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A COMPARISON OF TWO APPROACHES TO NUTRITION EDUCATION  
AT THE THIRD GRADE LEVEL

by

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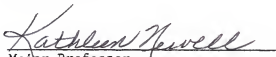
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## INTRODUCTION

In the United States, there is growing concern for the nutritional status of the population. Numerous groups, including educators and politicians, are requesting more nutrition programs and more funds are being made available for nutrition education. Despite the increased emphasis, there is little evidence that the majority of people are changing their dietary habits or are eating the foods which they need to live longer and healthier lives.

The ineffectiveness of nutrition education in changing eating habits may be attributed in part to school curricula and to teachers who either lack sufficient knowledge of nutrition or awareness of instructional materials (1). In most elementary schools, nutrition is an optional subject and the lessons that are taught on this subject are dependent upon the interest of the teachers and their college preparation in nutrition. Nutrition information in health textbooks may be limited and more effective instruction materials may not be available to teachers. Considerable emphasis is being placed on requiring nutrition education in school curricula. According to Leverton (2), that requirement will do little toward developing nutritional literacy unless teachers are trained adequately and sequential courses from kindergarten through grade twelve are made available and followed.

The standard educational approach to nutrition in the United States today is the Four Food Groups. The effectiveness of that

approach is being questioned by a growing number of nutrition educators (1-4). They point out that a large proportion of children have been "turned off" by nutrition teaching which includes only the Basic Four Food Groups through several consecutive grades. They believe that children are capable of learning much more about nutrient needs and the composition of foods than is being taught at the present time. Furthermore, it was suggested at the 1971 National Nutrition Education Conference that a teaching approach focusing on nutrients might be preferable to one based on food groups (5).

Paul Lachance (4) called attention to the urgent need to test effective approaches to nutrition education. Mayer (6) has stated that "Nutrition education is not only teaching of facts or ideas; it is changing behavior--and a very basic behavior at that." He urged nutritionists and educators to experiment with various ways to change eating habits and to keep careful notes on what works and what does not work. In an extensive study of children's food consumption behavior, two investigators (7) concluded that new and exciting ways to present nutrition information need to be studied and developed.

The mounting problem of plate waste in school lunch programs is further justification for developing more effective techniques in nutrition teaching. An average of 20 percent of food served in school lunch programs is wasted (8). In one school lunch study, grades one through three were found to have the largest per-portion amount of plate waste (9).

School-age children are one of the primary target groups for nutrition education. Hoffer (10) characterized elementary school children as receptive to nutrition education because a) they provide a captive audience, b) they are reached more easily than at any other time of life, c) they are flexible, open-minded, curious, and eager to learn, d) they accept new knowledge and new habits readily, e) their range of interests is increasing continually, and f) they can take nutrition education home to their families. As one author stated (11), "It is easier to teach than to change." The younger the child, the easier to teach him nutrition.

The present study was designed to compare the effectiveness of the standard approach to nutrition education, the Four Food Groups, with a new nutrient approach. In an attempt to determine if the latter approach was better, a written test was used to assess nutrition knowledge and plate waste in the school lunchroom was measured to determine any change in eating behavior.

## REVIEW OF LITERATURE

## Past and Present Status of Nutrition Education in Schools

Twenty years ago it was stated that teachers had an interest in nutrition education, but that lack of college training and confusion resulting from fads and food advertising limited their instruction and effectiveness (12). In 1971, one of the limiting obstacles in nutrition education was still the one million teachers with little or no nutrition training and no well-defined plans for teaching nutrition (13). Past nutrition programs tended to emphasize acquisition of nutrition facts rather than development of good food habits (14). That emphasis might be responsible for nutrition education's reputation of being "notoriously dull and ineffective" (15).

The Basic Four Food Groups approach is used most widely in elementary schools today. Frances Dobbins (16) has asserted that at ages eight, nine, and ten, information on the nutrients is rather meaningless and that an attempt to teach nutrition subject matter more advanced than the food groups may be ineffective and decrease interest in the nutrients in upper grades. The techniques and activities that are used to present the Basic Four Food Groups are many and varied. Learning activities that have been used with all age groups include: a "two-bite" club to encourage children to take at least two bites of every food on their tray at lunch, field trips to dairies, grocery stores, freezing plants, or bakeries, tours of kitchen facilities, animal feeding experiments, preparation of simple snacks in the classroom, and identification of foods by sense of touch (17-19). Food models, bulletin

boards, flannelgraphs, demonstrations, films, filmstrips, slides, records, recordings, puppets, songs, skits, and display and discussion of Type A lunches are audio-visual aids that have been used (20-23).

Learning activities that have been used for kindergarten and first grade students have included the following:

- drawing pictures of what they eat for breakfast
- talking about the food their pets eat
- servicing vegetables on toothpicks at a "lollipop vegetable party"
- sampling various types of fruits at a fruit basket party
- contrasting "food friends" (foods they like) with "food strangers" (foods they have not yet learned to like) and having them select one they are willing to try
- arranging pictures of fruits and vegetables on a bulletin board and placing a flag with the student's name on each picture of food he tastes
- assembling a "health train" composed of four milk cartons, each one filled with pictures from one food group
- drawing a clock face and measuring the time from the evening meal until breakfast to emphasize the importance of breakfast (17).

Second and third grade students have participated in projects such as making a mural of a local food product and its processing, writing "thank you" letters to the school lunch staff, keeping a food record for one day, and using the school lunch menu to classify the foods according to the Four Food Groups (17). Food group relays in which points were earned by placing food models in the correct food group bag, a bean bag toss with four containers representing the four food groups, board games, card games, nutrition instruction of younger children, and solution of crossword puzzles have been used as learning activities for students in upper elementary grades (24-26).

Traditionally, nutrition has been taught as a part of health education and home economics courses. More recently, nutrition educa-

tion has been incorporated into other courses in the curriculum (21). Studies of food from different countries have been included in social studies units. Older children have studied the nutrients in science units and younger children have grown plants as science projects. Poems, riddles, and stories about food and nutrition have been written in English courses. Using play money to purchase nutritious meals from an improvised cafeteria, counting calories, and figuring costs and amounts of food used in school lunchrooms have been used to relate nutrition to mathematics. Nutrition posters, collages, and mobiles have been constructed in art classes. The use of posters displaying caloric values and nutrient composition of foods in school lunchrooms and measurement of plate waste by older students have contributed to nutrition education.

In spite of the numerous techniques and learning activities that have been used to teach the Four Food Groups pattern, there has been much criticism of its effectiveness. Sinacore and Harrison (15) stated that often teachers and students think of the Four Food Groups as a set of standards to be learned. Many times teaching the Four Food Groups has become the only objective of the instructors (15). Because of the ineffectiveness of nutrition education in schools, Sodowsky (27) has suggested that instruction in nutrition and the use of innovative methods of teaching and integrating nutrition into the curriculum should be required for certification of all elementary school teachers.

Hicks (1) has described the Four Food Groups pattern as rigid and inflexible because it dictates which foods should be eaten and how



much should be eaten. She stated that when the food groups are introduced before the students comprehend their nutrient composition, it interferes with sequential understanding of nutrition and results in rote memorization without comprehension. Poolton (5) and Osman (3) agreed that the Four Food Groups approach is not adequate to accomplish the desired results in nutrition education. Poolton (5) suggested that extensive use of the Four Food Groups approach may affect adversely students' interest in nutrition. According to Giffit et al. (28), an eleventh grade student who had been taught the Four Food Groups through the tenth grade expressed the opinion that by that time, the subjects of nutrition and proper eating habits had been drummed into his head and he was sick of hearing about the Four Food Groups.

One critic (29) of the Four Food Groups pattern reported that menus based on the pattern resulted in inadequate diets. King et al. (29) evaluated the nutrient content of twenty published menus based on the Four Food Groups pattern and found that those menus provided 60 percent or less of the 1974 Recommended Dietary Allowances (30) for vitamin E, vitamin B<sub>6</sub>, magnesium, zinc, iron, and energy. Another criticism directed toward the Four Food Groups pattern is that it is not consistent with nutritional labeling which is nutrient-based (31).

#### Needs in Nutrition Education

Ruth Leverton, former Science Adviser to and Assistant Deputy Administrator of the Agricultural Research Service, United States Department of Agriculture (USDA), defined nutrition education as "a multidisciplinary process that involves the transfer of information,

the development of motivation, and the modification of food habits where needed" (2). Thus, the goal of nutrition education is not merely to teach facts, but to guide the behavior of children by establishing good food habits which will result in intelligent food selection day by day (15, 32). In both the first and third annual reports of the National Advisory Council on Child Nutrition, the importance of nutrition education in improving nutritional status has been stressed (33, 34). Even so, at the present time, nutrition education is integrated poorly into the school curriculum, which is a contradiction of the National School Lunch Act (35).

Nutrition education is needed to correct nutritional inadequacies in children's diets. In the Ten-State Nutrition Survey (36), dental problems, retarded growth, and low serum levels of vitamin C, protein, riboflavin, thiamin, calcium, iron, and vitamin A were found in low income elementary school children. Dietary practices that have been reported (17) to contribute to nutritional problems of school children include omission of breakfast, empty calorie snacks, inadequate meals at home, and food likes and dislikes.

Special attention has been given to the adequacy of breakfasts eaten by school age children. In Massachusetts, Callahan (37) found that 24 percent of the public school children ate inadequate breakfasts. Thirteen percent of the 24 percent ate no breakfast. Because hunger can influence learning and behavior, particularly in terms of the ability to concentrate, it is especially important to emphasize eating a good breakfast in nutrition education (38). Tuttle et al. (39) found

that the maximum work rate and maximum work output of boys ages twelve to fourteen were significantly better when a basic breakfast was included than when omitted.

The need for introducing nutrition education early in life and the importance of schools in providing that education has been recognized by nutritionists since 1929 (40). Emmons et al. (32) stated that schools are logical centers for nutrition education. Smey (12) called the elementary school the "ideal situation to begin and nurture nutrition...education" and pointed out that if children are not exposed to a definite program of nutrition education early, they are apt to confine their food choices to favorite foods for the rest of their lives.

An important aspect of nutrition education is the development of positive attitudes toward food. Because television may have negative influences on children's ideas of good food (41), day-to-day reinforcement of good food habits by classroom teachers has assumed greater importance. Lund and Burk (7) emphasized the need to recognize the impact of food attitudes on eating behavior. Poolton (5) stated that attitudes must be a priority criterion for evaluation of teaching methods. Travers (42) pointed out that many expressed attitudes correlate poorly with behavior. However, attitudes are considered to be intervening variables which must be measured before behavior can be predicted. Thus, attitude measurement has become an important factor in the determination of the effectiveness of nutrition education.

Participants in the White House Conference on Food, Nutrition, and Health in 1969 (15), and the National Advisory Council on Child

Nutrition in 1974 (34), stressed the need to develop a comprehensive nutrition education program in every school. During the White House Conference on Food, Nutrition, and Health (15), it was stated that "a dynamic nutrition education program that begins in early childhood and continues through the elementary and secondary schools can help young children to acquire positive attitudes toward food." Sinacore and Harrison (15) cited the importance of building on previous learning rather than repeating the same information year after year. Ideally, the burden of nutrition education would rest on the home and the schools would serve to reinforce the education received there. However, as White (43) pointed out, that situation is not a reality at present, so there is no choice but to undertake nutrition education programs in public schools.

Lund and Burk (7) have called attention to the need to study and develop new and exciting ways of bringing sound nutrition knowledge to people of all ages. As a result of a study conducted over thirty years ago, Neel (44) concluded that elementary school children could assimilate more advanced nutrition information than was being presented. The need for more creative and meaningful nutrition education was cited by MacReynolds (45). The benefits of teaching nutrients rather than food groups were suggested at the National Nutrition Education Conference in 1971 (5). Manoff (31) recognized that "Foods are vehicles for nutrients, and food-based information will still be important, but only with the underpinning of nutrient sophistication." Hicks (1) stated that once a child has learned basic knowledge about nutrient needs and

sources, he will form his own food classification system and guide to eating which will have more meaning than memorizing established groups.

Several programs have been developed which combine the nutrient and food group approaches. A program for children from kindergarten through third grade was developed by Nutrition Dynamics, Inc. (46). Five food groups were used and protein, carbohydrate, fat, vitamins, and minerals were designated as the "five nutes." Two other programs, Big Ideas in Nutrition Education (47) and the Mulligan Stew series (48), have included a nutrient approach. Big Ideas in Nutrition Education (47), developed by the Dairy Council of California, was based on a four-part instructional model including objectives, diagnosis or pretest, learning opportunities, and evaluation or posttest. Big Ideas in Nutrition Education has now been replaced by Food...Your Choice (49), a sequential nutrition learning system geared to the development of students from kindergarten through sixth grade. The Mulligan Stew program, developed through a special needs project funded by the Extension Service USDA, was based on the adventures of children in films and comic books. Learning activities included "nutritional missions" with specific assignments for each group.

#### Nutrition Education and Food Habits Studies

Differences in test scores on pre-, post-, and retention tests have been used to evaluate the effectiveness of nutrition education. Measurement of plate waste in school lunchrooms or dietary recalls before and after presentation of a nutrition education unit have been used to determine changes in eating behavior resulting from instruction.

Boysen and Ahrens (50) found little change in diets of second grade students as a result of a nutrition education program although students in the experimental group had higher scores on cognitive tests after instruction. Baker (51) reported similar results in a study of fourth and fifth grade students.

In a nutrition education program involving fifth, seventh, and tenth grade students, Head (52) found significant improvements in nutrition knowledge as measured by cognitive tests for all fifth grade classes and one seventh grade class. Three-day dietary recall data indicated that diets of seventh grade students improved after the nutrition education program. Plate waste from school lunches decreased significantly for fifth grade students. The amount of change in test scores and eating behavior decreased progressively at higher grade levels.

In another study (53), the Mulligan Stew nutrition film series was presented to fourth grade students and its effectiveness was measured by a written pre- and posttest and a dietary study using three-day food records before and after the program. The experimental groups increased their nutrition knowledge more than the control groups as indicated by their test scores. The experimental group that showed the greatest amount of improvement in scores from pre- to posttest also showed the greatest improvement in their nutrient intake. However, the results of the dietary study were inconclusive.

Several studies have been conducted to evaluate the effectiveness of Big Ideas in Nutrition Education (47). Bell and Lamb (54), using a six-week nutrition module based on that program, showed an

increase in the cognitive learning for fifth grade students receiving instruction, but no dramatic changes in eating habits were observed. Using the same program, Cooper and Murray (55) reported improvement in the nutrition knowledge of third grade students as a result of instruction and improvement in eating behavior by those children. They suggested that students may have reported what they thought they should have eaten rather than what they actually consumed. According to researchers, those reports indicated a positive change in attitude toward the importance of food which was a step in the right direction.

Lovett et al. (56) studied the effectiveness of nutrition teaching by three groups of elementary school teachers who were supplied with various resources. One group of teachers had been trained by Dairy Council personnel and had received their teaching materials, another group was supplied with the prepared materials from the Dairy Council and general objectives taken from health curriculum guides, and the third group was given general objectives only. Students who were taught nutrition by trained teachers using prepared materials from the Dairy Council improved more in basic nutrition knowledge and ability to apply that knowledge than students whose teachers were given prepared materials and objectives only.

Meyers and Jansen (57) evaluated the effectiveness of a nutrient approach to nutrition education of fifth grade students. The nutrition unit was designed to stimulate the interest of the students by relating subject matter to the science curriculum and meal planning in the school lunchroom. Learning activities centered around a nutrient abacus, an instrument for calculating nutrient composition of school

lunchroom menus by sliding counters along rods. The nutrition unit was taught by classroom teachers who had attended three inservice sessions to familiarize themselves with the material. The following concepts adapted from the New York State Curriculum Guide (58) for grades four through six were used:

1. The body (cells) uses nutrients from food for energy, growth, and maintenance.
2. Nutrients needed by the body (cells) come from a variety of foods. Some foods contain more nutrients than others.
3. To ensure that the cells get enough of each nutrient, a variety of foods should be eaten.

Three experimental groups and one control group were given a pre- and posttest and the other experimental and control group were given only the posttest. Nutrition knowledge of the experimental groups as measured by a written test administered before and after the unit improved significantly as a result of the nutrition unit. Response to a question which attempted to elicit students' opinions about their interest in nutrition indicated that the unit stimulated their interest. No plate waste studies were conducted by the researchers because it appeared unlikely to them that a three-week nutrition unit would result in immediate changes in food habits.

Food waste in school lunchrooms is costly, but more important, children do not receive the nutrients which the menus should provide when food is not consumed. One factor that has made it difficult to reduce plate waste in school lunchrooms is the fact that many families waste food at home. Harrison et al. (59) reported that in an urban population, the average household wasted between eighty and one hundred dollars worth of edible food per year. According to Lachance



(60), school foodservice "cannot be expected to remedy the plate waste habits of children whose families waste food."

Plate waste studies and determination of children's attitudes toward food have shown that green and yellow vegetables were the most disliked foods. In 1958, Patton et al. (61) reported very low consumption of vegetables by students. Walker et al. (62) found a significant decrease in fruit and vegetable intake by students between 1955 and 1965. Most of the decrease was attributable to the lower consumption of dark green and deep yellow vegetables.

Todhunter (63) stated that it is only through nutrition education programs that we can hope to improve the health of human beings and the only way to develop those programs is through research. Although it is recognized that nutrition education is needed, the best ways of accomplishing those goals are still unknown (6). According to Briggs (64), basic and applied research in human nutrition and nutrition education must be supported and intensified to answer such questions as "What are the most effective means of reaching people with nutrition information?" and "How can the food habits of the young child, the adolescent, and the adult be improved?" In response to those needs, the ninety-fifth Congress (65) has authorized a system of grants to state educational agencies to formulate and implement nutrition education programs in schools and child care institutions.

## MATERIALS AND METHODS

## Permission to Use Human Subjects

Permission to conduct a study comparing two approaches to nutrition education at the third grade level was obtained from the School Foodservice Director of the Manhattan Public Schools. The Rights of Human Subjects Checklist (Appendix, p. 48-49) was completed and submitted to the Chairperson of the College of Education Rights of Human Subjects Committee who recommended its approval to the Dean of the College of Education, Kansas State University. After consent to conduct the study was granted, a letter requesting permission to conduct the study using third grade students from selected Manhattan Elementary Schools was written to the superintendent (Appendix, p. 50) accompanied by a letter of approval from the Dean of the College of Education (Appendix, p. 51). A copy of the research proposal and the necessary forms (Appendix, p. 52-54) were sent to the University Committee on Research Involving Human Subjects which also granted permission to conduct the study (Appendix, p. 55).

## Preliminary Study

A preliminary study was conducted for the two-fold purpose of testing the instrument and presenting the nutrition instruction. Two third grade classes at Marlatt Elementary School participated in the preliminary study. Learning objectives were written for two approaches to nutrition education, Four Food Groups and Five Nutrients. In five thirty-minute lessons, one group of students received instruction on the Four Food Groups which was patterned after that used by third grade

teachers in Manhattan. Instruction based on the Five Nutrients program designed by Nutrition Dynamics, Inc. (46) was presented to the other group. The decision was made to extend the nutrition instruction to ten thirty-minute lessons in the experimental study.

Tests covering the information taught in the nutrition lessons were given to assess nutrition knowledge of the students. Two fifty-question tests were developed by writing two questions for each objective and assigning one question to each test to assure that they were of equal difficulty. Each class was given the same fifty-question test before and after the instruction. To judge the acceptability of each question, the percentage of students answering each question correctly was determined. Questions that were answered correctly by approximately 30 to 75 percent of the students on the pretest and 50 to 99 percent on the posttest were accepted. Based on the item analysis of the tests, an instrument was developed for use during the experimental study.

A one-way analysis of variance was performed on the pre- and posttest means and the changes from pre- to posttest means to determine if those means were equal. The analysis of variance was performed on the Four Food Groups questions and Five Nutrients questions separated and combined.

#### Experimental Study

The sample. Four classes of third grade students in two Manhattan Elementary Schools, Eugene Field and Bluemont, were selected to participate in the study. In each school one class of third grade students served as the control group and the other class served as the experimental group. The experimental group in each school received instruction

on either the Four Food Groups or the Five Nutrients. The control and experimental groups participated in the plate waste study and the assessment of nutrition knowledge. Only the experimental groups received nutrition instruction. A control group in each school was used to check for the possible beneficial effect of having taken the test previously and to identify inherent differences among students in the two schools.

Permission to conduct the study was requested of the principals and the four third grade teachers of the two schools. The project was explained to the teachers during individual visits. A list of the third grade students in both schools was obtained from the teachers. A letter was sent to parents of all students asking for permission for their children to participate in the study (Appendix, p. 56).

Plate waste study. In order to measure any behavioral change attributable to the nutrition instruction, food consumption in the school lunchroom was measured during a three-day period before and after the instruction. The following menus were served on each of the three days at both schools:

## Menu 1

Turkey and Noodles  
Green and Wax Beans  
Tossed Green Salad with Dressing  
Red Apple Wedges  
Buttered Rye Roll  
Milk

## Menu 2

Batter Fish and Chips with Catsup  
Red and White Coleslaw  
with Creamy Dressing  
Chocolate Chip Cookie  
Buttered Cornmeal Roll  
Milk

## Menu 3

Sanchos with Lettuce,  
Cheese and Tomatoes  
Tiny Green Peas  
Orange Juice  
Milk

Although the same menus were served on each of the three days at both schools, the food was prepared in different kitchens and delivered to the schools. Data were collected during the same three-day period in each school to eliminate any differences caused by such factors as weather, season, and day of the week. To avoid influencing students' decisions to eat in the school lunchroom, no special arrangements were made to assure that the students ate in the school lunchroom on the days plate waste was measured. Plate waste data were collected by a two-member team at each school in cooperation with foodservice personnel.

The first three-day plate waste collection was conducted two weeks prior to the instruction period. Before the third grade students were served lunch, the edible portion of each menu item on five sample trays was weighed on a gram scale. The weights were recorded and the average serving size for each item was determined.

Trays from all third grade students eating the food served in the school lunchrooms were collected at both schools for three days. Two tables were set up for the purpose of collecting returned trays. After the students had left the cafeteria, the edible portion of each menu item remaining on the plate was weighed. The plate waste was recorded in grams, or with a zero if no waste was left on the plate. The amount of plate waste recorded was compared to the average serving to obtain percentage plate waste. The same procedure was followed for a three-day plate waste study two weeks after the instruction period. The menus served at both schools for the second three-day plate waste study were the same menus that had been served for the plate waste study prior to the instruction period.

Testing of nutrition knowledge. Four developmental objectives with specific learning outcomes were written for the nutrition instruction and test items were constructed based on those objectives (Appendix, p. 57). At least two test items were written for most of the specific learning outcomes stated. The proposed test items were evaluated for face validity, content validity and readability by two professors in the College of Education and modified according to their suggestions. The test was designed to measure understanding and application in 60 percent of its score.

The pre-, post-, and retention tests were identical in content, but the order of the questions was varied. Each test consisted of fifty four-option multiple choice questions (Appendix, p. 58-67). Twenty-five questions tested material presented in the Basic Four Food Groups instruction and twenty-five questions tested material presented in the Five Nutrients instruction so that the same test could be given to all groups of students. Because of the length of the test, it was divided and given on two days. The students were instructed to read the questions silently as the teacher read them aloud to eliminate errors attributable to poor reading ability.

The pretest was given to all four groups one week before the instruction period. Following the pretest, ten thirty-minute nutrition lessons, using the two approaches described previously, were taught to the two experimental groups. Upon completion of the lessons, a posttest was administered to all four groups, followed by a retention test six weeks later. Children saw the tests only during their administration, and test items and individual scores were not discussed with them.

Instruction. The nutrition instruction was presented in ten thirty-minute lessons. The two approaches were taught by the same instructor to decrease variability in presentation. The course content for both approaches (Appendix, p. 68-70) was planned to fulfill the developmental objectives. The experimental group at Eugene Field Elementary School received instruction based on the Five Nutrients program designed by Nutrition Dynamics, Inc. The lessons were patterned after those presented by the Nutrition Resource Person for Unified School District 383. Teaching aids provided in the Nutrition Dynamics, Inc. program were used. They included posters, stuffed toys representing the "nutes," and coloring books. In addition, the students watched a film, played word games, served nutrient-deficient laboratory rats, tasted nutritious snacks, and planned a school lunchroom menu which was served in the school cafeteria the following week.

The experimental group at Bluemont Elementary School received instruction on the Four Food Groups which was patterned after that used by third grade teachers in Manhattan. Teaching aids included all those used for the Five Nutrients program except the posters, stuffed toys, and coloring books. Activities planned specifically for the Four Food Groups instruction included identifying foods by sense of touch, demonstrating the amount of sugar in various foods, observing different types of grains, keeping a twenty-four hour dietary record, making a Four Food Groups chart, and putting together a balanced meal by pasting a picture from each food group on a paper plate.

Statistical analyses. The mean score was calculated for each control and experimental group on the pre-, post-, and retention tests as were the changes in mean test scores from pre- to posttest, post- to retention test, and pre- to retention test. For each variable, the values for a student were included only if pre-, post-, and retention test scores were available. A one-way analysis of variance was used to determine if the means of the four groups were equal. If the analysis indicated the means were different, least significant differences were calculated to decide which group(s) differed. The one-way analysis of variance was performed for each of the six variables mentioned above on the Four Food Groups and Five Nutrients questions combined and separated.



## RESULTS AND DISCUSSION

## Test of Nutrition Knowledge

Five Nutrients and Four Food Groups. The analysis of variance of test scores--Five Nutrients and Four Food Groups questions combined is presented in table 1. There were no significant differences for pretest scores (Table 2) among the four groups, Five Nutrients Experimental, Five Nutrients Control, Four Food Groups Experimental, and Four Food Groups Control. Those results were similar to those of Bell and Lamb (54) who reported no significant difference in the written pretest scores between experimental and control groups in a study of the effect of nutrition education on dietary behavior of fifth graders.

The mean test scores on the posttest, retention test, and the change in mean test scores from pre- to posttest showed significant differences. In each case the Five Nutrients Experimental group scored higher ( $P < 0.05$ ) than the other three groups. The change in mean test scores from post- to retention test for the Four Food Groups Experimental group did not differ from that of the Four Food Groups Control group nor did that of the Five Nutrients Experimental group differ from that of its corresponding control group. The nutrition knowledge of the Five Nutrients Experimental group decreased more ( $P < 0.05$ ) from post- to retention test than that of the Four Food Groups Experimental group. However, the gain in nutrition knowledge as indicated by the change in mean test scores from pre- to retention test was greater ( $P < 0.05$ ) for the Five Nutrients Experimental group than for that of

TABLE 1

Analysis of Variance of Test Scores and Test Score Changes---  
Five Nutrients and Four Food Groups Questions Combined

Source of variation	df	Mean Squares					
		Pre	Post	Retention	Pre to Post	Post to Retention	Pre to Retention
Groups	3	53.95	401.55***	179.93**	215.91***	53.63*	94.64**
Residual	63	22.30	29.35	30.15	15.52	17.10	17.20

\* Significant at  $P < 0.05$

\*\* Significant at  $P < 0.01$

\*\*\* Significant at  $P < 0.001$

TABLE 2  
Means<sup>1</sup> and Standard Errors of Test Scores and Test Score Changes--  
Five Nutrients and Four Food Groups Questions Combined

Test:	Five Nutrients Approach		Four Food Groups Approach	
	Experimental n=20	Control n=18	Experimental n=16	Control n=13
Pre	21.7 ± 1.12 <sup>a</sup>	20.2 ± 0.96 <sup>a</sup>	19.7 ± 1.11 <sup>a</sup>	17.2 ± 1.51 <sup>a</sup>
Post	29.5 ± 1.52	20.6 ± 1.04 <sup>a</sup>	21.2 ± 1.13 <sup>a</sup>	19.1 ± 1.14 <sup>a</sup>
Retention	27.3 ± 1.47	20.5 ± 1.16 <sup>a</sup>	22.1 ± 1.01 <sup>a</sup>	21.0 ± 1.65 <sup>a</sup>
Change from:				
Pre to post	7.9 ± 1.01	0.3 ± 0.90 <sup>a</sup>	1.5 ± 1.06 <sup>a</sup>	1.9 ± 0.69 <sup>a</sup>
Post to retention	-2.3 ± 0.87 <sup>b</sup>	-0.1 ± 0.75 <sup>a,b</sup>	0.9 ± 1.14 <sup>a</sup>	1.9 ± 0.69 <sup>a</sup>
Pre to retention	5.6 ± 0.80 <sup>b</sup>	0.3 ± 1.11 <sup>c</sup>	2.4 ± 0.87 <sup>a,c</sup>	3.8 ± 1.34 <sup>a,b</sup>

<sup>1</sup> Means in a row sharing a common superscript are not significantly different ( $P < 0.05$ ) using LSD test.

the Four Food Groups Experimental group. The change in mean test scores for the Five Nutrients Experimental group was greater ( $P < 0.05$ ) than that of the Five Nutrients Control group, but the Four Food Groups Experimental and Control groups did not differ.

Five Nutrients. The analysis of variance of test scores--Five Nutrients questions is given in table 3. In agreement with the findings of Bell and Lamb (54) there were no significant differences among the group means on pretest scores (Table 4). There were differences for post- and retention test scores, change in mean test scores from pre- to posttest, from post- to retention test, and from pre- to retention test. The mean test scores on the post- and retention tests and the change in mean test scores from pre- to posttest were higher ( $P < 0.05$ ) for the Five Nutrients Experimental group than for the other three groups. The improvements shown in posttest scores and the change in mean test scores from pre- to posttest for the Five Nutrients Experimental group were similar to the findings of Meyers and Jansen (57) in a study with fifth grade students using a nutrient approach.

The change in mean test scores from the post- to retention test showed that the nutrition knowledge of the experimental groups (Five Nutrients Experimental group, Four Food Groups Experimental group) decreased more ( $P < 0.05$ ) than that of the control groups (Five Nutrients Control group, Four Food Groups Control group). There were no significant differences between the two experimental groups nor the two control groups for change in mean test scores from post- to retention test. Although the nutrition knowledge of the two experimental

TABLE 3

Analysis of Variance of Test Scores and Test Score Changes  
Five Nutrients Questions

Source of variation	df	Mean Squares							
		Pre	Post	Retention	Pre to Post	Post to Retention	Pre to Retention		
Groups	3	1.11	221.88***	88.96***	233.91***	47.29**	101.81***		
Residual	63	5.48	8.80	7.37	11.17	7.84	7.10		

\*\* Significant at  $P < 0.01$

\*\*\* Significant at  $P < 0.001$

TABLE 4

Means<sup>1</sup> and Standard Errors of Test Scores and Test Score Changes--  
Five Nutrients Questions

Test:	Five Nutrients Approach		Four Food Groups Approach	
	Experimental n=20	Control n=18	Experimental n=16	Control n=13
Pre	7.3 ± 0.58 <sup>a</sup>	7.3 ± 0.49 <sup>a</sup>	7.8 ± 0.59 <sup>a</sup>	7.3 ± 0.63 <sup>a</sup>
Post	14.9 ± 0.86	7.5 ± 0.62 <sup>a</sup>	8.9 ± 0.67 <sup>a</sup>	7.9 ± 0.57 <sup>a</sup>
Retention	12.1 ± 0.75	7.5 ± 0.52 <sup>a</sup>	7.5 ± 0.47 <sup>a</sup>	9.0 ± 0.85 <sup>a</sup>
Change from:				
Pre to post	7.7 ± 0.87	0.2 ± 0.76 <sup>a</sup>	1.1 ± 0.80 <sup>a</sup>	0.6 ± 0.75 <sup>a</sup>
Post to retention	-2.8 ± 0.66 <sup>a</sup>	0.0 ± 0.57 <sup>b,c</sup>	-1.4 ± 0.79 <sup>a,b</sup>	1.1 ± 0.72 <sup>c</sup>
Pre to retention	4.9 ± 0.66	0.2 ± 0.65 <sup>a,b</sup>	-0.3 ± 0.54 <sup>b</sup>	1.7 ± 0.73 <sup>a</sup>

<sup>1</sup> Means in a row sharing a common superscript are not significantly different ( $P < 0.05$ ) using LSD test.

groups decreased to about the same extent during the six-week period between the post- and retention test, the Five Nutrients Experimental group had greater gains on pre- to retention test scores than the Four Food Groups Experimental group. The change in mean test scores from pre- to retention test for the two control groups did not differ. The nutrition knowledge as measured by the change in mean test scores from pre- to retention test increased more ( $P < 0.05$ ) for the Five Nutrients Experimental group than for the Five Nutrients Control group, but the Four Food Groups Control group increased more than its corresponding experimental group.

Four Food Groups. The analysis of variance of test scores--Four Food Groups questions is presented in table 5. There were differences among groups for pretest mean scores. There was no difference between pretest mean scores for the experimental and control groups within each school, but there was a difference ( $P < 0.05$ ) between the schools when the experimental and control groups were compared. In contrast, no difference in pretest scores for the Five Nutrients questions was found between the schools. Higher scores on the Four Food Group questions were attained by students attending Eugene Field, which showed no significant differences in pretest scores between control and experimental groups.

On the posttest mean scores, there was no difference between experimental and control groups within each school and there was no difference between schools when experimental and control groups were compared. Failure by the Four Food Groups Experimental group to show

TABLE 5

Analysis of Variance of Test Scores and Test Score Changes--  
Four Food Groups Questions

Source of variation	df	Mean Squares					
		Pre	Post	Retention	Pre to Post	Post to Retention	Pre to Retention
Groups	3	51.29*	36.14*	33.35	1.51	13.45	20.90
Residual	63	12.90	12.79	16.39	6.98	11.44	10.48

\* Significant at  $P < 0.05$



TABLE 6

Means<sup>1</sup> and Standard Errors of Test Scores and Test Score Changes--  
Four Food Groups Questions

	Five Nutrients Approach		Four Food Groups Approach	
	Experimental n=20	Control n=18	Experimental n=16	Control n=13
Test:				
Pre	14.4 ± 0.64 <sup>c</sup>	12.9 ± 0.82 <sup>b,c</sup>	11.8 ± 0.91 <sup>a,b</sup>	10.2 ± 1.29 <sup>a</sup>
Post	14.5 ± 0.88 <sup>a</sup>	13.0 ± 0.73 <sup>a,b</sup>	12.3 ± 0.73 <sup>a,b</sup>	10.8 ± 1.20 <sup>b</sup>
Retention	15.2 ± 0.86 <sup>a</sup>	13.1 ± 0.94 <sup>a</sup>	14.5 ± 1.03 <sup>a</sup>	11.9 ± 1.21 <sup>a</sup>
Change from:				
Pre to post	0.1 ± 0.55 <sup>a</sup>	0.1 ± 0.67 <sup>a</sup>	0.5 ± 0.74 <sup>a</sup>	0.7 ± 0.61 <sup>a</sup>
Post to retention	0.7 ± 0.64 <sup>a</sup>	0.1 ± 0.61 <sup>a</sup>	2.2 ± 1.06 <sup>a</sup>	1.1 ± 1.07 <sup>a</sup>
Pre to retention	0.8 ± 0.56 <sup>a</sup>	0.2 ± 0.83 <sup>a</sup>	2.7 ± 0.89 <sup>a</sup>	1.8 ± 0.96 <sup>a</sup>

<sup>1</sup> Means in a row sharing a common superscript are not significantly different ( $P < 0.05$ ) using LSD test.

higher posttest scores than the groups that received no instruction on the Four Food Groups was in contrast to the findings of other investigators (50, 51, 53, 54). In similar studies, Bell and Lamb (54) and Baker (51) found higher scores on retention tests for experimental groups than for control groups.

Statistical analyses of change in mean test scores from pre- to posttest, from post- to retention test, and from pre- to retention test showed no differences among groups. In a similar study with fourth and fifth grade students, Baker (51) found a significant difference between experimental and control groups in the change in mean scores from pre- to posttest, but no difference in change from pre- to retention test.

#### Plate Waste

Statistical analysis of the plate waste data was impossible because of the extreme variability of individual student participation in the school lunch program. Because students were not required to eat in the school lunchroom, complete plate waste data, three days before and three days after instruction, were available for very few students. Therefore, plate waste data for the two third grade classes in each school were combined and two sample t-tests were performed on specific menu items for which sufficient data were available.

The method of preparing the apples on Menu 1 was different in the two school lunchrooms. At Eugene Field, the apples were quartered and cored; at Bluemont they were cut in half. Percentage plate waste for apples was higher ( $P < 0.05$ ) at Bluemont than at Eugene Field

(Table 7). The method of preparation may have contributed to the difference in plate waste.

Milk waste on Menu 1 at the two schools was compared. Percentage milk waste (Table 8) was higher ( $P < 0.05$ ) at Bluemont (34 percent) than Eugene Field (< 1 percent). The range for percentage milk waste varied greatly between schools. The range of 0-12 percent at Eugene Field showed that no student left all of his milk or even as much as one-fourth of it. At Bluemont, the range of 0-100 percent showed that although some students drank all of their milk, others left all of it. Less milk waste at Eugene Field than Bluemont might be attributed to the check on milk consumption by the lunchroom attendant at the former school. Although the students at Eugene Field were not forced to drink their milk, they knew that their milk cartons would be checked before they could leave the lunchroom and this may have influenced their intake.

In addition to a comparison of milk waste between schools, milk waste within each school was compared on Menu 2 when milk was the only beverage served with Menu 3 when orange juice was served in addition to milk. Milk waste increased ( $P < 0.001$ ) at Bluemont when both milk and orange juice were served (Table 9). Milk waste tended to increase at Eugene Field when both beverages were served, but the difference was not significant. The range of percentage milk waste was affected by serving both beverages. When milk was served alone, the range at Eugene Field and Bluemont was 0-35 percent and 0-58 percent, respectively, but when orange juice was served in addition to milk, the range changed to 0-100 percent and 0-99 percent, respectively.

TABLE 7

Comparison of Percentage Plate Waste Between Two Schools--Apple

School	Mean + S.E.	Range
Eugene Field n = 27	26 $\pm$ 7.2	0-100
Bluemont n = 24	52 $\pm$ 7.8*	0-100

\* Significant at  $P < 0.05$ 

TABLE 8

Comparison of Percentage Plate Waste Between Two Schools--Milk

School	Mean $\pm$ S.E.	Range
Eugene Field n = 27	1 $\pm$ 0.5	0- 12
Bluemont n = 24	34 $\pm$ 6.8*	0-100

\* Significant at  $P < 0.001$

TABLE 9  
 Comparison of the Effect of Serving Two Beverages on Milk Waste Within Schools

School	Change Mean $\pm$ S.E. <sup>1</sup>	Range	
		Milk Only	Milk + Orange Juice
Eugene Field n = 25	18 $\pm$ 9.6	0-35	0-100
Bluemont n = 17	46 $\pm$ 8.2*	0-58	0-99

<sup>1</sup> Change in milk consumption

\* Significant at  $P < 0.05$

When data for both schools were combined, total average plate waste for the two three-day studies was 29 percent. It was higher than the national average of 20 percent (8), but comparable to the 24.72 percent plate waste for first through fourth grade students reported by Mirone and Harvey (66) in 1954.

Average plate waste of selected menu items was calculated. The average consumption of meat entrees by third grade students was 72 percent. It was lower than the 83.2 percent reported by Harper et al. (67) for fifth and sixth grade students and the 90 percent consumption of protein-rich foods reported by Patton et al. (61). In this study, consumption of green vegetables was lower (48 percent) than that of the meat entrees. Harper et al. (67) found even lower vegetable consumption (37.8 percent) for fifth and sixth grade students.

#### Recommendations

Approaches to nutrition education. In this study, third grade students learned and retained more information on the Five Nutrients than on the Four Food Groups. The results indicated that they were capable of assimilating information on the Five Nutrients. In contrast, nutrition knowledge test scores did not increase when students were instructed on the Four Food Groups. Those results suggest that the Four Food Groups approach should be replaced or supplemented with a nutrient approach.

Future research. If the study was repeated, nutrition instruction should be given for a longer period of time. A change in eating

behavior as indicated by decreased plate waste in the school lunchroom would be more likely to occur following six weeks of nutrition instruction than two weeks of instruction.

Arrangements should be made to assure that students who participate in the study would eat in the school lunchroom on the days that plate waste is measured. Then the data could be analyzed statistically and conclusions drawn regarding the effect of the nutrition instruction on eating behavior.

## SUMMARY

Two approaches to nutrition education, one based on food groups and the other based on nutrients, were compared at the third grade level in two Manhattan elementary schools, Eugene Field and Bluemont. The nutrient approach was a modification of a program designed by Nutrition Dynamics, Inc., and the food group approach was the Four Food Groups. At each school there was an experimental group (Five Nutrients Experimental group or Four Food Groups Experimental group) and a control group (Five Nutrients Control group or Four Food Groups Control group). The influence of nutrition instruction on nutrition knowledge was determined by means of a pre-, post-, and retention test. Plate waste in the school lunchroom was measured to determine any change in eating behavior resulting from the nutrition instruction.

The mean score on the pre-, post-, and retention tests and the changes in mean test scores from pre- to posttest, post- to retention test, and pre- to retention test were calculated. Analyses were performed on the six variables for the Four Food Groups and the Five Nutrients questions combined and separated.

Analysis of the combined questions showed no significant differences among groups for pretest scores. The mean test scores on the posttest, retention test, and the change in mean test scores from pre- to posttest showed significant differences which were attributable to the Five Nutrients Experimental group. The nutrition knowledge of the Five Nutrients Experimental group decreased more from post- to retention test than that of the Four Food Groups Experimental group. The gain in



nutrition knowledge as indicated by the change in mean test scores from pre- to retention test was greater for the Five Nutrients Experimental group than for the Four Food Groups Experimental group.

When the questions on the Five Nutrients were analyzed no differences were found among the four groups on the pretest. Differences attributable to the Five Nutrients Experimental group were found on the posttest, retention test, and the change in mean test scores from the pre- to posttest and pre- to retention test. There was no difference between the two experimental groups on the change in mean test scores from post- to retention test. When the questions on the Four Food Groups were analyzed, the only variable that showed a significant difference between the two experimental groups was the pretest mean scores.

In this study, third grade students learned and retained more information on the Five Nutrients than on the Four Food Groups. Nutrition knowledge test scores did not increase when third grade students were instructed on the Four Food Groups. The results indicated that third grade students were capable of assimilating information on the Five Nutrients. The increase in nutrition knowledge test scores of the Five Nutrients Experimental group might indicate that there was more interest in nutrition when that approach was used than when the Four Food Groups approach was used. Those results suggest that the Four Food Groups approach should be replaced or supplemented with a nutrient approach.

Because of the extreme variability of individual student participation in the school lunchroom program, statistical analysis of the

plate waste data was impossible. Therefore, plate waste data for the two third grade classes in each school were combined and analyses were performed on specific menu items for which sufficient data were available. Apple waste and milk waste were compared between the two schools. Both were higher at Bluemont than Eugene Field. The difference in apple waste may have been affected by the method of preparation. Less milk waste at Eugene Field may have been influenced by the check on milk consumption by the lunchroom attendant. Milk waste in both schools increased to some extent when orange juice was served in addition to milk, but the increase was significant at Bluemont only. Total average plate waste was 29 percent. Average consumption of meat entrees and green vegetables was 72 percent and 48 percent, respectively.

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As one of my grandfathers wrote in the acknowledgments of his thesis thirty-nine years ago, "In an endeavor of this kind one soon realizes how dependent he is upon others." The author would hereby like to recognize her dependence upon and deep gratitude to--

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APPENDIX

## RIGHTS OF HUMAN SUBJECTS CHECKLIST

All faculty and students in the College of Education who are engaged in research, demonstration, or development activities involving human subjects (or using data previously gathered on human subjects) must complete this form. The responsibility party (a faculty member) must file a signed dated copy with the Chairperson, College of Education Rights of Human Subjects Committee a month prior to beginning the project along with a sample of any measuring instruments and the methodology section including informed consent procedures.

	YES	NO
1. Have you read the COE guidelines on the Rights of Human Subjects?	<u>X</u>	<u>*</u>
2. Do you explain procedures (in writing or orally) in terms which can reasonably be assumed understandable to subjects (including, and especially, when subject's primary language is not standard English)?	<u>X</u>	<u>*</u>
3. Does your treatment include the use or implied use of drugs or electric shock?	<u>*</u>	<u>X</u>
4. Does your treatment include the use of money (including paying subjects to participate)?	<u>*</u>	<u>X</u>
5. Do you explicitly inform subjects of their right to refuse to participate?	<u>X</u>	<u>*</u>
6. Do you explicitly inform subjects of rights to withdraw from participation at any time?	<u>X</u>	<u>*</u>
7. Do you explicitly offer to answer subject inquiries about your study prior to their participation?	<u>X</u>	<u>*</u>
8. Will you assure subjects of anonymity or explicitly inform subjects their responses are not anonymous to the investigator?	<u>X</u>	<u>*</u>
9. Have you provided adequate safeguards for the data?	<u>X</u>	<u>*</u>
10. Could any of your procedures reasonably be construed as anxiety provoking?	<u>*</u>	<u>X</u>
11. Could any of your procedures reasonably be construed to be socially unacceptable or involve activities or questions which might reasonably be construed by subjects as offensive?	<u>*</u>	<u>X</u>
12. Could any of your procedures or questions reasonably be construed as an invasion of an individual's privacy?	<u>*</u>	<u>X</u>
13. Do you intend to use students from your own classes as subjects?	<u>*</u>	<u>X</u>

- |   | YES       | NO         |
|---|-----------|------------|
| 14. Do your procedures involve any deception of subjects?   | <u>X</u>  | <u>X</u>   |
| 15. Do you offer to debrief subjects at the end of your investigation?  | <u>Y</u>  | <u>*</u>   |
| 16. Do you obtain informed consent from subjects or the parents or guardians of subjects, or persons responsible for safeguarding data?                         | <u>X</u>  | <u>*</u>   |
| 17. Has informed consent been obtained from all responsible individuals, including advisors, thesis committees, superintendents, principals, or division heads? | <u>X</u>  | <u>*</u>   |
| 18. Are you going to involve subjects off-campus?   | <u>X*</u> | <u>   </u> |

\*ANY RESPONSE (CHECK) OVER AN ASTERISK (\*) INDICATES YOU SHOULD CONTACT THE CHAIRPERSON, COE RIGHTS OF HUMAN SUBJECTS, TO DETERMINE THE NEED FOR COMMITTEE REVIEW OF YOUR PROPOSAL.

Lathleen Newell  
RESPONSIBLE PARTY (FACULTY MEMBER)

\_\_\_\_\_  
DATE

\_\_\_\_\_  
LEAVE BLANK

Don Veli  
OTHER INVOLVED PARTIES

\_\_\_\_\_  
DATE RECEIVED

DESCRIPTIVE TITLES: A Comparison of Two Approaches  
to Nutrition Education at the Third Grade  
Level

## SAMPLE LETTER

(Permission to conduct the study--  
to superintendent of public schools in Manhattan)

Dear \_\_\_\_\_:

I am asking for your cooperation in permitting me to conduct a research project on A Comparison of Two Approaches to Nutrition Education with Third Grade Students for my master's thesis at Kansas State University. The two approaches I plan to compare are presently being used in the elementary schools in Manhattan.

I would like to pretest three third grade classes to assess nutrition knowledge of the students and conduct a one-week course in nutrition as a part of health education instruction in two of the three classes. Following the week of instruction, a posttest will be administered to the students to assess any change in nutrition knowledge. A retention test will be given to the three classes six weeks later to measure long-term effects of the instruction. To determine the effect of the nutrition course on the eating practices of the students, observations will be made of plate waste in the school lunch program before and after instruction.

I will need your cooperation as well as that of the principal and third grade teachers. The information obtained will be kept confidential and will be used only for the research project.

I shall be glad to answer any questions you have in regard to the proposed research project.

Sincerely yours,

Miss Diana Tolin  
Department of Foods and Nutrition

Approved:

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Major Professor, Department of Foods and Nutrition

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Head, Department of Foods and Nutrition

## SAMPLE LETTER

March 31, 1977

Dr. Benjamin, Superintendent of Schools  
Board of Education  
2031 Poyntz  
Manhattan, Kansas 66502

Dear Dr. Benjamin:

I have seen these materials for A Comparison of Two Approaches to Nutrition Education at the Third Grade Level which have been approved by the Chairperson of the College of Education Rights of Human Subjects Committee. I concur that the two phases--1) the developing of the instrument in spring, 1977, and 2) the experimental study in fall, 1977--are appropriate for use in the schools.

Sincerely yours,

Dr. J. B. Utsey  
Dean, College of Education  
Kansas State University

## APPLICATION FOR APPROVAL TO USE HUMAN SUBJECTS

1. ACTIVITY OR PROJECT TITLE: A Comparison of Two Approaches to Nutrition Education at the Third Grade Level
2. PROPOSED SPONSOR (IF ANY):
3. PERSONNEL INVOLVED:

NAME	DEPARTMENT	PHONE
<u>Dr. Kathleen Newell</u> THE PRINCIPAL INVESTIGATOR OR A RESPONSIBLE INDIVIDUAL*	<u>Foods and Nutrition</u>	<u>532-5508</u>
<u>Diana Tolin, Graduate Student;</u> CO-WORKERS**	<u>Foods and Nutrition</u>	<u>532-5508</u>
_____	_____	_____
_____	_____	_____

## 4. ATTACH A COPY OF THE PROJECT PROPOSAL

- A. RISK. ARE THE RISKS TO HUMAN SUBJECTS OUTWEIGHED BY THE BENEFITS TO THE SUBJECT?  YES  NO  
ON WHAT PAGE OF THE PROPOSAL IS THIS INFORMATION OUTLINED? 9. IF THIS DESCRIPTION IS NOT OF SUFFICIENT DETAIL FOR THE COMMITTEE TO EVALUATE, ADD ADDITIONAL INFORMATION HERE.

\*MUST BE FACULTY - NOT A STUDENT

\*\*MAY BE GRADUATE OR UNDERGRADUATE STUDENTS

- B. INFORMED CONSENT. ON WHAT PAGE OF THE PROPOSAL IS THE PROCEDURE FOR SECURING INFORMED CONSENT OUTLINED? 9. IF THE PROPOSAL DOES NOT INCLUDE ALL OF THE FOLLOWING, DISCUSS THEM BELOW: (1) a fair explanation of procedures to be followed including identification of experimental procedures, (2) description of discomforts and risks, (3) description of benefits, (4) disclosure of appropriate alternatives available, (5) an offer to answer inquiries, and (6) instructions that the subject is free to withdraw consent and participation at anytime.
- C. EMERGENCIES. ON WHAT PAGE OF THE PROPOSAL ARE THE PROCEDURES FOR EMERGENCIES DISCUSSED? None. HAVE YOU LISTED POSSIBLE EMERGENCIES WHICH MIGHT ARISE?  
 YES  NO. If further detail concerning anticipated emergencies or procedures for handling emergencies should be discussed, do so in the space provided below.
- D. PRIVACY. ON WHAT PAGE OF THE PROPOSAL DO YOU DISCUSS PROCEDURES FOR KEEPING RESEARCH DATA PRIVATE? 8,9. This should include procedures for maintaining anonymity of subjects. Supplemental information concerning privacy of data may be discussed below.

5. STATEMENT OF AGREEMENT: The below named individual certifies that he/she has read and is willing to conduct these activities in accordance with the Handbook for Research, Development, Demonstration, or Other Activities Involving Human Subjects. Further, the below named individual certifies that any changes in procedures from those outlined above or in the attached proposal will be cleared through Committee 5075, The Committee on Research Involving Human Subjects.

Signed *Kathleen Newell*  
The Responsible Individual

Date *June 21 1977*





Graduate School  
Fairchild Hall  
Manhattan, Kansas 66506  
Phone: 913 532-6191

July 5, 1977

TO: Dr. Kathleen Newell  
Foods & Nutrition  
Justin Hall  
CAMPUS

FROM: John P. Murry, Chairperson  
Committee on Research Involving Human Subjects

RE: Committee Review of Your Proposal Titled, "A Comparison of Two Approaches to Nutrition Education at the Third Grade Level"

The Committee on Research Involving Human Subjects has reviewed the proposal identified above and has approved it with the stipulations indicated below.

This approval applies for this project only and only under the conditions and procedures described in the application. Any change in the protocol or conditions described in the proposal will require separate approval. This approval will be followed by surveillance procedures which will require periodic review of the project by consultation with the Responsible Individual and the examination of the appropriate records of the activity. Individual identification of human subjects in any publication is an "invasion of privacy" and requires a separate executed "informed consent."

Prior to initiation of activities involving human subjects, (unless specifically exempted) properly executed informed consent must be obtained from each subject or his/her authorized representative and such forms must be retained on file by the Responsible Individual for a minimum of three years after termination of the project.

Any unanticipated problems involving risk to human subjects or others should be reported immediately to the Director of the Student Health Center.

Stipulations: Since the "anonymity" referred to in the 3rd paragraph of the "Simple Informed Consent" document cannot be guaranteed on a pre-test/post-test research design, the "Informed Consent" form should guarantee "confidentiality" instead.

JPM:jk

Department of Foods and Nutrition  
 Justin Hall  
 Manhattan, Kansas 66506  
 Phone: 913 532-5508

August 22, 1977

Dear Parents,

The Department of Foods and Nutrition at Kansas State University is interested in developing nutrition education programs for use in schools. It is therefore desirable to compare two methods of nutrition education presently in use in the Manhattan public schools to determine the relative degree of effectiveness of the methods.

I am asking permission for your son(s) and/or daughter(s) in the third grade to be a part of this study. The study will involve four classes of third grade students. All four classes of students will take a pretest, post test, and retention test to assess nutrition knowledge. During the two weeks between the pre- and post tests, two of the classes will receive instruction in nutrition. Samples of nutritious food will be offered to these children in the classroom. If your child has any food allergies, would you please list them at the bottom of this page. Plate waste in the school lunch room will be determined for students participating in the study.

We request your permission to allow your child to participate in this study. Please discuss this with your child. The children will not record their names on the test papers and the test results will be kept confidential. Your child is free to withdraw from the study at any time.

Sincerely yours,

Approved: \_\_\_\_\_

*James Brown*  
 Head, Dept. Foods and  
 Nutrition

*Diana Tolin*  
 Miss Diana Tolin  
 Department of Foods and Nutrition

Date: \_\_\_\_\_

*August 22-1977*

-----  
 We have been fully advised of the procedures to be used in this project (as described above) and hereby voluntarily give permission for our child to participate.

Date \_\_\_\_\_

Legal Guardian \_\_\_\_\_

Allergies: \_\_\_\_\_

## DEVELOPMENTAL OBJECTIVES

1. Knows specific facts.
  - 1.1 Matches number of servings needed from each food group with correct number.
  - 1.2 Lists foods in a specified food group.
  - 1.3 States functions of nutrients.
  - 1.4 Identifies nutrients which specific foods contain.
  - 1.5 Reproduces examples of nutritious meals.
2. Understands use of nutrients and food groups.
  - 2.1 Identifies number of foods lacking in a day's menu if it is to meet Basic Four Food Groups Plan.
  - 2.2 Selects missing food group in a given meal.
  - 2.3 Associates specific nutrients with physical needs.
  - 2.4 Completes a meal lacking in the food groups with appropriate foods.
  - 2.5 Explains why nutrients are needed.
3. Applies concepts and principles of nutrition and food groups to meal situations.
  - 3.1 Modifies menus so that they contain at least one food from each food group.
  - 3.2 Selects food group missing from a meal.
  - 3.3 Identifies foods needed to meet recommendations for a balanced diet for one day.
  - 3.4 Selects food which best completes a meal described using nutrients.
4. Applies concepts and principles of nutrition to novel situations.
  - 4.1 Separates foods high in particular nutrients from those low in particular nutrients.
  - 4.2 Selects food which best meets specific physical needs.
  - 4.3 Demonstrates use of various foods to fulfill specific Basic Four Food Groups requirements.

## NUTRITION QUESTIONS

DIRECTIONS: Read each question silently as the teacher reads it out loud. Place an X in the blank by the choice which best answers the question. Be sure to mark one answer for every question.

1. Which nutrient is used for stored energy?  
 Vitamin A  
 Fat  
 Iron  
 Calcium
2. If you ate a roast beef sandwich and drank some milk for lunch, which food group would you be missing?  
 Bread and Cereal Group  
 Fruit and Vegetable Group  
 Meat Group  
 Milk Group
3. If Jim's mother wants him to eat a snack with lots of vitamin C, what food would she choose?  
 Milk  
 Raisins  
 Roll  
 Orange
4. What nutrient acts as the "repairman of the body?"  
 Fats  
 Minerals  
 Protein  
 Vitamins
5. Which nutrients give us energy?  
 Vitamin D and vitamin B  
 Vitamin A and vitamin C  
 Fats and carbohydrates  
 Calcium and iron

6. This meal has foods from three groups.

Ham  
Two slices of bread  
Milkshake

Which food is in the missing group?

\_\_\_\_\_ Apple  
\_\_\_\_\_ Butter  
\_\_\_\_\_ Cake  
\_\_\_\_\_ Cheese

7. If Mary's cuts and scratches heal too slowly, what food might she need?

\_\_\_\_\_ Bananas  
\_\_\_\_\_ Bread  
\_\_\_\_\_ Hamburger  
\_\_\_\_\_ Oranges

8. Which two foods do not belong to the same food group?

\_\_\_\_\_ Macaroni and cheese  
\_\_\_\_\_ Hamburger and pork chops  
\_\_\_\_\_ Milk and ice cream  
\_\_\_\_\_ Biscuits and rice

9. If Dale wants to grow bigger and have more muscles, which would be the best food for him to eat?

\_\_\_\_\_ Apples  
\_\_\_\_\_ Crackers  
\_\_\_\_\_ Meat loaf  
\_\_\_\_\_ Potatoes

10. What food group is missing from this dinner?

Steak  
Baked Potato  
Peas  
Lettuce Salad  
Ice Cream

\_\_\_\_\_ Bread and Cereal Group  
\_\_\_\_\_ Fruit and Vegetable Group  
\_\_\_\_\_ Meat Group  
\_\_\_\_\_ Milk Group

11. Which of the foods in this meal gives you the most protein?

Pork Chop  
Potato Chips  
Green Beans  
Pudding

\_\_\_\_\_ Pork Chop  
\_\_\_\_\_ Potato Chips  
\_\_\_\_\_ Green Beans  
\_\_\_\_\_ Pudding

12. If Bill wants energy for work and play, which nutrient does he need?

\_\_\_\_\_ Carbohydrate  
\_\_\_\_\_ Fat  
\_\_\_\_\_ Protein  
\_\_\_\_\_ Minerals

13. This meal has foods from three groups.

Bologna sandwich (2 slices of bread)  
Glass of milk

Which food is in the missing group?

\_\_\_\_\_ Cupcake  
\_\_\_\_\_ Ice cream  
\_\_\_\_\_ Lettuce salad  
\_\_\_\_\_ Piece of cheese

14. What food group are baked potatoes in?

\_\_\_\_\_ Bread and Cereal Group  
\_\_\_\_\_ Fruit and Vegetable Group  
\_\_\_\_\_ Meat Group  
\_\_\_\_\_ Milk Group

15. If Carol's hair and skin are not shiny, what nutrient might she need?

\_\_\_\_\_ Fat  
\_\_\_\_\_ Protein  
\_\_\_\_\_ Minerals  
\_\_\_\_\_ Vitamins

16. How often does everyone need to eat a good source of vitamin C?
- Once a day
  - Two times a day
  - Three times a day
  - Four times a day
17. If you ate a hamburger on a bun with a tomato and slice of cheese, which food would be from the Bread and Cereal Group?
- Bun
  - Cheese
  - Hamburger
  - Tomato
18. What two foods are in the same food group?
- Bologna and cheese
  - Oatmeal and raisins
  - Rolls and butter
  - Pork chops and peanut butter
19. Which nutrient acts like a gauge to regulate our bodies?
- Fats
  - Mineral
  - Protein
  - Vitamins
20. What food is in the same food group as spinach?
- Buttermilk
  - Orange
  - Cheerios
  - Hot dog
21. On Monday, Karen ate a peach and an apple. How many more servings does she need from the Fruit and Vegetable Group for that day?
- 0
  - 1
  - 2
  - 3

22. John ate a peanut butter sandwich and a piece of meat loaf one day. How many more servings does he need from the Meat Group for that day?

0  
 1  
 2  
 3

23. Which food has the most protein?

Apple  
 Bread  
 Carrot  
 Fish

24. This meal has food from three groups.

Chicken Leg  
Cornbread  
Chocolate Cake  
Milkshake

Which food is in the missing group?

Butter  
 Cherry pie  
 Green beans  
 Ice cream

25. If Terry's body needs iron, which food would be the best choice?

Pears  
 Roast beef  
 Milk  
 Carrots



## NUTRITION QUESTIONS

DIRECTIONS: Read each question silently as the teacher reads it out loud. Place an X in the blank by the choice which best answers the question. Be sure to mark one answer for every question.

1. What food group has been left out of this breakfast?

Cereal  
Toast with peanut butter  
Milk

- Bread and Cereal Group  
 Fruit and Vegetable Group  
 Meat Group  
 Milk Group

2. Which food is the best source of calcium?

Apple  
 Chicken leg  
 Milkshake  
 Bread

3. Which vitamin helps us see at night?

Vitamin A  
 Vitamin B  
 Vitamin C  
 Vitamin D

4. If Kathy wants the food containing the most calcium, which should she choose?

Apricot  
 Peas  
 Milk  
 Chicken

5. If your bones break too easily, what nutrient might you need?

Vitamin A  
 Iron  
 Calcium  
 Vitamin C

6. This meal has food from three groups.

Pork chop  
Rice  
Applesauce  
Cherry Pie

Which food is in the missing group?

\_\_\_\_\_ Cottage cheese  
\_\_\_\_\_ Muffin  
\_\_\_\_\_ Peaches  
\_\_\_\_\_ Punch

7. If Tim is about to run in a track meet and wants quick energy, what food should he eat?

\_\_\_\_\_ Apple  
\_\_\_\_\_ Carrot  
\_\_\_\_\_ Cracker  
\_\_\_\_\_ Steak

8. If you had macaroni and cheese and green beans for lunch, which food group would you be missing?

\_\_\_\_\_ Bread and Cereal Group  
\_\_\_\_\_ Fruit and Vegetable Group  
\_\_\_\_\_ Meat Group  
\_\_\_\_\_ Milk Group

9. Salad dressing contains a lot of which nutrient?

\_\_\_\_\_ Carbohydrates  
\_\_\_\_\_ Fat  
\_\_\_\_\_ Protein  
\_\_\_\_\_ Minerals

10. Linda's blood needs more iron. What food will help make Linda's blood better?

\_\_\_\_\_ Pear  
\_\_\_\_\_ Bread  
\_\_\_\_\_ Liver  
\_\_\_\_\_ Orange juice

11. Which food is in the Milk Group?

- Bacon
- Cornflakes
- Chicken
- Cottage cheese

12. Cereal is a good source of which nutrient?

- Carbohydrate
- Fat
- Calcium
- Vitamin C

13. How many servings of milk should you have each day?

- 1
- 2
- 3
- 4

14. If Helen eats a meal low in protein, which food would be best for her snack?

- Apple
- Graham crackers
- Grapes
- Peanut butter

15. How often do you need to eat a dark green or deep yellow vegetable?

- Every meal
- Two times a day
- Every day
- Every other day

16. Which food is in the same food group as muffins?

- Milk
- Toast
- Orange juice
- Sausage

17. Which of the Basic Four Food Groups is the best source of energy?

Bread and Cereal Group  
 Fruit and Vegetable Group  
 Meat Group  
 Milk Group

18. Carrots contain a lot of which vitamin?

Vitamin A  
 Vitamin B  
 Vitamin C  
 Vitamin D

19. Which food is not in the Fruit and Vegetable Group?

Celery  
 Cheese  
 Corn  
 Cauliflower

20. Jill has eaten two slices of toast and a biscuit today. What will give her the number of servings she still needs from the Bread and Cereal Group?

She already has the number of servings she needs.  
 A muffin  
 A muffin and a slice of bread  
 A muffin and two slices of bread

21. Jerry drank one glass of milk today. What will give him the number of servings he still needs from the Milk Group?

He already has the number of servings he needs.  
 Another glass of milk  
 Another glass of milk and a bowl of ice cream  
 Another glass of milk, a bowl of ice cream, and a malt

22. Raisins are a good source of which nutrient?

Fat  
 Vitamin C  
 Protein  
 Iron

23. Oatmeal contains the most of which nutrient?

- Carbohydrate
- Fat
- Vitamin C
- Vitamin A

24. What food group has been left out of this meal?

Ham sandwich (on two slices of bread)  
Lettuce and tomato on ham sandwich  
Kool-aid

- Bread and Cereal Group
- Fruit and Vegetable Group
- Meat Group
- Milk Group

25. What vitamin is added to milk?

- Vitamin K
- Vitamin B
- Vitamin C
- Vitamin D

## NUTRITION LESSONS--COURSE CONTENT

- I. Five Nutrients
  - A. General introduction to Five Nutrients
    - 1. Discuss meaning of nutrients
    - 2. Discuss color of food vs. nutrients
    - 3. Explain where nutrients are found
  - B. Protein
    - 1. Explain function
    - 2. Discuss food sources
      - a. Show pictures of foods high in protein
      - b. Taste food high in protein
    - 3. Play word game on "Proto"
    - 4. Show stuffed toy of "Proto"
    - 5. Color picture of "Proto"
  - C. Carbohydrates
    - 1. Explain function
    - 2. Discuss food sources
      - a. Show pictures of foods high in carbohydrates
      - b. Taste food high in carbohydrates
    - 3. Test foods for sugar and starch
    - 4. Show stuffed toy of "Carbo"
    - 5. Color picture of "Carbo"
  - D. Fats
    - 1. Explain function
    - 2. Discuss food sources
      - a. Show pictures of foods high in fats
      - b. Taste food high in fats
    - 3. Test foods for fats
    - 4. Show stuffed toy of "Fatto"
    - 5. Color picture of "Fatto"
    - 6. Compare and contrast with carbohydrates
    - 7. Solve "Fatto" and "Carbo" word scramble
  - E. Menu
    - 1. Analyze school menu for nutrients
    - 2. Name important nutrients in foods pictured
    - 3. Plan menu for school lunch
  - F. Minerals
    - 1. Explain general function
    - 2. Calcium
      - a. Explain function
      - b. Discuss food sources
        - 1. Taste food high in calcium
        - 2. Show pictures of foods high in calcium
    - 3. Iron
      - a. Explain function
      - b. Discuss food sources
        - 1. Taste food high in iron
        - 2. Show pictures of foods high in iron
    - 4. Show stuffed toy of "Minnie"
    - 5. Color picture of "Minnie"

### G. Vitamins

1. Discuss general functions
2. Vitamins B, C, and D
  - a. Discuss food sources
  - b. Explain functions
3. Vitamin A
  - a. Taste food high in vitamin A
  - b. Show pictures of foods high in vitamin A
4. Show stuffed toy of "Vity"
5. Color picture of "Vity"

### H. View film

- I. Observe nutrient-deficient laboratory rats

## II. Four Food Groups

### A. Introduction to Four Food Groups

1. Discuss purpose of eating
2. List names of food groups
  - a. List examples in each group
  - b. Discuss need for all four groups
3. Discuss general chart and recommendations for servings per day
4. Play breakfast word game

### B. Milk group

1. List examples from milk group
  - a. Discuss processing
  - b. Identify food from milk group by sense of touch
  - c. Taste food from milk group
2. Discuss servings per day and how to meet recommendations
3. Play game identifying foods in milk group

### C. Fruit and vegetable group

1. Explain function
2. Discuss number of servings needed each day and how to meet recommendations
  - a. List and explain need for citrus fruits
  - b. Explain need for dark green and deep yellow vegetables
3. List examples in group
  - a. Identify food from fruit group by sense of touch
  - b. Taste fruit
  - c. Identify food from vegetable group by sense of touch
  - d. Taste vegetable
4. Play identification game

### D. Select balanced meals for a day

1. Discuss school menus
2. Keep dietary record for twenty-four hour period
3. Plan menu for school lunch
4. Construct Four Food Groups chart
5. Plan balanced meal with pictures on paper plate

### E. Bread and cereal group

1. Discuss number of servings needed each day
2. Explain function

3. List examples in group
    - a. Taste bread
    - b. Cut out pictures
  4. Observe grains
  5. Solve bread and cereal group crossword puzzle
- F. Meat group
1. Discuss number of servings needed each day
  2. List examples
  3. Explain function
- G. Show amount of sugar in selected foods
- H. View film
- I. Observe nutrient-deficient laboratory rats



Test Scores for Pre-, Post-, and Retention Tests--  
Four Food Groups Approach

Student Number	Test Scores		
	Pre	Post	Retention
Experimental			
1	29	30	27
2	18	20	20
3	19	24	23
4	14	22	23
5	24	23	21
6	19	22	21
8	23	22	23
9	23	14	24
10	13	15	19
11	12	18	10
12	16	14	21
13	22	21	20
14	22	26	26
16	21	19	27
17	20	22	24
18	20	27	24
Control			
21	13	18	18
22	9	13	11
23	9	12	13
24	25	25	19
25	21	22	29
27	21	21	18
28	13	11	20
29	20	24	23
30	13	18	18
31	22	27	32
35	14	14	25
36	22	21	26
37	21	22	21

Test Scores for Pre-, Post-, and Retention Tests--  
Five Nutrients Approach

Student Number	Test Scores		
	Pre	Post	Retention
Experimental			
38	24	37	30
39	26	34	31
40	32	35	35
41	19	29	26
42	24	35	31
43	24	34	32
44	23	30	34
45	25	33	32
46	26	38	34
47	17	26	18
48	20	32	34
49	21	32	27
50	16	23	19
51	12	21	18
53	19	22	27
54	29	36	35
55	21	14	19
56	23	32	25
57	13	17	15
58	19	30	23
Control			
59	18	20	15
60	24	19	23
61	15	21	23
62	20	26	27
63	19	16	17
64	18	15	10
65	25	24	21
67	17	16	18
68	24	24	24
69	25	21	21
70	26	28	28
72	22	27	27
73	22	20	17
74	20	24	23
75	21	20	25
76	21	21	16
77	10	16	17
78	17	12	17

A COMPARISON OF TWO APPROACHES TO NUTRITION EDUCATION  
AT THE THIRD GRADE LEVEL

by

DIANA TOLIN

B. S., University of Oklahoma, 1976

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AN ABSTRACT OF A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Foods and Nutrition

KANSAS STATE UNIVERSITY  
Manhattan, Kansas

1978

In the United States, there is growing concern for the nutritional status of the population. As a result of this concern, increased emphasis is being placed on nutrition programs and nutrition education. Since school children are more receptive to new knowledge than other segments of the population, they are a primary target group for that instruction. Some educators have stated that nutrition education should be required in school curricula. They question the effectiveness of present nutrition instruction in schools which is usually based on the Four Food Groups and suggest that a teaching approach focused on nutrients might be preferable to one based on food groups.

Two approaches to nutrition education, one based on food groups and the other based on nutrients, were compared at the third grade level in two schools. At each school, there was an experimental group (Five Nutrients Experimental group, Four Food Groups Experimental group) and a control group (Five Nutrients Control group, Four Food Groups Control group). The influence of nutrition instruction on nutrition knowledge was determined by means of a written test. Plate waste in the school lunchroom was measured to determine any change in eating behavior resulting from the nutrition instruction.

The mean score on the pre-, post-, and retention tests and the changes in mean test scores from pre- to posttest, post- to retention test, and pre- to retention test were calculated. Analyses were performed on the six variables for the Four Food Groups and the Five Nutrients questions combined and separated.

Analysis of the combined questions showed no significant differences among groups for pretest scores. The mean test scores on the posttest, retention test, and the change in mean test scores from pre- to posttest and pre- to retention test showed significant differences which were attributable to the Five Nutrients Experimental group. When the questions on the Five Nutrients were analyzed, no differences were found among the four groups on the pretest. Differences attributable to the Five Nutrients Experimental group were found on the posttest, retention test, and the change in mean test scores from the pre- to posttest and pre- to retention test. When the questions on the Four Food Groups were analyzed, the only variable that showed a significant difference between the two experimental groups was the pretest mean scores.

In this study, third grade students learned and retained more information on the Five Nutrients than on the Four Food Groups. Nutrition knowledge as indicated by test scores did not increase when third grade students were instructed on the Four Food Groups. The results indicated that third grade students were capable of assimilating information on the Five Nutrients.

Because of the extreme variability of individual student participation in the school lunchroom program, statistical analysis of the plate waste data was impossible. However, plate waste data for the two third grade classes in each school were combined and analyses were performed on specific menu items for which sufficient data were available.