thirty days, fifteen days for each system.

Determination of Labor Time

The direct labor time required for each satellite service system was obtained through the use of time studies. Fourteen regular and part-time employees of William Fleming High School cafeteria were the subjects timed.

Work processes were defined as the separable steps that a person performs when doing a task that requires him to move from place to place. Work elements were defined as the actual steps that are performed within each process (17). Work processes, the broad categories of basic food production activities, used in this study were selected from previous studies utilizing work processes and elements for quantity food production (18, 20, 22). The work elements under each process for this study were developed for each service system to have definite beginning and ending points and to be capable of being conveniently timed with the use of a stopwatch. The work processes and work elements are shown in Appendix (A) and Appendix (B).

The sequence of work processes and elements was developed for each system, bulk and prepackaged plate, from observations of present practices before the study began. The sequence was established to concur with present practices in order to compute a direct labor cost that would represent a normal operation. The employees were timed from the time the prepared food was ready to be processed for transport through service to the child and clean-up in the satellite school. Management time, transportation time, and dishwashing time were not included in this study.

Actual employee labor time for each system was observed and the resulting times per work element under each work process was recorded on charts. Actual labor time observed was collected using the time study snap-back method with a decimal stopwatch.

Within the sequence of each type of service system, it was recognized that the nature of work and the number of employees involved changes. Some work elements were performed one time by one person for the entire output. The remaining work elements were performed by a different number of people for a specified number of units instead of the entire output. These work elements were termed "assembly-line" elements.

Because of this difference in the types of elements, two methods were used to collect the time study data. In the bulk system, "assembly-line" elements were established for the work process of serving in the satellite school. Time was recorded for the first of the two servers to place food items on thirty-six plates and then another time was recorded for the second server to place the remaining food items on the same thirty-six plates.

For the prepackaged plate system, "assembly-line" elements were used for the work process involving packaging the styrofoam plate. The stop-watch was started for timing the placement of food items on thirty-six plates by the first two servers on the packing line. A second time was then recorded for the next server to place the remaining food item(s) on the same thirty-six plates and for the last two servers to load the thirty-six styrofoam plates into the insulated containers. Each of the two recorded times were multiplied by "two" and "three", respectively, to obtain the number of man-minutes for thirty-six units.

Within each service system, the total number of man-minutes for thirty-six units for the appropriate work elements was obtained by the addition of the two recorded times for thirty-six units. The times for the remaining "one-person" work elements of each service system were recorded for the entire output.

Replications were made for each system over a thirty day period using the actual menus planned for the school system as shown in Appendix (C) and Appendix (D).

For the "one-person" elements there were 15 replications for each system. For the "assembly-line" elements there were 540 replications for each system.

During each replication, an "effort rating" was given to each work process by the observer to judge the speed of the work of the employees. Barnes' (23) percentage system was used. A rating of 100 was given for normal speed, numbers below 100 given for slower than normal speed, and numbers above 100 given for faster than normal speed. The assigned rating was multiplied by the total number of man-minutes for each process to produce an "adjusted time" for thirty-six units.

The average total labor time and the average total adjusted labor time for each service system were calculated by the addition of the recorded times for each work element, with division by the number of replications.

Determination of Labor Cost

Direct labor has been defined as that labor which works directly with the units produced and that increases as the volume increases. Costs of direct labor may be computed by first determining the total time spent by labor directly producing a specified number of units and secondly by multiplying the monetary value of the labor by the total labor time.

Values of the total labor costs for the two service systems in this study were computed by multiplying the wage rate of employees performing the work elements of the service system times the average total adjusted labor man-minutes recorded for each service system. The wage rate chosen was the highest hourly wage rate that is currently being paid in the Roanoke City Food Service Department, $2.61, plus the value of the current fringe benefits paid on that wage rate. The fringe benefits include; Social Security, City Retirement, and one meal per working day and was calculated at $0.23 or 9.19% of the wage rate used in this study. The total hourly wage rate including fringe benefits is $2.84. The choosing of the highest hourly wage rate was considered to be the most realistic because of rising labor costs.

A Guide for Labor Requirements

The data obtained on the average total adjusted labor time for thirty-six units are useful only when they can be used to predict labor needs

for larger volumes. Average total adjusted labor times for 100, 200, 500, and 1,000 meals were projected as being the most useful volumes for management decisions on which service system of satellite feeding to use.

To develop the average total adjusted labor time for each service system from which labor times for various volume levels could be predicted, work elements under each work process in a particular system were separated into stable or variable elements based on the nature of the element as related to volume. Stable work elements were defined as those elements which tend to remain constant regardless of the different volumes produced. Conversely, those elements which tend to vary in the time required to perform the activity according to the volume produced would be termed variable elements. Idle time was classified as stable, and delay time was considered variable.

Average total adjusted labor time for the stable, variable, idle, and delay times for a specified number of servings produced was computed from these data. To get the average total adjusted labor time of all stable work elements within each work process for a particular service system, the total adjusted time from all stable elements within that system were added and then divided by the number of replications.

Next, an average total adjusted labor time for all variable work elements were computed. All work elements involved in the "assembly-line" activities were variable. The average total adjusted labor time for all those elements involved in the "assembly-line" process were computed through fifteen replications of thirty-six units of totally produced and served plates. Thus, 540 observations were made for each variable work element involved in the "assembly-line" process.

The other variable work elements not involved in "assembly-line" activities were used in work that involved completed total production activities. Although the total time required to perform the element still varied with the volume, the activity or work was performed on the total number of units produced. For example, in the bulk service system, each pan containing a specified number of servings of food to be transported was placed in the mobile conveyance equipment by one person. As volumes increase, more pans must be placed in this temporary storage. To compute the average total adjusted labor time for each of these remaining variable work elements, the adjusted labor time under each individual work element of each work process accumulated for all replications were added and then divided by the number of replications made. This time was then divided again by the average total volume produced during the replications and multiplied by "thirty-six" to produce an average adjusted time per thirty-six units for the variable elements.

Student Customer Acceptability

An acceptability study of student customers for the two service systems was undertaken on the same day that a particular type of service was being timed. A questionnaire using a modified Thurstone hedonic scale--a five point facial hedonic scale without words--was used as shown in Appendix (E). A similar questionnaire was used by Goertz, Hitchcock, and Beach (41) in a Tennessee school lunch program to test the acceptability of new seafood recipes in elementary schools. On the questionnaire used in this study, the happiest face was given the value of five, denoting high acceptability, and the unhappiest face a value of one, indicating strong dislike. The only

information asked on the questionnaire was the child's age and the name of the school he was attending.

Twenty-five students over the entire serving period were randomly selected daily. The numbers were picked from a random numbers table to be assigned to the students, the place of the child in the serving line corresponding to the random number. Numbers 1 through 150 were selected for the school using the bulk service system, and numbers 1 through 100 were selected for the school using the prepackaged plate service system.

The randomly selected students were verbally instructed to read directions, fill out the form during the lunch period, and return it to the service area. Anyone not understanding the instructions were told to check the face showing how they felt about receiving their lunch in a styrofoam plate or about receiving their lunch from a steamtable. Instructions emphasized that the rating related to how their plate was served and not how they liked their lunch that day.

For each day the scores from the twenty-five questionnaires were analyzed to determine the arithmetic mean. For each service system a grand mean was computed from the daily means. The statistical analysis used to compare the grand means of the two service systems was the two-tailed "t" test, recommended by Peryam and Pilgrim (33) for a difference between two means of hedonic scales for measuring food preferences.

RESULTS AND DISCUSSION

The objectives of this study included the determination of direct labor time requirements and the resulting labor cost, as well as the acceptability of the service by elementary school students for two types of school food service satellite systems. The labor time data for the two satellite food service systems will be presented here to fulfill the stated objectives.

Labor Time

Work processes and work elements were defined as the basis for the time study. The two satellite service systems were observed while actual serving was being performed. The first objective was to determine the amount of time spent under the individual work processes of serving meals between the bulk and prepackaged plate systems. The processes examined include: portioning, preparation for merchandising, clean-up, finished preparation transportation, serving, clean-up, and finished preparation transportation. The sum of these individual processes account for the total labor time incurred, including idle and delay time.

From the actual labor time in man-minutes for each work element under each work process and the percentage "effort rating" figure, an average adjusted labor time in man-minutes for each work process in each service system was calculated for a base of thirty-six meals. Table 1 shows the actual observed time and the "effort rating" adjusted labor time required to serve the thirty-six meals by each service system and the percentage difference in time in relation to the actual observed time. The average total adjusted labor time to serve thirty-six meals for the prepackaged

Table 1

Average total labor time to perform work processes
for Bulk and Prepackaged Plate Systems for 36 servings

Work Processes	BULK SERVICE SYSTEM			PREPACKAGED PLATE SERVICE SYSTEM		
	Actual Average Time (in man-min.)	Adjusted Average Time (in man-min.)	Difference (in percent)	Actual Average Time (in man-min.)	Adjusted Average Time (in man-min.)	Difference (in percent)
Portioning	11.30	11.36	0.53	1.88	1.90	1.05
Prep. For Merchandising	-----	-----	----	27.54	27.43	0.40
Clean-Up	-----	-----	----	9.44	9.18	2.75
Fin. Prep. Transportation	21.06	19.69	6.51	6.82	6.71	1.61
Serving	76.79	74.93	2.42	26.80	27.26	1.69
Clean-Up	13.75	13.16	4.29	6.55	6.53	0.31
Fin. Prep. Transportation	10.78	10.63	1.39	6.94	6.84	1.44
Average Total Labor Time	133.68	129.77	2.92	85.97	85.85	0.14

plate service system was 85.85 man-minutes, while the bulk system required 129.77 man-minutes.

The percentage difference between the actual observed and the average adjusted labor time required to perform each work process ranged from 0.53 to 6.51 percent for the bulk service and from 0.31 to 2.75 percent for the prepackaged plate service. Two work processes performed in the central kitchen, preparation for merchandising and clean-up, were not required in the bulk service system.

The work process requiring the greatest amount of labor time in the bulk service system was the actual serving of plates in the satellite school. In the prepackaged plate service system, the preparation for merchandising and the actual serving of the prepackaged plates in the satellite school required the greatest amount of labor time. Other distinct differences in time spent under the individual work processes with the different serving methods were the finished preparation transportation and portioning processes. In the prepackaged plate system, the time spent under these work processes was less than when the bulk service system was used.

The work elements under each work process were categorized according to the nature of the activity as stable, variable, idle, or delay elements. In each work process the adjusted labor time recorded from the fifteen replications for each service system for the work elements under a given category-stable, variable, idle, or delay-were totaled and arithmetically averaged to determine the amount of time spent in each type of work element when performing a specified work process. Table 2 and Table 3 show, for a base of thirty-six servings, the average adjusted labor time

Table 2

Average adjusted labor time of work processes by work element types for the Bulk Service System

Work Element Types	BULK SERVICE SYSTEM (in man-minutes)					
	Portioning	Fin. Prep. Transport.	Serving	Clean-Up	Fin. Prep. Transport.	Total
STABLE	----	----	4.79	7.06	----	11.85
VARIABLE	2.52	4.32	17.28	1.44	2.52	28.08
IDLE	----	0.36	0.25	0.36	0.72	1.69
DELAY	----	0.36	17.28	0.25	----	17.89
TOTALS	2.52	5.04	39.60	9.11	3.24	59.51

Table 3

Average adjusted labor time of work processes by work element types for the Prepackaged Plate Service System

Work Element Types	PREPACKAGED PLATE SERVICE SYSTEM (in man-minutes)							
	Port.	Prep. For Merchan.	Clean-Up	Fin. Prep. Transport.	Serving	Clean-Up	Fin. Prep. Transport	Total
STABLE	---	2.10	8.84	----	2.68	2.39	----	16.01
VARIABLE	0.72	23.13	----	2.52	7.20	1.08	2.52	37.17
IDLE	----	0.22	0.01	0.11	0.22	0.26	----	0.82
DELAY	----	1.08	----	----	8.28	1.08	----	10.44
TOTALS	0.72	26.53	8.85	2.63	18.38	4.81	2.52	64.44

spent in performing each type of work element under each work process for the two service systems.

The greatest amount of labor time occured in performing variable work element activities in both of the service systems. In bulk service, delay time and stable work elements ranked second and third, respectively, in total time requirements; while the ranking of those elements was reversed in the prepackaged plate system. Idle time accounted for very little of the total labor time required to serve thirty-six meals in either system.

In the bulk service system, the greatest amount of the average adjusted labor time occured during the serving work process performed at the satellite school. This process involved placing the food on the plate and placing it on the counter for the child to receive. In the prepackaged system, the preparation for merchandising work process, which was performed in the central kitchen, required the greatest amount of time; with the serving process performed in the satellite school requiring the second greatest amount of labor time. The preparation for merchandising process involved the actual prepackaging of the plates in the central kitchen. The serving work process under this system involved only distributing the prepackaged plates individually to the children. Thus, the bulk system had one peak production period while the prepackaged plate system had two peak production periods.

The average total adjusted labor time required and the percentage difference in the time required to perform the four types of elements for thirty-six meals under both systems are shown in Table 4. As indicated before, the variable work element activities required the largest percentage

Table 4

Average total adjusted labor time and percentage difference by work element types for the two service systems for 36 servings

Work Element Types	AVERAGE TOTAL ADJUSTED LABOR TIME				Percentage Difference Between Two Systems
	BULK SERVICE SYSTEM		PREPACKAGED PLATE SERVICE SYSTEM		
	Time (in man-minutes)	Percentage of Total Time	Time (in man-minutes)	Percentage of Total Time	
STABLE	11.85	19.91	16.01	24.84	25.98
VARIABLE	28.08	47.19	37.17	57.69	24.46
IDLE	1.69	2.84	0.82	1.27	51.48
DELAY	17.89	30.06	10.44	16.20	41.65
TOTALS	59.51	100.00	64.44	100.00	7.65

of labor time to serve thirty-six meals in both systems. The stable elements accounted for 19.91 and 24.84 percent of the average total adjusted labor time spent in the bulk and prepackaged plate systems, respectively. Delay time was 30.06 percent of the time required in the bulk system, as compared to only 16.20 percent in the prepackaged plate system.

The greatest differences among the work elements in the labor requirements for the two systems occured in the idle and delay times. There was a difference of over 51 and 41 percent between the two methods for idle and delay elements, respectively. The prepackaged system required approximately 25 percent additional labor time in both stable and variable work elements when compared to the bulk system.

A Guide for Labor Requirements

After the average total adjusted labor time per stable or variable work element was calculated for thirty-six meals, as shown in Table 4, an average total adjusted labor time and the average labor time per meal in man-minutes were projected for 100, 200, 500, and 1,000 meals.

As the volume of the number of meals served increased, the time required to serve the greater volume also increased. However, this increase in serving time was not directly proportional to the increase in the number of meals served, but was dependent upon the amount of variable-type and stable-type time allocated to each work process.

Since stable work elements and idle time were assumed to be unaffected by increased volume levels, the number of man-minutes allocated for these elements remained static as the number of meals served increased. Variable and delay elements were assumed to increase

proportionately as the number of meals served increased. To calculate the projected labor time of these variable and delay elements for each volume level, a factor was computed for each volume level by dividing the number of meals to be served by the base of thirty-six servings. The labor time for the base of thirty-six servings was then multiplied by these factors to get the projected time requirements for the variable and delay elements. An average total adjusted labor time could then be computed for each volume level by summing the work elements and their respective variable-type and stable-type times. Average labor time per meal served was then calculated by dividing the total projected labor time by the number of meals to be served, as shown in Table 5.

As the volume level increased, the average total adjusted labor time increased for both systems. The average adjusted labor time required per meal served decreased as the volume level increased in both systems. Time requirements were consistently less for the bulk service system than for the prepackaged plate service system.

Table 6 shows the average total adjusted labor time and percentage differences for projected volume levels for the two service systems. As the volume increased for the two service systems, the percentage difference in labor requirements between the bulk and prepackaged plate became smaller. At a volume of 100 meals, the difference between the two systems was 5.27 percent; and at a 1,000 volume level, the difference had decreased to 3.64 percent.

Table 5

Projected average total adjusted labor time
for selected volume levels for each service system

Work Element Types	PROJECTED AVERAGE TOTAL ADJUSTED LABOR TIME (in man-minutes)							
	BULK SERVICE SYSTEM				PREPACKAGED PLATE SERVICE SYSTEM			
	100 Meals	200 Meals	500 Meals	1,000 Meals	100 Meals	200 Meals	500 Meals	1,000 Meals
STABLE	11.85	11.85	11.85	11.85	16.01	16.01	16.01	16.01
VARIABLE	77.78	155.84	389.75	779.78	102.96	206.29	515.92	1,032.21
IDLE	1.69	1.69	1.69	1.69	0.82	0.82	0.82	0.82
DELAY	49.56	99.28	248.31	496.81	28.92	57.94	144.91	289.92
Average Total Adjusted Labor Time	140.88	268.66	651.60	1,290.03	148.71	281.06	677.66	1,338.96
Average Adjusted Labor Time Per Meal	1.41	1.34	1.30	1.29	1.49	1.41	1.36	1.34

Table 6

Average total adjusted labor time and percentage differences for projected volume levels for two service systems

Projected Number of Meals	AVERAGE TOTAL ADJUSTED LABOR TIME (in man-minutes)		Time Difference (in percent)
	BULK SERVICE SYSTEM	PREPACKAGED PLATE SERVICE SYSTEM	
100	140.88	148.71	5.27
200	268.66	281.06	4.41
500	651.60	677.66	3.85
1,000	1,290.03	1,338.96	3.64

Labor Cost

The second objective was to examine the total direct labor cost of serving meals by the two service methods. In the previous sections it was found that the total average adjusted labor time was higher for the prepackaged plate system.

One might assume that a larger average total adjusted labor time for one system would also mean a higher labor cost for that particular system. The total direct labor costs of the two systems at specific volume levels will be examined.

Labor dollar value for labor time was determined by multiplying the required amount of time to serve thirty-six meals under each system by $2.84. This value was the highest hourly wage rate, $2.61, plus the value of fringe benefits currently being paid by the Roanoke City Public Schools system on that wage rate, which was $0.23 per hour.

Table 7 shows a projected labor cost for different volume levels for the two service systems based upon the average total adjusted labor time projected for each volume level, multiplied by the dollar value established. Labor costs between the two systems ranged from $6.76 to $7.14 for 100 meals served to $61.92 to $64.27 for 1,000 meals served for the bulk and prepackaged plate systems, respectively.

The labor time and cost difference for the selected volume levels can easily be converted into a labor cost difference for one school year, or 180 days, as shown in Table 8.

Labor dollar savings during a school year for bulk service at the various volume levels was determined by taking the time difference in man-minutes between the two systems at each volume level and multiplying

Table 7

Projected total labor cost for selected volume levels
for the two service systems

Volume Level	PROJECTED TOTAL LABOR COSTS (in dollars)	
	BULK SERVICE SYSTEM	PREPACKAGED PLATE SERVICE SYSTEM
100	6.76	7.14
200	12.90	13.49
500	31.28	32.53
1,000	61.92	64.27

Table 8

Projected differences in labor time and costs for bulk service at selected volume levels for one school year

	100 Meals	200 Meals	500 Meals	1,000 Meals
Time Difference (in man-minutes)	7.83	12.40	26.06	48.93
Total Time Difference for 180 School Days (in man-minutes)	1,409.40	2,232.00	4,690.80	8,807.40
Hourly Wage Plus Fringe Benefits (in dollars)	2.84	2.84	2.84	2.84
LABOR COST SAVINGS (in dollars)	67.65	107.14	225.16	422.76
LABOR SAVINGS IN PERCENTAGE OF TOTAL LABOR COSTS	5.27	4.41	3.85	3.64

the difference by 180 days. This total adjusted labor time difference for one school year was then multiplied by the previously established hourly wage rate plus fringe benefits to determine the labor cost savings of choosing the bulk service system. The percentage of labor cost savings at each volume level is equal to the percentage difference in labor time at each volume level.

A money savings of $67.65, or 5.27 percent of total labor costs, for 100 meals up to $422.76, or 3.64 percent of the total labor costs, for 1,000 meals can be realized with the use of the bulk service system during one school year.

Student Acceptability

The fourth objective was to compare results of student acceptance ratings as indicators of general acceptance of the bulk satellite service system and the prepackaged plate service system. Even though a service system may reduce some cost as compared to another type of service through its labor-saving characteristics, the quality of the service must be accepted by the students if the school food service objectives are to be met.

The mean acceptance scores for each service system, bulk and prepackaged plate, are listed in Table 9 for each of the test periods observed. These means were calculated from the numbers assigned to the faces used to represent the five-point facial hedonic scale. The number "five" was assigned to the happiest face, with the unhappiest face given the number "one". Twenty-five responses made up each sample.

The reliability of the procedures used to collect the acceptance data was considered to be acceptable. The over-all acceptance rating

Table 9

Mean rating of acceptability for two service systems

Replications	Bulk[1]	Prepackaged Plate[1]	Significance[2]
1	4.6	3.4	
2	4.4	3.1	
3	4.3	3.4	
4	4.8	3.2	
5	4.3	4.0	
6	4.0	3.2	
7	4.5	2.4	
8	4.3	3.2	
9	4.5	2.0	
10	4.8	2.2	
11	4.2	2.6	
12	4.4	2.8	
13	4.2	2.5	
14	4.6	1.6	
15	4.4	2.2	
Over-all Acceptability Mean[3]	4.42	2.78	**

1. N = 25

2. The symbol ** represents a significant difference determined at the .05 level by the "t" test.

3. The over-all acceptability mean is the mean value score obtained from all 15 replications for each service system.

for the bulk satellite service system was 4.42, compared with 2.78 for the prepackaged plate satellite service system. The "t" test, at the five percent significance level, was used to show whether there was any significant difference between the over-all acceptability means of the two service systems. There was a signicant difference in the preference of the student customer for the bulk system over the prepackaged plate system.

CONCLUSIONS

This study was undertaken to determine the direct labor requirements and student customer acceptability of two methods of satellite food service, realizing that there are limitations to conclusions than can be drawn from observations of one food service. The results of this study appear to support the selection of the bulk service system for satellite feeding, as compared to the prepackaged plate service system, when related to direct labor cost and student acceptability. The bulk service system, as observed in this study, required less average total labor man-minutes and a smaller direct labor cost for thirty-six meals than the prepackaged plate system.

The majority of the total time for each service system was spent in preparing plates for the children and serving these plates. Since this particular activity occurred only once during a serving period in the bulk system, as compared to twice in a serving period for the prepackaged plate system, employee scheduling could be the key to further labor cost savings in addition to reducing labor cost due to a reduction of total man-minutes. A part-time employee could be hired to carry out this serving work process, since the serving period occurred only once at the actual lunch period. This person would not need to be trained in actual food production and thus have a rate lower than food preparation personnel or at a rate containing no fringe benefits.

The prepackaged plate service system required a large number of man-minutes at two points during the plate service. In the morning personnel

were needed for packaging the plate and again at meal time for the actual serving of the plates to children. Since split-shift schedules are not feasible for part-time employees in a normally short work day, top-wage food preparation people are used currently in the morning in the kitchen for packaging the plates. Part-time employees, who may or may not be food production employees, can be utilized for distributing the plates in the satellite school. The bulk service system continued to require less average total adjusted labor than the prepackaged plate system as the number of meals projected was increased from 36 to 100, 200, 500, and 1,000. Thus, scheduling problems and production wage rates could be eliminated or reduced through use of the bulk satellite service system.

In addition to requiring fewer labor man-minutes, resulting in a lower direct labor cost than the prepackaged plate service system, the bulk system was the more highly rated system by the student customers. The bulk service received an over-all acceptability rating of moderately liked, as compared to moderately disliked for the prepackaged plate. This difference of acceptance was significant at the five percent level of significance.

With the resulting acceptability ratings and the lower direct labor cost of the bulk service system, as compared to the prepackaged plate service system, the economics and acceptability do not have to be weighted by school food service administrators in this particular situation when considering the choice between the two systems. If a difference did occur between labor cost and acceptability, management would then have to develop a weighting system for these two variables.

The present study showed that there are some economic advantages as well as better student acceptance through the use of the bulk satellite

service system. With this student acceptance, development of the bulk service system for school food service satellite feeding should afford some economic advantages over a prepackaged plate system.

With development of the bulk system into a school food service organization, savings in direct labor time gives a manager an opportunity to increase the number of meals served from a central kitchen without additional employees and to realize actual savings in labor costs through reduced labor time requirements and/or rescheduling of employees.

There is a need for further investigation of labor requirements and of student acceptability for these two service systems of satellite feeding, as well as of other methods of satellite feeding. The controversy still goes on among school administrators as to whether or not to build kitchens in new schools, add kitchens to presently used schools, or which type of satellite feeding to institute if a kitchen is not provided. Recommendations for further study of whether or not to choose a satellite system and/or which type of satellite service to choose include the following: student acceptance of the bulk service system and an on-site kitchen service, labor time studies at larger volume levels for bulk and prepackaged plate, volume level at which the bulk system becomes prohibitive due to time and facilities, additional labor time and cost over an extended period of time for clean-up using disposables and permanentware, and a comparison of labor costs and of investment and maintenance in equipment and space for an on-site kitchen and a bulk satellite service school over twenty years.

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APPENDIX A

WORK PROCESSES AND WORK ELEMENTS

FOR THE BULK SERVICE SYSTEM

APPENDIX A

WORK PROCESSES AND WORK ELEMENTS DEFINED
FOR THE BULK SERVICE SYSTEM

I. Portioning: Rationing by weight or volume into pan or container, or into individual portion sizes for ultimate service.

WORK PROCESS	WORK ELEMENT
Portioning	1. Assemble and preheat conveyance storage equipment within work area.
	2. Divide product into individual portion sizes if necessary.
	3. Pack individual portions for transport.
	4. Cover all menu items for transport.
	5. Transport all menu items to conveyance storage equipment.
	6. Place all menu items in conveyance storage equipment.

II. Finished Preparation Transportation: Transportation involved after the meal has been prepared.

WORK PROCESS	WORK ELEMENT
Finished Preparation Transportation	1. Pack and transport to loading area all eating and serving utensils.
	2. Transport all menu items in conveyance storage equipment to loading area.
	3. Load all food and utensils into transportation vehicle.
	4. Unload all food and utensils from transportation vehicle at satellite school.

III. Serving: All activity concerned with serving the finished meal to customers.

WORK PROCESS	WORK ELEMENT
Serving	1. Transport all food and serving and eating utensils to serving area.

WORK PROCESS	WORK ELEMENT
Serving (cont'd)	2. Assemble required eating utensils in serving area.
	3. Assemble required menu items and serving utensils on serving line.
	4. Serve menu items on individual compartmental trays.
	5. Replenish food as needed on serving line from storage conveyance equipment.

IV. Clean-up: All activity concerned with cleaning up serving area.

WORK PROCESS	WORK ELEMENT
Clean-up	1. Remove unserved food and used serving utensils to storage conveyance equipment.
	2. Transport unserved food and used serving utensils to loading area.
	3. Obtain all used eating utensils.
	4. Transport containers of eating utensils to loading area.
	5. Clean serving area.

V. Finished Preparation Transportation: Transportation involved after the meal has been prepared.

WORK PROCESS	WORK ELEMENT
Finished Preparation Transportation	1. Load all food and utensils into transportation vehicle.
	2. Unload all food and utensils from transportation vehicle at central kitchen.

VI. Personal: Time in which no productive activity is performed, applied under all processes.

WORK ELEMENT
1. Idle non-productive time.
2. Delay time due to other factors, such as waiting for a class to come to the mobile serving area.

APPENDIX B

WORK PROCESSES AND WORK ELEMENTS

FOR THE PREPACKAGED PLATE SERVICE SYSTEM

APPENDIX B

WORK PROCESSES AND WORK ELEMENTS DEFINED
FOR THE PREPACKAGED PLATE SERVICE SYSTEM

I. Portioning: Rationing by weight or volume into individual portion sizes for packaging for service.

WORK PROCESS	WORK ELEMENT
Portioning	1. Divide prepared food into individual portions, if necessary, before placement on packaging line.
	2. Cover product until packed for service.

II. Preparation for Merchandising: All activity concerned with the preparation of the finished product including plating correct portions, garnishing, and storing until actually served to the customer.

WORK PROCESS	WORK ELEMENT
Preparation for Merchandising	1. Assemble serving utensils on packing line.
	2. Secure packing cups and lids or individual waxed paper bags, styrofoam plates, and storage containers.
	3. Arrange product or mixture into individual packing cups or bags, close cup or bag, and load into storage containers.
	4. Replenish product or mixture from temporary storage.
	5. Assemble required menu items on packing line.
	6. Portion menu items into individual plates and load into storage containers.
	7. Replenish menu items as needed from temporary storage.

III. Clean-Up: All activity concerned with cleaning up the packing line.

WORK PROCESS	WORK ELEMENT
Clean-Up	1. Remove serving utensils and empty pans to dishwashing area.

WORK PROCESS	WORK ELEMENT
Clean-Up (cont'd)	2. Remove unserved food to temporary storage.
	3. Clean packing area.

IV. Finish Preparation Transportation: Transportation involved after the meal has been prepared.

WORK PROCESS	WORK ELEMENT
Finished Preparation Transportation	1. Transport food storage containers and eating utensils to loading area.
	2. Load all containers into transportation vehicle.
	3. Unload all containers from transportation vehicle at satellite school.

V. Serving: All activity concerned with serving the finished meal to the customers.

WORK PROCESS	WORK ELEMENT
Serving	1. Transport all food storage containers and eating utensils to the serving area.
	2. Set up all food and utensils for service.
	3. Remove food from temporary storage.
	4. Assist children with obtaining food and eating utensils.

VI. Clean-Up: All activity concerned with cleaning up serving area.

WORK PROCESS	WORK ELEMENT
Clean-Up	1. Remove unserved food and used eating utensils to temporary storage.
	2. Clean serving area.

VII. Finished Preparation Transportation: Transportation involved after the meal has been prepared.

WORK PROCESS	WORK ELEMENT
Finished Preparation Transportation	1. Transport all food storage containers and eating utensils to loading area.
	2. Load all containers into transportation vehicle.

WORK PROCESS	WORK ELEMENT
Finished Preparation Transportation (cont'd)	3. Unload all containers from transportation vehicle at central kitchen.

VIII. Personal: Time in which no productive activity is performed, applied under all processes.

WORK ELEMENT
1. Idle non-productive time.
2. Delay time due to other factors, such as waiting for a class to come to the mobile serving area.

APPENDIX C

ACTUAL MENUS

DURING THE OBSERVATIONS OF THE

BULK SERVICE SYSTEM

APPENDIX C

Type A actual menus served in the elementary schools using the Bulk Service System

2/26	2/27	2/28	3/1
Meat Loaf	Corn Dog	Oven Fried Chicken	Hamburger on Bun
Mashed Potatoes C	French Fries	Sweet Potatoes A&C	Rice
Green Beans	Kale A&C	Green Peas	Mixed Vegetables
Hot Roll	Hot Roll	Hot Roll	Citrus Sections C
Red Devil's Food Cake	Fruit Cup	Oatmeal Cake	
3/2	**3/5**	**3/6**	**3/7**
Lasagna	Turkey Tetrazini	Tomato Soup C	Frankfurter on Bun
Mixed Greens A&C	Buttered Broccoli A&C	Chicken Salad Sandwich	w/Chili Sauce
French Roll	Hot Roll	Potato Sticks	Mashed Potatoes C
Tropical Apples	Cinnamon Applesauce	Banana	Green Peas
			Pineapple Upside Down Cake
3/8	**3/9**	**3/19**	**3/21**
Pizza	Fish Square w/Tartar Sauce	Spaghetti w/Meat Sauce	Pepper Steak
Green Beans	Hash Brown Potatoes	Mixed Greens A&C	Mashed Potatoes C
Cole Slaw C	Spinach A&C	French Roll	Whole Wheat Roll
Hot Roll	Hot Roll	Sliced Peaches	Apple Crisp
Peanut Butter Cookie	Spice Cake		
3/23	**3/27**	**3/28**	
Chicken and Noodles	Sloppy Joe on Bun	Roast Turkey w/Dressing	
Sweet Potatoes A&C	French Fries	Sweet Potatoes A&C	
Green Peas	Cole Slaw C	Green Beans	
Hot Roll	Chewy Peanut Butter Bar	Hot Roll	
Yellow Cake w/Chocolate Icing		Cake w/Icing	

APPENDIX D

ACTUAL MENUS

DURING THE OBSERVATIONS OF THE

PREPACKAGED PLATE SERVICE SYSTEM

APPENDIX D

Type A actual menus served in the elementary schools using the Prepackaged Plate Serving System

3/12 Hamburger on Bun French Fries Mixed Greens A&C Hermits	3/13 Chili Beans w/Meat Sauce Tossed Salad A&C Hot Roll Peach Crisp	3/14 Oven Fried Chicken Sweet Potatoes A&C Green Peas Hot Roll Gingerbread	3/20 Corn Dog Buttered Corn Spinach A&C Hot Roll Oatmeal Cake
3/22 Fish Square w/Tartar Sauce French Fries Cole Slaw A&C Hot Roll Brownie	3/26 Frankfurter on Bun w/Chili Sauce Baked Beans Kale A&C Fruit Cup	3/29 Meat Loaf w/Tomato Sauce Mashed Potatoes C Green Peas Whole Wheat Roll Chocolate Pudding	4/2 Turkey Shortcake Rice Green Beans Citrus Sections C
4/3 Lasagna Tossed Salad C Hot Roll Tropical Apples	4/4 Hamburger on Bun Sweet Potatoes A&C Mixed Vegetables Brownie	4/5 Oven Fried Chicken Mashed Potatoes C Green Peas Whole Wheat Roll Apple Pie	4/6 Fish Square on Bun French Fries Spinach A&C Yellow Cake w/Chocolate Icing
4/9 Spaghetti w/Meat Sauce Mixed Greens A&C French Roll Fruit Cup	4/10 Pork Barbecue on Bun Mashed Potatoes C Green Peas Chocolate Pudding	4/11 Corn Dog French Fries Tossed Salad A&C Hot Roll Peach Crisp	

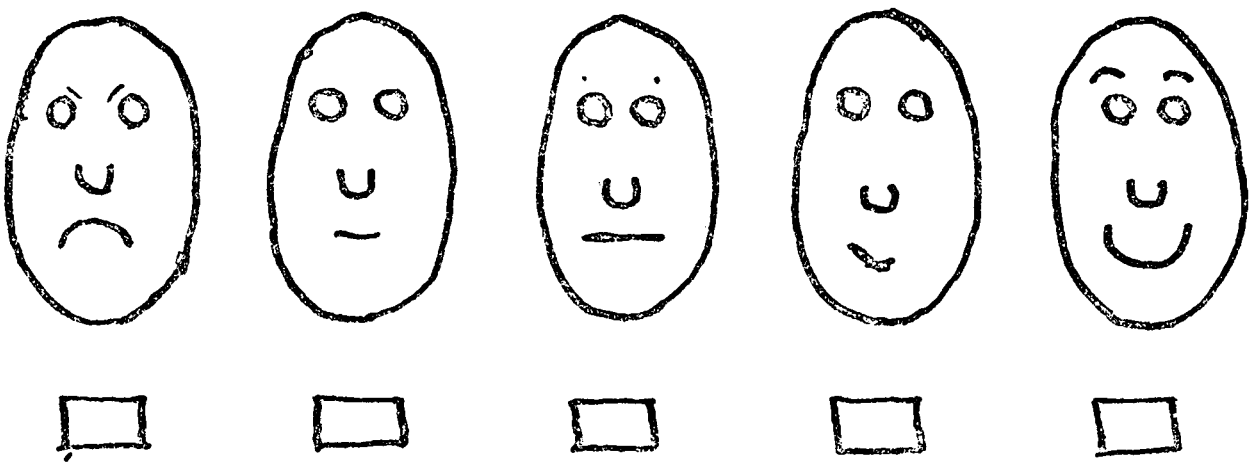
APPENDIX E

FACIAL HEDONIC SCALE

APPENDIX E

Facial hedonic scale questionnaire used in each satellite school for measuring the acceptability of each type of service system

AGE _____ SCHOOL _____



CHECK THE SQUARE BELOW THE FACE WHICH SHOWS HOW YOU FEEL ABOUT THE WAY YOUR FOOD IS SERVED.

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DETERMINATION OF PROJECTED DIRECT LABOR TIME FOR TWO METHODS OF SATELLITE FEEDING- INDIVIDUAL PREPACKAGED PLATE MEALS AND BULK TRANSPORT MEALS

by

Nancy L. Hargroves

(ABSTRACT)

The purpose of this study was to determine for two methods of satellite food service being used in school lunch programs--bulk and prepackaged plate--the direct labor time and costs for a specified number of meals served. Student customer acceptability for each type of service system was also investigated.

Time studies were used to collect the data for the direct labor requirements. Times were recorded with the use of a stopwatch on charts of the work processes and work elements involved in the central kitchen and in one satellite school for each service system. Readings from the stopwatch and an effort rating were begun from the time the prepared food was ready to be processed for transportation, through actual service to the child and clean-up in the satellite school. Data were collected in the Roanoke City School Food Service Department over a period of thirty days.

From these data, labor time and costs were projected for selected volume levels for both systems. Wage rates used to compute costs

represented the highest food service wage rate plus fringe benefits currently paid in the school system.

Facial hedonic scales for acceptability of the service systems were given daily to twenty-five randomly selected elementary school students at the satellite schools.

The bulk service system, in this study, required less average total labor time and cost at volumes from 36 to 1,000 meals due to a reduction in total man-minutes and to a possibility for more economical employee scheduling. The bulk service system also was significantly more acceptable to elementary-aged children than the prepackaged plate.

From the economic and student acceptance data in this study, it appears that development of a bulk service system would be feasible for school food service satellite feeding.