



A comparison of learning procedures in the nutrition education of preadolescents
by Karen Heller Olson

A thesis submitted to the Graduate Faculty in partial fulfillment of the requirements for the degree of
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Montana State University
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Abstract:

The purpose of the study was to compare two different methods of teaching nutrition to preadolescents. The sample was 150 fifth grade science students at Willson Middle School in Bozeman, Montana, and the study was conducted in May-June, 1972. Two lesson plans were devised, each with the same objectives and each presenting the same general information. One lesson plan made use of the Basic Four Food Groups, while the other used specific nutrients and presented 'explanations of their functions in the body. These lessons were taught by the investigator. The test instrument was administered by the investigator, on three occasions: as a pretest, as a posttest immediately after the lesson, and one month later as a second posttest.

The students exhibited a significant gain from both lesson plans. However, the group presented specific nutrient information lost significantly in knowledge in the month period between posttests, while those presented the Basic Four did not. As a result of the lesson with specific nutrients, students appeared better able to pick foods containing adequate amounts of these nutrients than did the students presented the Basic Four. The boys in the study gained more consistently from both lesson plans than did the girls.

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Signature Karen H. Olson

Date August 17, 1972

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KAREN HELLER OLSON

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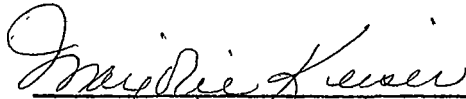
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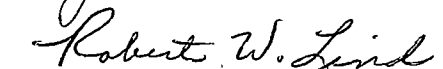
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ABSTRACT

The purpose of the study was to compare two different methods of teaching nutrition to preadolescents. The sample was 150 fifth grade science students at Willson Middle School in Bozeman, Montana, and the study was conducted in May-June, 1972. Two lesson plans were devised, each with the same objectives and each presenting the same general information. One lesson plan made use of the Basic Four Food Groups, while the other used specific nutrients and presented explanations of their functions in the body. These lessons were taught by the investigator. The test instrument was administered by the investigator, on three occasions: as a pretest, as a posttest immediately after the lesson, and one month later as a second posttest.

The students exhibited a significant gain from both lesson plans. However, the group presented specific nutrient information lost significantly in knowledge in the month period between posttests, while those presented the Basic Four did not. As a result of the lesson with specific nutrients, students appeared better able to pick foods containing adequate amounts of these nutrients than did the students presented the Basic Four. The boys in the study gained more consistently from both lesson plans than did the girls.

CHAPTER I

INTRODUCTION

Basic Four Food Groups in Nutrition Education

A food guide, the Basic Four Food Groups, is the main method used for nutrition education efforts. The guide divides all foods into four classes: fruits and vegetables, breads and cereals, meat and meat substitutes, and milk and milk products (1).

A number of legitimate criticisms have been directed at the use of the food guide for teaching nutrition. Our food supply has changed so that many of the foods we eat no longer fit neatly into one of these groups (2). It has been shown that one can have an adequate intake of nutrients without following the requirements of the Basic Four. If one has the recommended number of servings from the Basic Four, one can still fall short of sufficient quantities of needed nutrients (3).

Perhaps the strongest argument against the common practice of teaching nutrition with the Basic Four Food Groups is that it is a simple tool. It is used to teach wise food choices as early as kindergarten. With advanced science training at all grade levels students are not

interested in hearing the same simple message in the same way, year after year (4).

Importance of Nutrition Education for Preadolescents

Preadolescence is a desirable age for nutrition education because these students are accepting of information and are at a teachable age (5). Students later in the adolescent phase of development strive to assert their independence and peer group influence is much stronger (6).

The hope with nutrition education is that one will be motivated to establish food habits that will supply sufficient nutrients for the body's needs. The child who has good food habits is at a definite advantage when he arrives at adolescence (7). It is easier to establish good food habits while young than to attempt to modify or change undesirable food habits as an adult (8).

The need for good food habits to be established early is also illustrated by the many children who develop obesity in preadolescence. The chances are great that an obese child will become an obese adult unless good food patterns are established, and the need for exercise is recognized (9).

The number of teenage mothers has greatly increased. The added nutritional needs placed on a body already in a stress situation because of growth requirements is very great (10). Because of pregnancy and early marriage, many girls are required at an early age to be responsible for a family's health.

Purpose of the Study

This study was undertaken to determine whether preadolescents can better learn and retain nutrition information when it is presented in nutrient terms than when presented by use of the Basic Four Food Groups. Use of the nutrients included explanations of their function in the body, rather than merely stating amounts of food required for optimal health.

There is one obvious limitation to the research design which is readily admitted, but which was deemed unavoidable. The test instrument was administered to the sample on three occasions and one lesson was presented. A single lesson period cannot achieve the learning of which any person or group is capable. However, even this limited research took four class days to complete. With very crowded schedules in the spring of the school year, the

school system and the class instructor, Mrs. Jennings, were most kind in giving the time they did to the project.

Research Questions

1. Can fifth grade students better recall nutrition information when told why specific nutrients are needed by the body than when taught using the Basic Four Food Groups?

2. Can fifth grade students better retain nutrition information when told why specific nutrients are needed by the body than when taught with the Basic Four?

3. Can students better select foods with an adequate nutrient content when given specific nutrient information than when taught using the Basic Four?

4. Does the knowledge of girls increase more than that of boys with nutrition education?

CHAPTER II

REVIEW OF LITERATURE

Nutrition education for young people, teaching which foods to select for intake of required nutrients, usually relies largely on use of the Basic Four Food Groups, within the framework of three meals a day (8, 11).

The Basic Four Food Groups is a teaching tool which places foods into groupings under the headings: breads and cereals, fruits and vegetables, milk and milk products, and meat and meat substitutes. The amounts of food or number of servings recommended are adjusted for the individual's age, sex, or if pregnant or lactating (1).

Need for Improved Nutrition Education for Young People

Improved Science Background

The need to change this method of instructing students in nutrition has been expressed by nutrition educators for several reasons. One of the most important of these is the change in the students. The science program presented to grade school children is much advanced as compared to earlier years. They are capable of understanding technical information once thought to be beyond them (12).

Mayer claims that the main reason people are not listening to the nutrition message is that it is so simple they think they know it already. "Food faddists" receiving much public attention do not present a simple message. They discuss nutrients and food content in detail. While much of their information may be incorrect, it is presented at a sophisticated intellectual level which the generally more advanced education of young people warrants (2).

Social Changes

Nutrition education is in need of modification in light of the changing life styles of people which greatly influence food habits (13). There have been several cultural changes in the United States which are reflected by changes in food habits.

The shift of the population to the city has changed traditional meal patterns, as well as making home grown and home prepared foods less common (14). The variety and quality of the food in today's supermarket makes these activities unnecessary and even economically undesirable (8).

The people of the United States spend about 100 billion dollars a year for food. This represents only 17 percent of the take-home paycheck. In 1960 families spent

20 percent of their income on food, while in 1950 they spent 22 percent on food. This decrease is in spite of the fact that more factory preparation of foods is done on products today (8).

Parrish stated that as the percentage of income spent on food declines, so does time spent and interest in food preparation decline (14). The working housewife with little time to spend on food preparation adds much to the demand for already prepared foods (8).

The family meal is no longer the social event it once was in many homes. Many people rarely fix meals, and if meals are prepared and served, they are frequently skipped by some family members, especially by adolescents (12, 14).

Often these young people are not hungry because of eating soon before the meal (15). These people are very pressed for time with the increase of school-related and other activities. This contributes to meal-skipping as has the short lunch hour at many schools (14).

Snacking, that is eating in addition to the traditional three meals a day, has become a more common phenomenon (14). The idea that only three meals a day is right and wholesome is fast disappearing because a more casual

eating pattern now better suits cultural needs. People can now eat when they feel like it. There are snack bars, vending machines, lunch counters in stores, popcorn stands and drive-ins--everywhere are places to eat and drink (13).

Vending machines may help to accentuate the general pattern of consumption as outlined by the 1965 Household Food Consumption Survey. This is that fewer fruits and vegetables and dairy products are in the diet (16, 17). Sources of vitamin C and vitamin A are too perishable for use in these machines. Sources of calcium are not seen, for most of the items are high carbohydrate (concentrated energy) foods (16).

In general, eating outside the home has become more common. The United States Department of Agriculture (USDA) reported that in 1968, of the total consumer expenditure for food and drink, 20 percent was spent away from home (18). There are now about 344,000 public eating places in the United States (8). Giffit, et al. pointed out that this trend leads toward greater monotony in food choices. Standardized mass-produced items eaten over and over again accentuate the natural disinclination toward unfamiliar foods (13). Parrish suggested that the increasing popularity of the quick service drive-in further narrows the

variety of foods consumed. The absence of green and yellow vegetables and fruits on the menu should be noted (14).

The presence of television in the home has indirectly exerted a strong influence on the family meal patterns. The mealtime is adjusted so favorite programs can be watched or meals are eaten hurriedly and with little conversation so as to not miss a program. Often the meal is eaten on trays in front of the television set (13).

Changes in Food Supply

Research by agriculture and the food industry has added to the kinds of foods on the market (19). Methods of preserving and processing the food supply constantly add to the already existing 8,000 items on the supermarket shelves. Just two decades ago there were only 3,000 items (8).

Many of the same foods are seen in different forms--canned, frozen, dried, or freeze-dried. These same foods are also in many combinations as the convenience foods--those partially or totally prepared--become more popular (13).

With more people eating outside the home, the supermarket faces an added diminution of competition which has

its effect on the food supply. Besides competing with other supermarkets, they carry more ready-to-eat items and family sized, precooked, frozen food entrees to entice people to fix quick meals at home rather than eating out (8).

Why Nutrition Education is Important for Preadolescents

Growth Needs

Adolescence is the period in which a child grows into a mature man or woman. This is done by undergoing profound complex changes: Physical, physiological, mental, emotional and social (20).

The duration of adolescence is difficult to define. It begins with changes in hormonal activities, and the end is difficult to determine (20). Steroid hormones influence changes in body size, tissues, and energy metabolism (21).

Pubescence, rapid growth, and maturation are major recognizable physical events of adolescence. For girls this normally occurs at about age 10 to 12, and for boys at about age 12 to 14. Prepubescence includes early and hidden changes associated with altered endocrine activity. This is at about 8 years of age for girls and 10 years of age for boys. Prepubescence is the second period of rapid growth in the life cycle (20). The velocity of growth decreased from

birth until the preadolescent growth spurt occurs (22).

In 1932 Wait and Roberts conducted a study of girls ten to sixteen years of age and found that the total energy needs rose to a peak just before puberty and then dropped markedly (23). Dreizen, et al. reported that menarche, onset of menstruation, occurs after the peak of the height spurt has passed (24). Heald also reported that maximum growth is likely to occur just before puberty and then decline rapidly (25).

Valadian stated that there are three factors influencing growth. These are genetic, hormonal, and environmental. Rapid growth makes one more vulnerable to environmental circumstances and hence one's state of health becomes even more important in these periods (20). Lesser stated that the preschool child has been given health guidance and that the preadolescent needs the same care during such rapid increase in size (26).

There is an increase in muscle mass during the growth spurt, as well as an increase in long bone growth and total body mass (27). Some other physiological changes related to the growth spurt are: increased blood volume, increased number of red blood cells, increased hemoglobin, and increased sex hormones (20).

The Food and Nutrition Board of the National Research Council has developed formulations of daily nutrient intakes that were judged to be adequate for the maintenance of good nutrition in the population of the United States. These are designated as Recommended Dietary Allowances (RDA). The levels are adjusted for body size, sex, age, and whether pregnant or lactating. The recommended amounts for preadolescents reflect the increased nutrient needs for this age group. Because of major differences in growth rate, separate RDA are proposed for boys and girls after nine years of age (Table 1). The suggested caloric intakes are adjusted for body size, but some additional variables which can affect need are: appetite, activity, and quality of growth as determined by deposits of subcutaneous fat (10).

Protein allowances are increased on the basis that gain in body weight is 18 percent protein. The increased vitamin A requirement for children and adolescents is based on body weight, with additional amounts to satisfy growth needs (10).

Ascorbic acid performs multiple functions in the body. The requirements for this water-soluble vitamin increase with growth. Beginning at twelve years of age the

Table 1

Recommended Dietary Allowances at Selected Ages

| Males | | | | | | |
|---------|------|------------------|-------------|-------------|------------|------------------|
| Age | Kcal | Protein grams | Vit A IU | Asc A mg | Iron mg | Calcium grams |
| 8-10 | 2200 | 40 | 3500 | 40 | 10 | 1.0 |
| 10-12 | 2500 | 45 | 4500 | 40 | 10 | 1.2 |
| 12-14 | 2700 | 50 | 5000 | 45 | 18 | 1.4 |
| 14-18 | 3000 | 60 | 5000 | 55 | 18 | 1.4 |
| 35-55 | 2600 | 65 | 5000 | 60 | 10 | .8 |
| Females | | | | | | |
| Age | Kcal | Protein grams | Vit A IU | Asc A mg | Iron mg | Calcium grams |
| 8-10 | 2200 | 40 | 3500 | 40 | 10 | 1.0 |
| 10-12 | 2250 | 50 | 4500 | 40 | 18 | 1.2 |
| 12-14 | 2300 | 50 | 5000 | 45 | 18 | 1.3 |
| 14-16 | 2400 | 55 | 5000 | 50 | 18 | 1.3 |
| 16-18 | 2300 | 55 | 5000 | 50 | 18 | 1.3 |
| 35-55 | 1850 | 55 | 5000 | 55 | 18 | .8 |

Food and Nutrition Board, National Academy of Sciences-National Research Council. Recommended Daily Dietary Allowances, Revised 1968.

requirement is computed using metabolic body size: 2.5 milligrams for each kilogram of body weight to the three-quarters power (10).

Iron is a constituent of hemoglobin and many enzymes (10). The increased need for iron in periods of rapid growth is seen by the increased amount of hemoglobin, as well as increased amount of body tissue which the hemoglobin supplies with oxygen (28).

During periods of prepubertal growth, retention of 400 milligrams per day of calcium may be required for adequate mineralization of the rapidly growing skeleton. Retention of dietary calcium varies greatly, but 40 percent is the assumed average. The values suggested in the RDA of 900 to 1400 milligrams per day would permit retentions of this magnitude (10).

Present Nutritional Status of Young People

Traditionally four kinds of measurements are used to assess nutritional status. Anthropometric measurements consist of height, weight, skinfold thickness and others. Biochemical assays performed are of the blood, urine, and other tissues. Clinical assessment consists of attention to signs and symptoms frequently characteristic of

malnutrition. Dietary records show an individual's food intake for a certain period of time (12).

The RDA are intended to serve as guides for interpretation of food consumption records of people. The actual nutritional status must be judged on the basis of all four methods of measurement (10). Even with these it is necessary to derive an assessment of nutritional status of a group or individuals. There are no definite methods for attaining this information (12). If the RDA are not met completely, it should not be assumed that the group or individual is malnourished (10).

The dietary studies are not useless. They can serve an educational purpose by instructing young people about nutrient values and desirable nutrient intakes. The dietary records can provide insight into possible dietary lacks or excesses that should be verified by other means (12).

There has been no statistically valid nationwide study of the nutritional status of American youth (12). The 1965 Household Food Consumption Survey of the United States Department of Agriculture, including a segment on preadolescents and adolescents, found that girls' mean intake of iron was 11 milligrams per day, much below the RDA of 18 milligrams. Vitamin A, ascorbic acid, and calcium levels

were all found likely to be below the RDA for this age group. This is due to the intake of milk and milk products (main sources of calcium), and fruits and vegetables (main sources of vitamin A and ascorbic acid) in less than recommended quantities (17).

A Ten State Nutrition Study was conducted in 1968-1970 to determine nutritional levels of disadvantaged families. Methods used to determine nutritional status included biochemical assay and dietary records. Measuring the amount of hemoglobin in the blood is one way to assess the status of iron nutriture in individuals. This study gave results showing males to have a greater percentage of iron deficiency than females (3.5 percent for males, 2.2 percent for females). This was believed due to the inappropriate standards for males. They were declared deficient in hemoglobin with values of less than 12 milligrams per 100 milliliters of blood. Females were not declared deficient until they were as low as 10 milligrams of hemoglobin per 100 milliliters of blood. The dietary portion of the study does show a high percentage of adolescents falling below 70 percent of adequate levels of iron intake (29).

Vitamin A levels in the plasma were measured, but with no adjustments for seasonal variability. The results obtained suggest that problems with deficiency of this vitamin are greater in children under ten years of age. Serum vitamin C was also measured, and the greatest problems were seen in relationship to those in the lowest income group (29).

Eppright and Roderuck in a study of 1200 children in Iowa, reported that 40 percent of the girls, and 30 percent of the boys had diets with one or more nutrients present in amounts less than two-thirds of the RDA. They also reported calcium and ascorbic acid levels of intake as being low for all groups and iron being low for girls twelve years of age and older. This was again attributed to the low consumption of milk, milk products, fruits, and vegetables (30).

Lund and Burk conducted a study of 136 fourth graders nine and ten years of age in Minnesota using one-week dietary records. They found that the mean percentages of the diets of the children was nearly 100 percent or above for all nutrients except iron and niacin (31). In a study of fourth, fifth, and sixth graders, Patterson reported more than half of the subjects had diets low in iron. This study concluded

that food sources of iron, calcium, vitamin A, thiamin, and ascorbic acid should be stressed in nutrition education programs (32).

Hinton and coworkers in a study of eating behavior of fourteen preadolescent girls found there was a low intake of milk, vitamin A, and ascorbic acid sources (vegetables and fruits) (33). Edwards and associates also found calcium, vitamin A, and ascorbic acid levels slightly low for 6200 adolescents (34).

Hodges and Krehl found mean values of nutrient intake and biochemical measurements met accepted standards except a small proportion which had low levels of hemoglobin, vitamin A, and ascorbic acid. The calcium and protein intake were rated as adequate (35).

Wharton reported that calcium, iron, vitamin A and ascorbic acid were consumed in the lowest amounts. The study was a three-day dietary record of 421 adolescents (36).

Hampton and coworkers in a two year study in California of 122 adolescents' nutrient intake, found calcium and iron most likely to be low--especially for girls (37, 38).

It appears that these same nutrients are problems not only for young people, but for nearly every age group in the United States (17, 39, 40). Their appearance as problems in

childhood and persistence throughout life is significant. This points out that basic food patterns established in childhood persist through adult life (31).

Obesity

The RDA suggest a gradually increasing need for calories with growth. But the number of calories needed actually decreases per kilogram of body weight. Allowances for children of both sexes are about 80 kilocalories for each kilogram of body weight up to ten years of age. After ten years of age, the values gradually decline to 50 kilocalories of body weight for adolescent males and 35 for adolescent females (10).

The obese person is one who has an accumulation of body fat. In the male this is considered the case if body fat exceeds 20 percent of body weight. The female is considered obese if more than 30 percent of body weight is fat (41).

Johnson, et al. reported the prevalence of obesity in elementary and secondary school children to be highest in periods of greatest growth and immediately thereafter. They stated this reflects the general pattern of slow growth in early school years with prepubescent and pubertal tendency

to gain weight from ten to fifteen years of age, and a gradual deceleration of weight following. Obesity is most likely to develop in the years between beginning and finishing junior high school (42). However, Heald reported that the results of studies are conflicting as to when those who are obese became that way. Children do not tend to grow out of their obesity, but rather tend to remain obese as adults (43).

Heald also reported that one-third of obese adults had a history of juvenile obesity. This obesity persisting into adult life tends to be more severe and difficult to treat than adult onset obesity (43). Seltzer and Mayer concurred with this for they reported that obesity occurring during adulthood is related to excessive caloric intake and inactivity. But obesity in children is attributed to inactivity and faulty food patterns. Therefore adult weight loss is hard, for the obese person must modify long-standing faulty food patterns (9).

It has been suggested that activity or lack of it may be the major factor in obesity. Johnson and coworkers found children to accumulate more weight in the autumn and winter because of lack of activity (42). Huenemann and associates suggested that nearly all young people today are inactive. In a study of teenagers' activities, only 20

percent of time was spent in activities requiring more than 2.5 kilocalories per minute, or 150 kilocalories per hour (44). Terms denoting activity level are defined as follows: low, up to 120 kilocalories per hour; light, 120 up to 240 kilocalories per hour; moderate, 240 to 360 kilocalories per hour; and heavy, 360 to 600 kilocalories per hour (10).

Bullen, et al. in a study of obese girls' activity as observed by motion picture sampling, found the obese subjects to be far less active than the nonobese even during supervised sport events (45).

Eppright and Roderuck, in a study of Iowa school children, reported that the obese children had dietary intakes the same or lower in calories than the normal weight children (30). In a study of obese school children Eppright and coworkers found the caloric value of their diets was less than that of those children with medium physique. They also calculated nutrient intakes of these obese children and found a greater percentage of obese girls with inadequate diets than with adequate diets. They found when nutrient content of the diet was adequate, overweight was not a problem (46).

Johnson, et al. in a study of twenty-eight obese and twenty-eight nonobese girls reported that the caloric intake of the obese girls was less than that of the obese. The

investigators concluded that inactivity was a very important factor. Both groups were inactive, but the obese girls were more so (47).

Mayer pointed out the psychological aspects of overweight which can affect children's personality development. These are: obsessive concern with physical status, withdrawal, passivity, distorted body images, and excessive preoccupation with weight. Obese children have a strong sense of self-blame and a sense of inferiority (48).

Seltzer and Mayer stated that the opportunity for greatest success in the control of obesity lies in facing the problem in the pre-adult stage. The lower the grade level the better for the obese child. These were the findings of a study conducted to test a weight control program in a public school system. They concluded that students can be helped to lose weight by establishing daily habits of physical activity and proper food intake (9). Christakis and associates concurred with these results in their conclusions of a similar study with obese high school boys (49).

Pregnancy

More than 200,000 school-age girls bear children each year and this number increases by about 3,000 annually (50).

Pregnancy is the most common reason for girls to drop out of high school (51).

The nutritional stress put on a mother's body by pregnancy is in addition to the developmental needs of her own body. The RDA for pregnancy are:

| | | | | | |
|------|---------|-----------|----------|---------|-------|
| Kcal | Protein | Vitamin A | Asc Acid | Calcium | Iron |
| +200 | 65 g | 5000 IU | 60 mg | +.4 g | 18 mg |

These values increase the daily protein need of a sixteen year old (pregnant) girl by 10 grams, vitamin A by 1,000 IU, and ascorbic acid by 10 milligrams. While the iron requirement remains the same, it is very difficult to acquire that amount of iron. The diet usually provides 6 milligrams per 1,000 kilocalories. The caloric requirement is not the 3,000 calories that would be required to provide this amount of iron in the diet (10).

There is an increased effectiveness of intestinal absorption of calcium during times of physiological stress such as pregnancy and lactation. However, the RDA call for an additional 400 milligrams to be included in the diet. The total amount of calcium required by a sixteen year old girl would be 1.7 grams (10). Milk and milk products are primary sources of calcium. It would take five cups of milk a day to meet such a high calcium requirement (52).

The additional nutrient demands of pregnancy may comprise the young mother's growth potential and increase her risk in pregnancy (50). The Committee on Maternal Nutrition of the National Academy of Sciences stated that poor nutrition and youth stand out as major causes of low birth weight and poor pregnancy outcome (53).

Of the 196,000 live births to girls less than seventeen years of age in 1965, the average birth weight was substantially lower than that of infants born to older mothers. The proportion of low birth weight babies is greater and infant mortality rates are higher when the mother is seventeen or younger (53).

Recent studies have suggested a relationship between malnutrition of the mother and subsequent decrease of the number of brain cells of the child. The brain increases cell numbers by division from shortly after conception to six months after birth (54). The decreased cell numbers of the brain presumably lead to irreversible impairment (54, 55).

About 85 percent of schoolage mothers keep their babies. They are then solely responsible for the nutritional well-being of an infant. Approximately 60 percent of these young girls are married at the time of the child's birth (50). Spindler points out that 53 percent of all girls between

fifteen and nineteen years of age are or have been married (6). This suggests that a substantial percentage of teenage girls are responsible for the maintenance of health of a family.

Van deMark and Underwood conducted a study of dietary habits and food consumption of 100 teenage families and found that the young mother did not provide her family with adequate amounts of milk, vegetables, fruit, and total calories to provide nutrients as recommended in the RDA (56). This closely reflects consumption patterns seen across the United States (17).

Factors Influencing Food Habits of Young People

Good food habits do not just happen, their development is a part of the total socialization process of an individual, and begins as soon as a child is born (7, 8). It is a tremendous advantage for children to have good food habits during the transition years of adolescence (7). It is easier to develop and maintain good habits in young children than correct bad habits (8). With good food habits they are better prepared for the many social factors which characteristically affect food intake patterns of adolescents (57).

While the home is the main force behind food habit formation, indications are that the American family today is playing a less prominent role as a socializing agent than it did formerly. Children spend much of their day at school and eat the noon meal away from home (13).

Parental influence is weakened because there is less parent-child contact. Children spend more time with other children and they watch television. About 95 percent of households have television sets. Children between six and sixteen years of age watch television an average of twenty-two hours a week, with the sixth grade being peak watching time (13).

The degree to which food advertising has been successful in its efforts to influence food buying and consumption is unknown (13). A recent study by Gussow reported the scope of advertising of ingestible items to children. About 82 percent of commercials on children's television were for food, drink, candy, gum, or vitamins. There was just one taste encouraged and that one was for sweets (58).

A study by Ward and Wackman of the effects of television advertising on children showed a large percentage of mothers usually yield to children's attempts to influence

purchases of ingestible items. By the time their children are eight to ten years old, 91 percent of mothers purchase the kind of cereal the children request. For five- to seven-year olds, the percentages of mothers "usually" yielding to the child's preferences were:

| | |
|-------------------|-----|
| Breakfast cereals | 88% |
| Snack foods | 52% |
| Candy | 40% |
| Soft drinks | 38% |

Advertising by manufacturers directed to children is effective in terms of sales (59).

In general advertising has been countereducational with respect to good nutrition. Advertising will not make a person eat more, but he may eat more of some things and less of others. The greatest amounts of advertising budgets are spent on less nutritional foods: snack foods, candy, soft drinks, and alcohol (2).

The peer group becomes of great importance to the child as he approaches adolescence. Young people begin to spend more and more time away from home (6). They value socializing with peers and enjoy sharing food and drink with their friends (6, 60). These young people are attempting to assert their independence from family control (13).

It is suggested that the normal decline of parental influence is occurring earlier than formerly. Giffit cited a study published in 1959 stating that seventh graders had an equal preference for their parents and their peer group (61). Ten years later the same type of study showed a greater shift to peer dependence at every age level included in the study, fourth through tenth grade (62).

Importance of Knowledge in Formulating Food Habits

Reports conflict as to whether knowledge or nutrition actually precipitates better food habits. The major rationale for requiring nutrition is that knowledge of the subject will encourage students to adopt or maintain "good" food habits which in turn will result in better health (63).

In a survey of nutrition education research, Whitehead reported that some studies found little correlation between increased knowledge of nutrition and improved food practices (64). Hinton, however, reported a positive relationship between knowledge and nutrition and desirable food practices. But the study pointed out that other factors are important in the determination of eating practices, such as: the individual's values; weight-for-age; social status; psychological adjustment; and family relationships (33).

In a study to analyze children's food consumption behavior, Lund and Burk developed a conceptual framework of behavior related to food (Figure I). Variables A, B, C, and D are those related directly to the child. Other variables are broken into two categories, the two primary exposures for the young person: the home and the school. Variables I through H are those variables which can affect food consumption as related to the home and family environment. Variables L and M are related to the child's experience. This conceptual framework does show the complexity of the food consumption act, but also stresses the important part knowledge of nutrition plays. In each category of variables (child-related, home-related, and school-related) knowledge is mentioned as a determinant of food consumption (variables C, I, L, and M) (31).

Eppright stated that nutrition knowledge is a necessary tool for living because human beings have no instinctive knowledge of what to eat (65). However, the foods offered consisted only of those foods in what is now known as the Basic Four. No snack foods, desserts, candy bars, or soda pop were included (58).

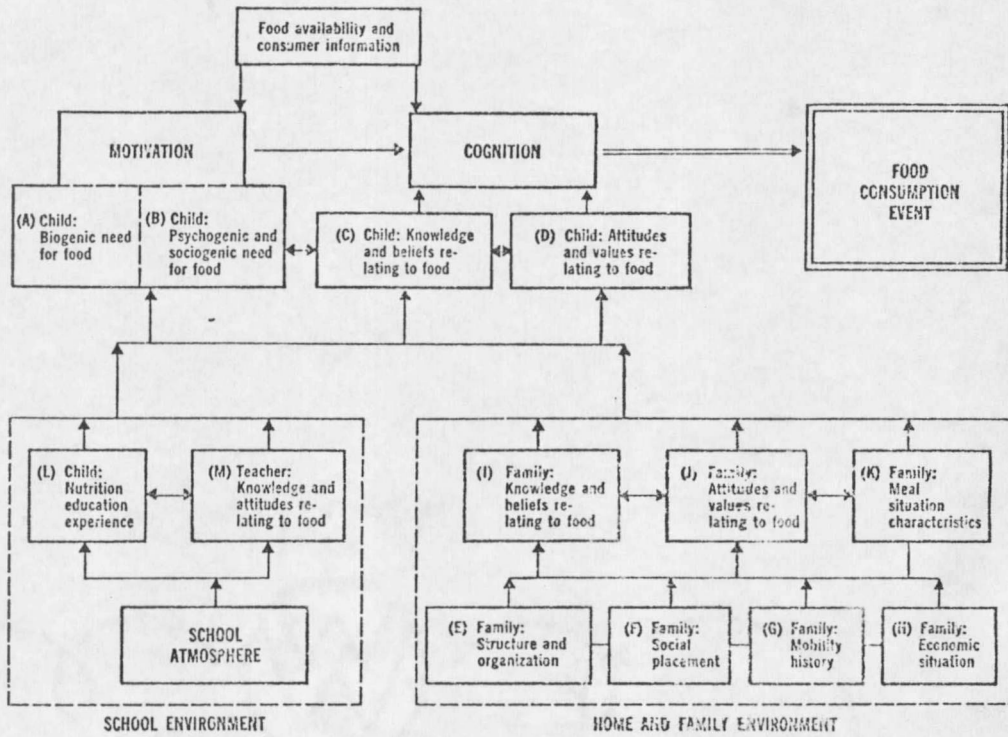


Figure 1

Conceptual Framework for Analysis of the Structure of Children's Consumer Behavior Related to Food

Lund, L. A. and M. C. Burk 1969 Multidisciplinary Analysis of Children's Food Consumption Behavior. Agriculture Experiment Station, University of Minnesota, Technical Bulletin 265, p 26.

Ellis found, in 1944, that knowledge alone will not change food habits. It is necessary for individuals to be informed about certain nutrition facts before they can be expected to change their food habits. This implies that food habit improvements are not due to chance and that education may be a determinant in affecting such a change (67). Knowledge may not guarantee good food habits, but lack of knowledge is a deterrent to adequate diets.

Age of Acceptability and Teachability

Perhaps one of the greatest reasons that nutrition education is of importance in the preadolescent stage is the teachability of this age group. Lewis conducted a study of 5,000 students from kindergarten through the twelfth grade, asking them to express health interests, concerns, and problems (68). The fifth graders in Lewis' study expressed a desire to know all about the human body. It was concluded that children ages 10 through 13 are not placid and unconcerned. They are keenly aware of situations threatening their well-being. They appreciate the worth of a good mind and body. These preadolescents want a chance to converse with peers, to raise questions, and to have honest answers from a knowledgeable adult (68).

Attempts to Change Food Habits Through Nutrition Education

Food habits reflect economic, social, technological, political, and ideological aspects of the existing culture (13). With the complexity of changing food habits recognized, few attempts to improve or change the habits of young people have been attempted.

Whitehead reported in 1952 on the first longitudinal nutrition education work in the United States with young people. Seven day dietary intakes were recorded. Before the nutrition education experience only 1.6 percent of the diets were rated as good. After four years of nutrition education another seven day dietary intake record found 25.4 percent of the diets to be good. The author attributed the change to the nutrition education program. The study claimed to recognize the possibility that the children merely learned which foods were higher in nutritive value and put these on the intake record rather than foods actually consumed (69).

Whitehead conducted a study of adolescents to determine the effect of one or two years of nutrition education. Groups with training did better on dietary intake records than the control groups. The conclusion was that the

two year experience was more effective than just one year. But the difference was attributed to other factors in the study than the time element itself (70).

Lovett, et al. developed a program for second graders to measure increase of knowledge, ability to apply the knowledge, and change in behavior and attitude regarding nutrition. The experimental group improved by 60 percent and the control group by 36 percent. However, the study assumes behavior change on the basis of one breakfast and questions asked of the parents to determine changes in the children's attitudes to nutrition (71).

Baker, in a study of fourth and fifth graders, found the experimental groups scored higher than control groups on tests given after the nutrition education experience. However, the nutritive and caloric values of the diets changed little as a result of the program (5).

Expectations of Nutrition Education

Behavioral change is the ultimate goal of nutrition education (63). Some nutrition educators feel presentation of facts to students is useless, unless by facts the students are moved to action. The assumption cannot be made that someone has learned until he has modified his behavior (51).

However, nutrition education which claims to improve dietary habits can be expected to do so within carefully defined limitations (64). It is unreasonable to expect a student to show immediate behavioral changes in terms of food habits and patterns in response to a nutrition education experience (72).

There is undoubtedly some positive association between increased knowledge of nutrition and better nutrition practices. But nutritional considerations have never played a major role in determining the diets of the American public (63).

Health considerations do play some role in what people eat, but the beliefs often are not based on scientific observation. Even if nutrition education can affect only health motivated decisions and make them more rational, it will have served a useful purpose (63).

Harker and Kupinsel outlined some expectations for beginning nutrition students. If a student could appraise his own food intake accurately, could evaluate to some extent the food intake of others, and could question lay information intelligently, he would have mastered as much of an understanding of nutrition as could be expected (72).

Weaknesses of Food Guides

A food guide is a pattern of food usage which should supply nutrients in recommended amounts and reflect closely actual patterns of food intake. It should allow maximum flexibility in the choice of particular foods (3).

It has been recognized that one can attain the necessary level of nutrients in the diet without following the most commonly used food guide, the Basic Four. One can also have the recommended number of servings from the food guide and still be low in specific nutrients such as calcium and iron (3). Another weakness of the food guide is seen when one compares the foods included in the guide with the actual foods consumed by the public. Over 50 percent of our foods are highly processed, that is prepared to various degrees before being placed in supermarket. The manufactured and simulated foods, such as those made with soybean protein, make the situation more perplexing (2). The assumption with food guides has been that if the major nutrients are consumed in sufficient quantity, the rest (many whose functions are as yet unknown), will automatically be provided in sufficient quantity (12). No such assumption can be made justifiably with use of manufactured foods.

A study conducted in Canada utilizing dietary records found that only 6.3 percent of the nutritionally adequate food intake records matched the Basic Four, and 4.4 percent matched the Basic Seven requirements (3).

The food guides are defended as not being meant for use by professionals, but their use is continued into college texts (73). The Basic Four is introduced in grade school or before and with little alteration is used throughout school years and beyond. Young people in junior and senior high school have voiced resentment of the fact they are taught nutrition in the same way as children in kindergarten (4).

Summary

Present nutrition education consists mainly of use of the Basic Four Food Groups within the framework of three meals a day. As a guide it has inherent weaknesses, one of which may be its simplicity. After the earliest years in school, children are able to accept ideas of a more advanced nature. It is just a general guide; following recommended servings of food will not necessarily assure one of adequate nutrient intake. Social changes, educational advances, and changes in the food supply also point to the need for an

improved method of presenting nutrition information to young people.

The stage of development known as preadolescence is a desirable age for nutrition education. Persons of this age exhibit great interest in human physiology and are close to, or already experiencing, the second growth spurt in their life cycle, which presents new nutritional demands on their bodies.

Social factors help create nutrition-related problems for the young person. Life styles requiring little physical activity have helped make obesity common. The incidence of teenage pregnancy creates a tremendous nutritional burden on many young girls. The mass media and the peer group are taking more of the socialization of the child away from the home.

Dietary surveys point out that the same nutrients are inadequately supplied to the body throughout the life cycle, suggesting that food habits established in early years tend to persist throughout life. The exact relationship between nutrition education and improving dietary habits is difficult to ascertain. Without knowledge there is a decreased chance for an adequate intake of nutrients,

because man does not instinctively know what to eat to provide a balanced diet.

CHAPTER III

PROCEDURES

Selection of the Sample

The sample consisted of 150 students in the six fifth grade science classes taught by Mrs. Pat Jennings at Willson Middle School in Bozeman, Montana. The science classes were chosen because this is where nutrition information is presented to the students.

The fifth grade classes are desirable for nutrition education because at this age level nutrition is not associated with home economics which is considered by many to be just for girls. Also, students of this age are considered more teachable than many students later in the adolescent development stage (5).

Instrument

The instrument consisted of twenty-three items (Appendix A) to test retention of information presented in the lesson plans (Appendix B). Of this number, thirteen were taken from an instrument developed in a study by Dwyer, et al. (63). The remaining ten were items devised by the investigator.

The survey instrument was pretested with the other six fifth grade science classes at Willson Middle School taught by Mrs. Shirley Smith. The pretest resulted in some general nutrition knowledge items being deleted because they were repetitious and because of the excessive time students took to complete them.

Administration of Instrument

The test instrument was administered as a pretest May 3, 1972, to all six groups in order to establish the baseline of nutrition knowledge. The lesson (Appendix B) was presented May 4, 1972. Groups one, three, and five were taught by Lesson Plan I; groups two, four, and six were taught by Plan II. This was to balance as much as possible the effect the time of day a class meets has on the ability of students to concentrate.

Plan I had material presented with use of nutrients and scientific explanations of their functions. Plan II used the Basic Four and included a Nutrition Bingo Game. The objectives of the two lessons were the same, with the same general information presented in each. The major difference was that Plan II gave little explanation.

Two nutrients were emphasized in the lesson plans. Iron was chosen because of the great difficulty growing young people have in attaining recommended quantities in foods commonly eaten: Ascorbic acid was chosen because people generally have the idea that only citrus fruits contain this nutrient (32). Both of these nutrients have been found to be consumed in less than recommended quantities (17).

May 5, 1972, the survey instrument was again administered to each class for the purpose of measuring the gain in knowledge resulting from the lesson. Four weeks later, June 1, 1972, the same instrument was again given to each group to measure retention of nutrition knowledge.

Identical procedures were followed in all administrations of the test instrument. Students were given twenty minutes to complete the test and were asked to remain quietly in their seats until all students had finished. As each student finished, the investigator picked up his test, checking it to be sure all identification items had been completed. Room and seat numbers were used as identification codes for the purpose of matching scores on each student's pretest, posttest, and second posttest.

Analysis of Data

The matched pretest, posttest, and final posttest scores for each student were analyzed by use of a t-test to determine the significance of the difference between these correlated samples. A t-test for the difference between two means for independent samples was also used to compare Lesson I and II to determine which was more effective in terms of recall of nutrition information, as well as level of retention of the information.

A chi square on correlated paired observations was done on items 11, 12, 17, and 18 of the test instrument comparing responses of each student on the pretest and the first posttest. Again the results of the test were compared between the lesson plans to determine which was the more effective means of communicating food selection.

The t-test on the difference between correlated samples was also used to compare the scores of the boys with those of the girls to determine whether the girls gained more knowledge than the boys. The .05 level of significance was used throughout as the criterion for acceptance or rejection of the hypotheses.

The breakfast recall from item 23 on all administrations of the test instrument was compared with the Basic Four Food Groups. This was done to determine the types of breakfasts these preadolescents commonly have.

CHAPTER IV

RESULTS AND DISCUSSION

Description of Sample

The sample included all students in the six fifth grade science classes taught by Mrs. Pat Jennings at Willson Middle School in Bozeman, Montana. Participating in the study were 150 students. Lesson Plan I was presented to seventy-one students (Group I): thirty-three boys and thirty-eight girls. Group II to which Lesson Plan II was presented consisted of seventy-nine students: thirty-nine boys and forty girls.

There was no opportunity to randomly assign the students to the treatments for they could only be present at the time their science classes usually met. The pretest was given to determine basic nutrition knowledge. The pretest mean for Group I was lower than the mean for Group II (11.58 and 12.78, respectively).

Examination of Research Questions and Discussion of Results

Four questions were tested by analyzing data obtained by the administration of the test instrument to the groups on three occasions. The following discussion addresses

itself to the results obtained for each research question.

Research question 1. Can fifth grade students better understand nutrition information when told why specific nutrients are needed by the body than when taught using the Basic Four Food Groups?

Group I, consisting of three of the science classes, was presented Lesson Plan I. This lesson gave detailed information on iron and ascorbic acid: their function in the body and food sources of each to meet the RDA for people of this age. Group II, the other three science classes, was presented Lesson Plan II. This utilized the Basic Four Food Groups to point out where food sources of ascorbic acid and iron are found in this teaching tool.

Mean differences between the pretest and posttest, and between the pretest and the second posttest, were computed for Group I and Group II. A t-test to determine the significance of the difference between correlated samples was used for treatment of the data. This statistical test was appropriate for the present study, since the pretest, posttest, and second posttest scores for each individual contributed perfectly matched pairs.

Table 2 shows the results of the t-tests on both groups presented the lesson plans. Each improved significantly on the comparison between the pretest and the first

posttest, indicating that both lesson plans produced an increase in nutrition knowledge.

Table 2

Values of t on the Mean Difference Between Pretest (1), Posttest (2), and Final Posttest (3)

| | df N-1 | test 2-1 | test 2-3 | test 3-1 |
|----------|-----------|-------------|-------------|-------------|
| Group I | 70 | 13.09 | -3.02 | 9.38 |
| Group II | 78 | 4.72 | - .84 | 3.29 |

Critical value of t at .05 level of significance--1.994.

When the final posttest was compared with the pretest, both groups gained significantly. This indicates that students in both groups had an overall gain of knowledge in the time period of this study.

Tables 3 and 4 illustrate the changes in means produced from both lesson plans. Table 3 shows the increase in means immediately after the nutrition education experience. Table 4 illustrates overall knowledge gain from the pretest to the final posttest.

A t-test to determine the significance of the difference between means for independent samples was used to treat these means. It was found that there was no

significant difference between means for either comparison between pretest and posttest or between the pretest and second posttest. This suggests that both groups gained in knowledge, and it is not possible to state that one group did better than the other.

Table 3
Mean Scores of Nutrition Tests
Pretest and Posttest I

| | Pretest | Post I | Change |
|----------|---------|--------|--------|
| Group I | 11.58 | 15.96 | +4.38 |
| Group II | 12.78 | 13.95 | +1.19 |

Table 4
Mean Scores of Nutrition Tests
Pretest and Posttest II

| | Pretest | Post II | Change |
|----------|---------|---------|--------|
| Group I | 11.58 | 14.82 | +3.24 |
| Group II | 12.78 | 13.73 | + .95 |

Research Question 2. Can fifth grade students better retain nutrition information when told why specific nutrients are needed by the body than when taught with the Basic Four?

A month after the posttest was administered, the test instrument was again presented to the students to determine retention of the nutrition information. A t-test on mean differences between correlated samples was used for treating the data for the two posttests. Table 2 shows the resulting t-scores indicating that Group I lost significantly in knowledge while Group II did not.

Table 5 shows the differences in means of the two posttests. A t-test for difference of means of independent samples showed that the mean changes were not significantly different. The change in both groups was in the same direction, that is, a loss in knowledge.

Table 5

Mean Scores of Nutrition Tests
Posttest I and Posttest II

| | Posttest I | Posttest II | Change |
|----------|------------|-------------|--------|
| Group I | 15.96 | 14.82 | -1.14 |
| Group II | 13.95 | 13.73 | - .22 |

In this study those presented nutrition information with use of specific nutrients exhibited a tendency to not retain the information as well as those who were taught using the Basic Four Food Groups.

Research Question 3. Can students better select foods with an adequate nutrient content when given specific nutrient information than when taught using the Basic Four?

A chi square test on correlated paired observations was computed on items number 11, 12, 17, and 18 of the test instrument) dealing with food selection (Figure 2). The number of students whose responses were wrong on the pretest and right on the posttest (A), and those who changed from right on the pretest to wrong on the posttest (B) were compared with the formula given in Figure 2 for chi square.

| | | | |
|---------|-------|----------|-------|
| | | Posttest | |
| | | Right | Wrong |
| Pretest | Wrong | A | B |
| | Right | C | D |

$$\text{chi square} = \frac{(D-A)^2}{A+D}$$

Figure 2

Table for Tabulating Data for Chi Square on Correlated Paired Observations

The result of previous nutrition education experiences was evident on test items 11 and 18 as seen in Table 6. Citrus fruits are taught to be the source of vitamin C and liver is the main source of iron suggested. The lesson plans attempted to point out that there are other sources of vitamin C and iron besides those traditionally presented. This proved ineffective in both lesson plans.

Group I significantly improved on the other two test items (numbers 12 and 17). These asked for selections of food to be made for ascorbic acid- and iron-rich foods. There was no significant change on these items in Group II as seen in Table 6.

Table 6
Chi Square Values for Items of Food Selection

| Item number | Lesson Plan I | Lesson Plan II |
|-------------|----------------|----------------|
| | χ^2 value | χ^2 value |
| 11 | 1.00 | .22 |
| 12 | 4.25 | 0 |
| 17 | 5.14 | .8 |
| 18 | .78 | .6 |

The critical value of χ^2 at the .05 significance level with one degree of freedom is 3.84.

These findings indicate that much teaching needs to be done to change students' beliefs in oversimplifications which have been used for years to teach basic nutrition. This study also concurs with Mayer's claim that the relationship between nutrition and food selection is not being handled adequately by present nutrition education efforts (2).

Research Question 4. Does the knowledge of girls increase more than that of boys with nutrition education?

A t-test to determine the significance of the difference between correlated samples was used to analyze the student scores. The t values were determined for the boys in Group I and those in Group II. Table 7 illustrates use of the pretest and first posttest for comparison. Values of t were computed for the girls in both lesson plans using their scores from the pretest and posttest.

Table 7

T Values for Boys and Girls Comparing
Pretest and Posttest I

| | Group I | | | Group II | | |
|-------|-------------|---------------|---------|-------------|---------------|---------|
| | test pre | means post | t value | test pre | means post | t value |
| Boys | 11.5 | 16.2 | 8.81 | 12.8 | 14.6 | 4.93 |
| Girls | 11.6 | 15.8 | 9.80 | 12.8 | 13.4 | 1.68 |

The girls in Group II did not gain significantly in knowledge between the pretest and posttest. Therefore one cannot state from results of this study that girls gain more knowledge than boys with nutrition education. The boys did increase test scores significantly in both lesson plans indicating that they benefitted from both lesson plans.

Questions asked the investigator would indicate that students of this age are interested in nutrition. This interest should be utilized at this age level as well as in later school years. This could be done by inclusion of nutrition education in classes that reach more males, such as health and science classes. Upon entering junior high school students find nutrition is included primarily in the home economics courses, which generally reach only the girls.

Analysis of Breakfast Data

The last question of the survey instrument asked the students to recall what they had for breakfast the morning of the test. With only one lesson presented, it would be unreasonable to expect a great deal of behavior change. The data was considered merely as the report of three days' breakfast for each student.

In this study only four percent of the students missed breakfast entirely. This is a fairly low proportion when compared with the results of a study of junior and senior high school students which found that 10 percent skipped breakfast (74). Another study of senior high school students found that 16 percent missed breakfast (75).

Each breakfast reported was compared with the Basic Four to see if all food groups were represented. Table 8 shows the eight percent of the students had breakfasts containing all four food groups. The fairly low percentage of those having a serving from the meat group (21 percent) contributed greatly to this figure. This was not considered critical for it has been shown that filling the protein requirement for the day presents no problem for most young people (17, 35). Therefore, the protein needs will probably be met by meals later in the day. It should be noted that milk, breads and cereals do contribute protein to the diet.

It was considered important, therefore, to see if the students had foods from each of the other three groups besides meat. It was found that 32 percent of the breakfasts reported included foods in each of these groups. Since no quantities of food were considered, these cannot be termed adequate breakfasts.

Table 8
Comparison of Breakfasts with Basic Four

| | Percentage |
|--------------------------------|------------|
| No breakfast | 4 |
| All four food groups | 8 |
| Three food groups ¹ | 32 |
| Group I (Meat) | 21 |
| Group II (Milk) | 77 |
| Group III (Fruit-veg.) | 45 |
| Group IV (Breads-cereals) | 88 |

¹Milk, bread-cereals, and fruit-vegetable groups

Of these three groups, fruits and vegetables were found to be consumed in the lowest quantity. Forty-five percent of the students reported consumption of foods from this group. It cannot be assumed that these were all ascorbic acid-rich foods. Many students had such fruits as bananas and apple juice which do not contribute substantial amounts of this vitamin to this diet.

The most common breakfast pattern seen was cold cereal and milk. This contributed to the high percentage of

those breakfasts reporting the use of milk (77 percent). This figure represents milk used as a beverage, as well as that used on cereal, which may or may not actually be ingested. It was found that 88 percent of the breakfasts reported use of at least one food from the bread and cereal group, one that is usually represented adequately in young people's daily food intake.

Comparing these breakfasts with the Basic Four Food Groups pointed out a problem with use of this food guide. With simulated foods such as the popular breakfast "fruit" drinks, there is a question as to whether one should count a serving of these equivalent to a serving of orange juice. According to Williams orange juice contains, in addition to ascorbic acid, some protein, calcium, iron, vitamin A, thiamin, and riboflavin, as well as some trace elements (52). The main ingredient in breakfast drinks besides ascorbic acid is sugar (58). This makes the breakfast drinks nutritionally inadequate as substitutes for natural fruit juices.

CHAPTER V

SUMMARY, CONCLUSIONS, RECOMMENDATIONS

Summary

The most commonly used method of teaching all age groups how to make wise food choices is a food guide, the Basic Four Food Groups. It is considered by many nutrition educators to be too simple a tool for use with today's young people who have advanced science training. The food supply has also changed so it now contains processed, manufactured, and simulated foods which do not fit easily into the Basic Four framework. The purpose of this study was to determine whether preadolescents can understand nutrition information better when it is presented to nutrient terms than when taught using the Basic Four.

The sample for this study was six fifth grade science classes. Two lesson plans were devised with each having the same objectives. Lesson Plan I used specific information about nutrients, while Lesson Plan II utilized the Basic Four. The test instrument consisted of twenty-three items and was administered three times to the sample: as a pretest; as a posttest immediately after the nutrition

education experience; and again four weeks later as a final posttest.

A t-test on the mean difference between correlated samples, a t-test on the difference between two means for independent samples, and a chi square on correlated paired observations were the statistical treatments applied to the students' test responses. It was found that both methods of presentation of nutrition information produced a significant increase in knowledge as measured by the t-tests. There was an overall gain in recall of nutrition facts when comparisons were made of the posttests for both lesson plans. Group I lost significantly in factual recall in the period between posttests. While this group may have had an immediate gain of knowledge larger than that of Group II, the retention of information was not equal to that of Group II.

Four items on the test instrument were analyzed by the chi square. Group I, presented nutrient information, had a significant increase on two of these items. There was no significant change produced from either lesson plan for the other two items, possibly due to the nature of the questions.

The t-test on the mean difference between correlated samples was performed to compare boys' and girls' scores. It was found that the boys gained significantly in knowledge on both lesson plans when results of the pretest and the first posttest were considered. The girls in Group I gained significantly in knowledge while those in Group II did not.

Conclusions

From data collected in three administrations of the test instrument, the following can be concluded from this study:

1. Can fifth grade students better recall nutrition information when told why specific nutrients are needed by the body than when taught using the Basic Four Food Groups?

Both methods of presenting nutrition information produced significant results, so in this study students presented nutrient information did not have better recall than those taught with the Basic Four.

2. Can fifth grade students better retain nutrition information when told why specific nutrients are needed by the body than when taught with the Basic Four:

Students presented nutrient information lost knowledge significantly in the time period of the study, while

those taught by the use of the Basic Four did not.

3. Can students better select foods with an adequate nutrient content when given specific nutrient information than when taught using the Basic Four?

In this study the nutrient presentation was more effective in producing food selection of adequate nutrient content. However, much teaching must be done to change students' beliefs in oversimplifications resulting from previous education.

4. Does the knowledge of girls increase more than that of boys with nutrition education?

The girls in Group I experienced a significant degree of knowledge increase while those in Group II did not. The boys significantly gained from both lesson plans, so in this study the boys gained more consistently than did the girls.

Recommendations

This Study

It would be desirable to teach an entire unit of nutrition, for instance, a week of classes. This would give more basis for determining whether learning had taken place.

The study may have produced different results if conducted earlier in the school year. The students had already been exposed to some nutrition information in their regular science class. They may have actually learned more from this lesson had it been presented before the nutrition unit in their class schedule. Also, students tend to be somewhat more restless in the spring than earlier in the school year.

With presentation earlier in the year, a longer period of time could elapse between posttests so the levels of retention from each method of instruction could be more thoroughly determined.

Future Studies

With more time for instruction, the lesson could include discussions of all four problem nutrients: calcium, iron, ascorbic acid, and vitamin A. This would make it possible for test questions to include food selection items that would involve more choices, making these more like situations young people face when making daily food choices.

The regular instructor could present the lessons, thus helping to eliminate possible bias in the study toward the presence of a new person as instructor in the classroom.

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APPENDIX A
Test Instrument

NUTRITION TEST

Grade _____ Age _____ Mark with an X Female _____
Male _____

- _____ 1.* What are the Basic 4?
1. the four vitamins which are needed for health: vitamins C, D, A, and B
 2. the four food groups: dairy products, meat or meat substitutes, cereal products, vegetables and fruits, which are needed for health
 3. the four proteins which are basic for growth
- _____ 2.* The best sources of protein in our diets are
1. milk and cheese, meats and cereals
 2. green and yellow vegetables and citrus fruits
 3. butter and sugar
- _____ 3.* What is a carbohydrate?
1. substance such as sugar and starch that are found in foods and used by the body for energy
 2. a fatty substance manufactured by the body and also present in many foods of animal origin which is related to heart disease
 3. a substance found in foods which is essential for the growth and building of tissue
- _____ 4.* Which of these foods is richest in calcium?
1. dairy products and vegetables
 2. meat
 3. eggs
 4. citrus fruits
- _____ 5.* What is a nutrient?
1. unit for measuring energy
 2. a substance found in foods which has a special job in the body
 3. a substance found in foods which causes mental illness
- _____ 6.* Which of the following are vitamins?
1. niacin, thiamin, riboflavin, and ascorbic acid
 2. iron, calcium, and phosphorous
 3. fat, protein, carbohydrate and alcohol

*Items from test instrument developed by Dwyer, Feldman, and Mayer (63).

- _____ 7.* A lack of Vitamin C causes
1. rickets
 2. scurvy
 3. beriberi
 4. pellagra
- _____ 8. Vitamin C's main function in the body is to
1. cure colds
 2. prevent blindness
 3. cement all living cells together
- _____ 9.* Vitamin C is found mainly in which of these foods
1. milk and dairy products
 2. fruits and vegetables
 3. meat and fish
- _____ 10. When a person hasn't been getting enough Vitamin C for a long time he will
1. have great difficulty seeing very well
 2. have blood vessels which will break easily and bruises result
 3. neither of these
- _____ 11. We have to have a citrus fruit every day to get enough Vitamin C.
1. true
 2. false
- _____ 12. Which combination of foods would most nearly give you enough Vitamin C for the day?
1. ham, slice of bread and a glass of milk
 2. cereal and a glass of milk
 3. peas and baked potato
- _____ 13. Iron is needed in the diet to
1. help make blood
 2. prevent rickets and build strong bones and teeth
 3. keep healthy eyes
- _____ 14.* Which of these foods is richest in iron?
1. meats, eggs, and green vegetables
 2. milk and dairy products
 3. citrus and other fruits

- ____ 15.* Hemoglobin
1. is a unit for measuring energy
 2. milk and dairy products
 3. citrus and other fruits
- ____ 16.* A lack of iron is called
1. anemia
 2. pellagra
 3. rickets
- ____ 17. The school lunch is serving three vegetables. Which of these would you choose to get the most iron?
1. green peas
 2. squash
 3. corn
- ____ 18. To get the most iron you should eat
1. liver
 2. cheeseburger with lettuce and tomato
 3. either. They have equal amounts
- ____ 19.* When bread is enriched what does this mean?
1. it has extra sugar which has been added to it
 2. it has certain B vitamins and iron added to it
 3. it is richer in protein than regular bread
- ____ 20. French fries and potato chips shouldn't be eaten because they contain nothing useful for our bodies except calories.
1. true
 2. false
- ____ 21. Women need more iron than men do
1. true
 2. false
- ____ 22. If you want to lose weight, you should just stop eating breads and cereals for they contain nothing useful for the body except calories.
1. true
 2. false
- ____ 23. What did you have for breakfast this morning?

APPENDIX B
Lesson Plans

Lesson Plan Objectives

As a result of this lesson the student should:

1. know what a nutrient is.
2. understand the functions of vitamin C and iron in the body
3. know food sources of vitamin C and iron and be able to choose food combinations which will give the RDA for the day.

Lesson Plan IMethodGeneralizations

- | | |
|---------------|---|
| Discussion | I. A nutrient is a substance which has a specific function in the body. |
| Discussion | II. A nutrient needed by the body is vitamin C. |
| *Visual Aid 1 | A. Vitamin C has not been proven to cure or prevent colds. |
| Visual Aid 2 | B. Vitamin C does act in cementing cells together. |
| | 1. Collagen acts in holding tissues together. |
| | 2. Vitamin C acts in wound healing. |
| | 3. A bruise, internal bleeding |

*Table of Visual Aids

caused by broken blood vessels, may occur more easily if vitamin C is not present in sufficient quantities.

Discussion

4. Deficiency of vitamin C is called scurvy, and symptoms of this disease are understandable when one knows the function of vitamin C in the body.

Visual Aid 3

- C. Food sources of vitamin C are mainly fruits and vegetables.
 1. Citrus fruits are the best sources.
 2. Other fruits and vegetables contain vitamin C.

Visual Aid 3

- D. A certain amount of vitamin C is needed each day for optimal health.

Visual Aid 3

1. The RDA for young people aged 10-12 years is 40 milligrams per day.

Visual Aid 4

2. There are combinations of fruits and vegetables which will give the required amounts of this vitamin for the day.

Visual Aid 5 III. Iron is another nutrient needed by the body.

A. Iron functions in the formation of red blood cells.

1. This part of the cell is called hemoglobin.

Visual Aid 6

2. Hemoglobin carries oxygen to all cells and returns carbon dioxide to the lungs.

Discussion

3. A type of anemia results when the body does not receive sufficient iron.

Discussion

4. Iron requirements increase with growth for there are more blood cells formed, and more body cells requiring oxygen.

Discussion

5. Iron requirements increase whenever there is blood loss, to replace red blood cells.

Visual Aid 7

B. Iron is found in the foods we eat, specifically green plants, meat and liver.

Visual Aid 7

2. Animals eat green plants and store iron in their muscles and liver.
3. Humans eat plants and the animals.

Visual Aid 8

4. Many cereal products are enriched, B vitamins and iron have been added after processing.

Discussion

C. A certain amount of iron is required by the body for good health.

Visual Aid 9

1. The RDA for girls of this age is 18 milligrams, while for boys it is still 10 milligrams.

Visual Aid 9

2. Food combinations of foods commonly eaten will give the amount required for boys of this age, but it is very difficult for preadolescent girls to get as much iron as they need from food sources.

Visual Aids 3, 9 IV. Calcium sources are not included
in foods supplying vitamin C and
iron.

Lesson Plan information obtained from E. A. Martin 1971
Nutrition in Action. Holt, Rinehart and Winston, Inc.,
New York.

TABLE OF VISUAL AIDS

Lesson Plan I

| <u>Number</u> | <u>Type</u> | <u>Discussion</u> |
|---------------|--------------------------|--|
| 1. | Overhead Transparency | Individual bone, nerve, and muscle cells in system held together by collagen. |
| 2. | Bottles | Glue and vitamin C to illustrate the similarities of function of these two substances |
| 3. | Poster | Food sources of vitamin C with amounts contributed by several fruits and vegetables |
| 4. | Poster | Combination of foods giving the RDA of vitamin C for the fifth graders |
| 5. | Overhead Transparency | Traces the path iron follows when ingested up to the formation of hemoglobin |
| 6. | Overhead Transparency | Cycle showing hemoglobin's function in taking oxygen to the cells and returning carbon dioxide to the lungs. |
| 7. | Poster | Iron is incorporated into plants through the soil. Plants are consumed by animals, and man eats both. Explains why iron is found in the foods it is. |
| 8. | Poster | Labels showing enrichment of bread and cereal products |
| 9. | Poster | Food sources of iron and amounts contributed by each in relation to the RDA for this age group: 10 milligrams for boys; 18 milligrams for girls. |

Lesson Plan BMethodGeneralizations

Discussion

I. The Basic Four Food Groups is a guide to see whether foods eaten are giving the body the substances needed for optimal health.

A. A nutrient is a substance which has a specific function in the body

B. No one food contains all nutrients needed by the body and so a variety of foods are required.

Basic Four

II. The Basic Four groups foods into four classes.

Discussion
and chart

A. Fruits and vegetables are the main sources of vitamin C in the diet and dark green vegetables are sources of iron.

Discussion

1. The function of vitamin C is to cement cells together and lack of enough vitamin C causes scurvy.

Discussion

2. The function of iron in the body is as part of the red blood cell called hemoglobin and lack of enough iron causes a type of anemia.

Discussion and
Chart of Basic
Four

- B. Milk and milk products furnish most of the calcium required for formation of bones and teeth.
- C. Meat and meat substitutes are protein sources.
 1. Nuts and legumes are also protein sources.
 2. Liver is the best source of iron, but it is present in other meats, especially beef.

Discussion and
Chart

- D. Breads and cereals provide other nutrients in addition to supplying energy.

Poster showing
labels of enriched
products

1. This group provides protein.
2. Many products of this group are enriched which means B vitamins and iron have been added to the product after processing.

Nutrition III. Foods we eat fit into the Basic Four.

Bingo*

*Lewis & Clark Expanded Food and Nutrition Program, Montana
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