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A Nutrition Education Component for High School Health Curriculums

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A NUTRITION EDUCATION COMPONENT FOR HIGH SCHOOL HEALTH CURRICULUMS

by

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ABSTRACT

A Nutrition Education Component for the
High School Health Curriculum

by

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Adolescents, who have been shown to be at nutritional risk, and having poor nutritional knowledge and sporadic eating habits, are in need of comprehensive, sequential nutrition education. The purpose of this study was to develop, implement, and evaluate a nutrition education unit for inclusion in the health education curriculum of secondary schools. The two-week unit which included nutrient density concepts was evaluated in two high schools in Utah.

Data from a mail survey of health educators (n=74) revealed their need for nutrition training and resources, and guidance for integrating nutrition into health classes. High school health teachers were provided with teacher training materials, lesson plans and instructional aids. Four treatment groups (n=92) were exposed to the nutrition unit and two control groups (n=45) received no nutrition information during the test period. All subjects were pre- and post-tested to determine change in knowledge of and attitude toward nutrition, and completed food frequency questionnaires for purposes of measuring behavioral changes.

The treatment groups improved their nutrition test scores by 12 percentage points from pre- to post-test. Students were shown to reliably mark semantic differential scales measuring attitude. Overall attitude toward nutrition improved slightly. The nutrient density concept was mastered by students and proven to be an effective nutrition education tool. Post-food frequency data showed a consistent trend of decreased frequency of almost all food categories for controls as well as treatment groups, illustrating the importance of control groups in nutrition education studies. Participating health teachers positively evaluated the unit and indicated that their nutrition training and resource needs were sufficiently met.

(131 pages)

STATEMENT OF THESIS PROBLEM

Introduction

In recent years, there has been a growing recognition that greater emphasis in nutrition education is needed as one way to improve the nutritional status of the U.S. population. The final recommendations of the White House Conference on Food, Nutrition and Health (1970) included the need for more effective nutrition education at all ages. Research continues to support the role of nutrition in physical and mental development and in achievement of productivity. In a position paper on the scope and thrust of nutrition education (1978), the American Dietetic Association (ADA) stated that the objective of nutrition education is "to transmit knowledge to consumers about their nutritional needs and the nutritive value of foods in a way which will motivate them to transform this knowledge into eating behavior which promotes health and well-being." (ADA Position Paper, 1978, p. 302).

Nature and Origin of the Study

One population in particular need of nutrition education is the adolescent group. They are the future adults of American society and will be the major decision makers regarding consumer needs and wants. The importance of their proper education in all areas of health cannot be overlooked. The results of the Ten-State Nutrition Survey (1969-1970) indicated that children under the age of 17 (and especially teenagers) had the highest prevalence of nutritional problems. Low nutrient intakes of calcium, iron, vitamin A and calories were found to be significant in this age group.

Adolescent obesity has been recognized as a distinct health problem in the U.S. (Spargo, et al., 1966; Ten State Nutrition Survey, 1969-70). Abraham and Nordsieck (1960) have reported that approximately 80 percent of those who were obese in childhood or adolescence remained obese into adult life. Obesity in the teenage years increases health hazards in adult years of the individual. Preliminary findings of the Health and Nutrition Examination Survey (HANES, 1971-72) point out that both overconsumption and underconsumption of calories and basic nutrients are a problem for teenagers. It becomes evident that teenagers need some standard by which to judge the nutritional value of the meals and snacks which they consume on their own, so that adequate amounts of nutrients are provided within the proper calorie framework.

Several studies have been conducted to determine the nutrition knowledge and attitudes of secondary school students. Dwyer, et al. (1970) reported on a study of the attitudes toward nutrition education and knowledge of nutrition among high school students in a metropolitan area. The overall mean score for the students on the test of nutrition knowledge was 55.9 out of a possible score of 100. This is a relatively low score considering that all the students had completed classes dealing with nutrition (usually as a component of health education courses). A mean of 54 percent of 22 nutrition-related items were correctly answered by 5000 junior high school students in a study by Harrison and Irwin (1964). In a review article by Sutton (1962), numerous misconceptions related to nutrition were outlined from the results of selected studies measuring the general health knowledge of children and youth. The above references all point to the relative

lack of knowledge of the average high school student regarding the subject of nutrition.

Nutrition has been found to be a relatively low interest subject in comparison to other topics covered in health education (Orr, 1966; Dowell, 1966; and Dwyer, 1970). Dwyer's results revealed that the majority of students in her survey felt that nutrition was equally or less interesting than other parts of their health classes. The subject matter was considered to be "boring" or had already been encountered in previous courses of study. Remarks from high school students indicated a general distaste for the "four food group" approach. Topics of special interest expressed by the students included weight loss and dieting, detailed coverage of the proper food to eat for a well-balanced diet, and more explanation and discussion of the effects of deficiencies and excesses of nutrients on the body, in that order.

Hicks (1977) suggests that possible reasons for the questionable effect of nutrition education on the nation's eating habits can be attributed to our schools, their curricula, and teachers with little preparation in nutrition education and who lack awareness of instructional materials. The treatment of the nutrition information may be another factor. Nutrition content in health and science textbooks is limited and often too general, but in most cases, more effective, pertinent instructional materials are not readily available to teachers.

The traditional educational approach to nutrition is somewhat rigid. The "Basic Four Food Group" plan outlines which foods should be eaten and the amounts in which they should be consumed. Many convenience foods, mixed dishes, fast foods, and snacking trends do not easily adapt to the basic four guidelines. The familiar guide to

good eating has not placed emphasis on the energy content of the diet as it relates to the nutrient value. The recent USDA publication entitled, Food (1979) addresses the calorie issue more directly but specific individual guidelines are ultimately the responsibility of the consumer. In the new publication, a fifth group, entitled "fats, sweets and alcohol" is added to the basic four groups. The amount of the foods in this group to be used daily depends on the number of calories a person requires. This system recognizes these commonly consumed foods which do not fit into one of the four food groups and recommends caution in their consumption because of the low nutrient value and high calorie content.

The nutritional quality of a food must be made apparent to the consumer if one is to make wise choices in the diet. Recently, a nutrient-to-calorie approach has been proposed as a more effective means of teaching nutrition (Sorenson and Hansen, 1975; Hicks, 1977). Hansen (1973) used a nutrient density approach to develop an Index of Nutritional Quality (INQ) for a specific food. An INQ value can be assigned to any food by comparing the nutrient composition of the food to its caloric content. A nutrition education program based on the nutrient density concept has been developed and evaluated for kindergarten through sixth grade (Brown, et al., 1979). Results indicate that elementary school children are capable of effectively applying the nutrient density concept to their eating habits. Improvements in eating patterns and increased nutrition interest of children exposed to the program were reported.

Consumer eating habits in the United States have changed drastically in the past 50 years. More meals and snacks are eaten away from the

home. There are more convenience foods and fast foods being consumed by the population. The nutrient density concept can be applied to snack foods, fast foods and convenience foods (Hansen and Wyse, 1979). A majority of high school students consume foods from vending machines on a regular basis according to Hruban (1977). All family members and especially teenagers have more control over their personal dietary intake. By providing INQ information to this population and allowing them to compare nutrient quality they would be better prepared to make prudent food choices.

In an informal telephone survey of five health instructors from three Junior High Schools and two Senior High Schools in Cache County, Utah, in February, 1979, it was found that all of them presented some nutrition information in their health classes. Home economics, biology and general sciences were also reported to contribute to the nutrition education of the students. All of the health teachers contacted expressed their feelings of inadequacy in teaching nutrition. The main resource that was currently being used for nutrition information was reported to be a general health textbook. They all indicated a need and desire for more nutrition education materials for their reference.

When questioned about specific topics in nutrition that are presented in the class setting, there was some variety mentioned. However, the most frequently mentioned topics were the Basic Four, processes of digestion, and nutrient functions and needs. There appears to be no predetermined number or sequence of nutrition topics provided to the students. Instead, the variety of nutrition subjects and related activities seems to depend on the particular interests and competency of the individual teachers. Similarly, the amount of time devoted to

nutrition in the health curriculum varied widely, ranging from five to fifteen class sessions.

All of the health instructors contacted were receptive to the possibility of acquiring additional nutrition education reference materials. They expressed an interest in nutrition resource information regarding weight control, fast foods vs. conventional foods and food fads. In general, they acknowledged the importance of nutrition education for the adolescent and were interested in further promoting it with assistance from qualified nutritionists.

A specific recommendation of the final report of the White House Conference (1970) was the development of a comprehensive program of nutrition education which could be included as an integral part of the cirriculum of every school in the U.S. Health education programs in elementary and secondary schools offer excellent opportunities to make effective nutrition education available to large numbers of children. It is felt by many that nutrition education should be incorporated into the health curriculum on a serious, well-developed and effective basis, since nutrition is a key factor in the maintenance of overall health (Schubert, 1970; Sinacore and Harrison, 1971).

The goal of nutrition education for the student should be aimed at two types of nutrition related responsibilities which individuals have in our society. These are identified by Sinacore (1971) as: 1) to make reasonably adequate choices in selecting one's own diet and that of anyone for whom an individual selects foods, and 2) to develop and express opinions on issues of public policy which affect nutrition. Schubert (1970) emphasizes that school systems and educators have a key role in meeting the challenge of educating children in nutritional

health. Not only is this role related to the growth and development of the children but also to the welfare and progress of their communities.

Statement of the Problem

Nutrition has been shown to be an essential component contributing to overall health status at all ages. The nutritional knowledge and attitudes toward nutrition of the high school student are less than desirable. Since they are the future adults of this society, attempts must be made to provide the proper nutritional knowledge and encourage its practical application to daily eating habits. This is important to the health, productivity, and well-being of future generations. The availability of nutrition resources related to specific health problems is often very limited or not organized into concise packets of information. There is a need to provide the health educator with pertinent nutrition information materials in order that students can be presented with appropriate concepts to be applied in their daily lives.

Purpose of the Study

The purpose of this study was to develop, implement, and evaluate a nutrition education component for use in the health curriculum of high schools. The two-week unit of study was directed toward nutrition-related consumer health concerns. Three major nutrition topics were addressed, including: 1) nutrient needs and Recommended Dietary Allowances; 2) qualitative evaluation of foods by use of the INQ method; 3) energy needs and weight control. Related topics which were discussed were nutrition labeling, fad weight reduction diets, protein supplements, Basic Four Food Groups, and behavior modification. The concept of

of nutrient density was incorporated in an attempt to promote the development of healthy eating patterns based on qualitative and quantitative decisions concerning the nutritional value of individual foods or combinations of foods.

Objectives

Objective I

To develop a two-week nutrition unit of study for high school health education curriculums.

A. Write a summary of background information and a glossary dealing with the specified nutrition topics as a reference for the health educator.

B. Develop lesson plans for the major topics, which are based on behavioral objectives, to be coordinated with appropriate learning activities, instructional materials and evaluation methods, for classroom use.

Objective II

To implement the two-week nutrition education component in local high school health education classes.

A. Identify the appropriate secondary school officials to solicit their cooperation in implementing the research program.

B. Pilot test the nutrition education packet in a school district outside Cache County for evaluation and revision.

C. Field test the revised nutrition education unit in two local high school health education courses of study.

Objective III

To evaluate the effectiveness of the nutrition education packet in the classroom and as a nutrition resource for the health educator.

A. Develop and administer pre- and post-tests, and Food Frequency Indicators to measure the change in nutrition knowledge and attitudes regarding nutrition, of high school participants and compare it to a control group which is exposed to the nutrition unit.

B. Obtain the assessment of the participating health teachers as to the effectiveness of the nutrition packet in the classroom, and its usefulness as a nutrition resource for them.

Objective IV

To assess the nutrition training of health educators in the state of Utah and the current classroom practices regarding nutrition presentation in the health education curriculum.

Significance of the Study

In 1970 the recommendations regarding nutrition education which were developed as a consequence of the White House Conference on Food, Nutrition and Health, were reported. One of the main recommendations stated:

> That a comprehensive and sequential program of nutrition education be included as an integral part of the curriculum of every school in the United States and its territories. (Panels on Nutrition Teaching and Education, 1974, p. 26)

The American Dietetic Association concurs that nutritional concepts should be introduced to children sequentially as an important element of their basic education to provide them with a sound knowledge base and influence lifelong attitudes and habits (The American Dietetic

Association, 1978). There is much encouragement to integrate the nutritional concepts into appropriate subject matter areas in the schools (Schubert, 1970; The American Dietetic Association, 1978; Sinacore and Harrison, 1971; Panels on Nutrition Teaching and Education, 1970). Comprehensive health education programs are being implemented which begin in kindergarten and continue through the secondary grades. Since basic nutrition education should be made available to every child--college-bound or not, boys as well as girls--on a continuing basis, health education programs provide the opportunity to do this (Sinacore and Harrison, 1971).

The panels on Nutrition Teaching and Education of the White House Conference also stressed the importance of providing continuing education opportunities for teachers, school health personnel and food service personnel to keep up-to-date in nutrition education and educational techniques. In the state of Utah a separate series of instructional units in nutrition is not currently incorporated into the secondary school curriculum. Generally, nutrition education is integrated into home economics, basic science, health education and other curriculum areas based on a curriculum guide published by the Utah State Board of Education (1978). However, the consistency of the nearly 90 high schools in the state in conforming to the recommended guideline is questionable.

The present study was undertaken as a step toward uniformly including nutrition education into the secondary education health curriculum. Health education is mandated in the state of Utah. At the same time, by the nature of the nutrition education package, a provision is made to enhance nutrition training and update high school personnel who are involved in nutrition as it relates to overall health.

Research Design

The nutrition education research study was conducted in two phases. The first phase consisted of the development of teacher training and nutrition education materials and their evaluation in a pilot study. Based on the outcome of the evaluation during the pilot study, the nutrition education materials were then revised. The second phase included the field testing of the revised unit in two high schools in Cache County, Utah.

The pretest-posttest control group research design was utilized in the field test. Two experimental groups (class sections) were exposed to the nutrition unit in each school. One class section in each school served as a control group and did not receive any nutrition information during the test period.

A pre-test consisting of 25 basic nutrition questions and five attitude questions, was administered to all groups three weeks prior to the test period (Appendix A). Approximately five weeks later, after the field test period, a post-test was given containing the same 30 questions. A Food Frequency Indicator (Appendix B) was also given to the subjects at the same time that the pre- and post-tests were administered and the students were assigned to complete it as a home assignment. It consisted of 18 questions regarding some general eating patterns of the students as well as their indications of frequency of consumption of 110 food items. This was developed as a possible tool to determine any changes in eating behavior in the course of the five-week interim period.

A Health Education Resources Inventory (Appendix C) was developed to evaluate the nutrition training of health education teachers in the state of Utah, and their current practices in teaching nutrition in the classroom. It included such information as nutrition resources used for class preparation, time spent on nutrition in the health education curriculum, topics discussed, and methods of classroom teaching.

Results of the pre- and post-tests, health teacher survey and the food frequency form were statistically analyzed for significance. This information is summarized in the Results section of the thesis.

Hypothesis

The implementation of a two-week (10 class sessions) nutrient density-nutrition education component developed for high school health education classes, will improve the basic nutrition knowledge and attitude toward nutrition of the participating high school students.

Limitations

A major limitation of the study is the difficulty to accurately measure attitudinal and behavioral changes in the subjects regarding nutrition and eating habits. Both the Food Frequency Indicator and the attitudinal questions, if valid and reliable, can only measure short-term behavioral changes.

Definition of Terms

Basic Four Food Groups: A food guide devised to translate the technical language of nutrients and recommended dietary allowances into terms of daily eating habits. Using this method, foods are categorized

into four groups based on their similar nutrient content. The four groups include: 1) Milk and Cheese; 2) Meat, Poultry, Fish, and Beans; 3) Fruit and Vegetable; and 4) Bread and Cereal.

Index of Nutritional Quality (INQ): A concept which quantitatively evaluates the nutritional value of a food or diet. The INQ method compares the nutrient value of a food to its calorie (energy) value.

Nutrient Density: A comparison of the nutrient content of a food or diet to its energy (kilocalorie) content. This is the same as referring to the INQ value of a food. A food that is nutrient dense has a high proportion of nutrients relative to the energy provided.

REVIEW OF LITERATURE

Need for Nutrition Education of Adolescents

It is widely accepted that nutrition is a critical factor in the promotion of health and prevention of disease and in recovery from illness or injury. Evidence is mounting that Americans at every age and socioeconomic level are failing to consume a diet optimal for health (ADA Position Paper, 1971). Estimates by the Senate Select Committee on Nutrition and Human Needs indicate that an average 20 percent reduction in incidence, prevalence, and cost in most disease categories could be seen with improved nutrition (U.S. Senate, 1977). The impact of a less than adequate diet on the health of the nation is seen in a variety of situations, including: 1) increased risk of complication of pregnancy in the poorly nourished woman; 2) increased chance of low-birth-weight infants and the accompanying risk of retarded physical and mental development; 3) high prevalence of overweight and underweight children and adults; 4) debilitation of the malnourished elderly; 5) widespread dental diseases in the total population; and 6) high prevalence of chronic illness requiring dietary treatment, monitoring, and follow-up (Yanochik, 1978). Nutrition-related health risks must become a priority for health professionals.

Six of the ten leading causes of death in the United States have been associated with diet: heart disease, arteriosclerosis, cancer, diabetes, hypertension, and cirrhosis of the liver (U.S. Senate, 1977). The American diet and lifestyle have been implicated in each

of these chronic degenerative diseases. The seriousness of these diseases demands that the general population understand and practice the basic principles of good nutrition.

Epidemiological evidence indicates the prevalence of obesity is increasing at an alarming rate in the United States (Van Itallie and Hirsch, 1979; Connor, 1979). This is due to a number of factors, including, decreased exercise and a more sedentary life style due to technological advances, greater availability of attractive food choices, and greater affluence. Obesity, which is caused by an excessive calorie intake, has been shown to be a major risk factor in the development of degenerative diseases. It has been related to the development of atherosclerosis, coronary heart disease, stroke, hypertension, diabetes mellitus and cancer of the uterus (U.S. Senate, 1977; Connor, 1979; Van Itallie and Hirsch, 1979).

A segment of the U.S. population that is particularly at nutritional risk is the adolescent group. Major findings of the Ten-State Nutrition Survey (1969-70) indicated that adolescents between the ages of 10 and 16 years had the highest prevalence of unsatisfactory nutritional status (Anonymous, 1972). The objective of the survey was to determine the prevalence and location of serious hunger, malnutrition, and resultant health problems that occur in low-income populations, and to make recommendations regarding ways to resolve them.

Twenty-four-hour dietary recall records were utilized to determine dietary intake of selected nutrients for various age, sex and ethnic groups. Generally, dietary protein intakes were well above levels considered to be adequate and vitamin C status was not a major problem.

for the teenage sample. However, vitamin A status was found to be poor, particularly in the adolescent Mexican-American population living in the Southwest. In addition, the cumulative percentage distribution data showed that between 20 and 54 percent of the adolescents had calcium intakes less than 650 milligrams per day. Nutritional status data from this group showed that iron intakes were lower than intakes of any other nutrient. This was especially true among females. This low dietary iron intake may be related to the biochemical determinations which showed that many adolescents had low hemoglobin levels.

Another finding of the survey was an excess of underweight and undersized children in adolescence, found in all population groups studied, when compared with standards used in the U.S. Significant numbers of adolescents had reported caloric intakes below the standard set for their age, sex, and weight. A wide range of caloric intakes was noted in the dietary data and was consistent with the findings of underweight and overweight children and adolescents. Results from the Ten-State Survey indicate that the percentage of obese adolescents 12 to 17 years of age varies from 15.9 percent to 29 percent for white males, and 10.0 percent to 15.3 percent for white females; from 9.3 percent to 13.3 percent for black males, and 9.0 to 18.6 percent for black females.

Poor dental health was encountered in many segments of the population in the Ten-State study. Between-meal snacks of high carbohydrate foods, such as candies, soft drinks and pastries were associated with the development of dental caries in adolescence. A recent study of the snack food intake of adolescents indicated a negative correlation between increments in decayed, missing or filled teeth, and frequency

of apples, fruit juice and sugarless gum intake, and a positive association with candy intake and spending money (Clancy, et al., 1977).

In 1965-66, the United States Department of Agriculture (USDA) conducted a Household Food Consumption Survey, in an effort to determine the food intake and nutritive value of diets of a representative sample of men, women, and children in the United States. The dietary intake information was gathered by conducting 24-hour food recall interviews with various household members. The average nutritive content of the food eaten by different sex and age groups was compared with 1968 Recommended Dietary Allowances (RDAs) to determine adequacy of diets (USDA, 1972).

One purpose of the study was to identify those age-sex groups with diets in need of improvement. The groups with average diets below allowances in more than one mineral or vitamin were all age groups of females, nine years and older, boys 12 to 17 years, and men 75 years and over. The age groups including girls nine years and older and women through age 54 had diets averaging at least 20 percent less than the recommended allowances of calcium and iron, with many below by 30 percent or more. In addition, girls 12 to 19 consumed diets providing 1 to 10 percent less than the suggested amounts of vitamin A and thiamin. Boys aged 12 to 17 had diets below recommendations for calcium and iron.

The Health and Nutrition Examination Survey (HANES) studied a national sample of persons representative of the U.S. civilian, non-institutionalized population. The mean nutritive content of diets consumed by different age, sex, race, and income groups was compared by using indices of iron, calcium, vitamins A and C intakes. The age

groups considered to be at high risk with regard to the HANES include pre-school children of ages one to five, adolescents of ages 12 to 17 years and adults of ages 60 years and over (Anonymous, 1971-1972).

A significant finding of the dietary data was that iron intake was below standard for adolescents of ages 12 to 17 years. This was typical of both negro and white groups as well as both low and high income groups. Adolescents had mean iron intakes that were 23 to 33 percent below the standard. Females had iron intakes that were significantly below the standards for maintenance of good nutrition in healthy persons in the U.S.

Iron deficiency anemia is relatively common in underweight, undernourished teenagers, especially in girls (Robinson, 1969). Biochemical test values of hemoglobin and hematocrit were the two measures used to assess anemia in the HANES population. The percent of low hemoglobin and hematocrit values in the 12 to 17 year group was notable. Serum iron and transferrin saturation measurements were made in order to assess nutrient iron status and to give an indication of the amount of iron present in the blood. The highest prevalence of low percent transferrin saturation values occurred in the one to five, 6 to 11 and 12 to 17 year age groups. These findings are evidence of a deficiency with respect to the nutrient, iron, which is related to the incidence of anemia, based on both dietary intake and biochemical data.

Another area of major concern regarding teenagers is the frequent occurrence of adolescent pregnancy. In 1973, nearly 600,000 births occurred to young people under the age of 19 (Miller, 1975). The pregnant adolescent is considered at high risk because she is still in

a period of growth and yet must sustain the growth of a fetus. Compounding the problem is the frequent incidence of underweight status and anemia found in adolescent girls.

A number of social factors contribute to increased health risks of the pregnant teenager. Generally, the young mother's eating habits would be similar to the eating habits of non-pregnant adolescent girls. Many girls at this age are concerned with body image and weight and in an attempt to maintain slender figures, follow bizarre diet plans to decrease calorie intake, without regard to proper nutrient intake. Consequently body reserves of nutrients may be marginal or deficient. Also, pregnant teenagers may avoid or delay seeking prenatal care because of financial constraints, ignorance of the importance of such care and a failure to acknowledge their pregnant condition. Because of these factors, the pregnant teenager is more likely to develop medical complications during pregnancy and to give birth to a low-birth-weight baby.

Infant prematurity, and infant morbidity and mortality are more prevalent in the adolescent mother and her offspring (Yanochik, 1978; and Egan, 1979). Low-birth-weight babies have been associated with impaired physical and mental development. Nutrition information about the appropriate kinds and amounts of foods to eat during pregnancy as well as periods prior to pregnancy, is essential to insure the health of both mother and infant. The nutritional status of the mother prior to conception is equally as important in determining the outcome of pregnancy as is the quality of diet during pregnancy.

Limited data is available on the nutritional status of adolescents as compared to data on other age groups. However, the studies that have

been conducted show that a significant minority of youth consume low levels of calcium, iron, and vitamin A. The incidence of anemia, overweight and underweight conditions, and lack of physical activity are also notable in this population. Because the adolescent period is the last major period of growth, the types and quantities of foods teenagers eat could have an impact on their final development, and affect the physical and mental well-being of their children.

Major nutrition problems such as obesity, anemia and dental caries are often compounded by present day food fads and dietary practices. Eating habits of teenagers are sporadic and in many cases nutritionally deficient. The aberrations in food habits of boys and girls are related to their attempt to express independence, exercise freedom of choice, and a desire to be associated with their peers. Teenagers spend a significant amount of time away from the home and, therefore, eat many of their meals and snacks "on the run." Frequent snacking is very typical of the adolescent population (Hruban, 1977). Much of the food consumed is obtained from vending machines, soft drink machines, or "fast food" franchise restaurants. Many of the foods available from these sources are high in fat, simple sugars and salt. This type of food is easier to obtain than homemade meals, is relatively inexpensive, and is "popular," providing a convenient opportunity for socialization. However, health risks associated with the increased intake of these food substances is well documented (U.S. Senate, 1977).

Body image and weight consciousness of adolescents make them susceptible to a wide variety of fad diets, bizarre food combinations, and nutritional supplements. The young girl is generally attempting to lose weight to maintain a slim figure and will try any fad reducing

diet promising quick and easy weight loss. Often these diets stress the consumption of one or several food items exclusively, which results in the elimination of major nutrients, offering the risk of nutritional deficiencies. The boys are equally concerned about weight, but their goals are generally to gain weight in order to improve their athletic skills and physical vigor (Robinson, 1969). In their search for "instant energy" and "muscle-building" food substances, the young men frequently consume unneeded and expensive food supplements.

Teenagers need to be provided with some standard by which to judge the nutritional value of their meals and snacks (Picardi, 1975; and Egan, 1979). Not only should they be made aware of alternate nutritious food choices but they need to be informed of simple and meaningful evaluation techniques for determining the nutritional value of mixed dishes, unconventional foods and new convenience items. When they are confronted with food fads, teenagers need to be able to assess rationally, the health benefits and dangers of such habits, based on sound nutrition information. The adolescent years may provide an opportunity for choice for the first time, therefore they may be a captive audience for concepts of nutrition, provided they can make their own choices about foods, meal times and other consumer-related food concerns.

Nutrition Knowledge of Adolescents

Although adolescents are in need of practical nutrition information, due to poor nutritional status and unpredictable dietary habits, there is much evidence that they lack proper nutrition knowledge and in many cases hold incorrect beliefs about nutrition-related

topics (Sutton, 1962; Harrison and Irwin, 1964; and Dwyer, et al., 1970). Sutton (1962) outlined some of the common miconceptions held by children and youth regarding health education, based on a number of reported studies. The following are examples of some of these:

> ...more than half of a group of tenth grade girls believed that taking vitamins will guarantee you good health, and half of this group of tenth grade girls believed that vitamins in certain pills are better than vitamins in natural foods... Misconceptions concerning body weight and weight control are indicated by findings that nearly half of a group of college students believed that the best way to lose weight is by exercising, and more than one of four of the group believed that overweight is usually due to faulty glands... In regard to dental helath, approximately one of four junior high school students believed that the main reason for fluoride in drinking water is to kill germs in the water (Sutton, 1962, p. 348).

These selected misconceptions serve to illustrate the basis upon which many children and youth are making decisions about their health, which may increase their health risks.

A study was done by Harrison and Irwin (1964) to determine the prevalence of certain harmful health misconceptions among junior high school students attending public schools in metropolitan areas of Tennessee and Massachusetts. A health knowledge inventory was developed and administered to nearly 5000 students. It was found in the data analysis that junior high school students subscribe to many harmful health misconceptions, regardless of metropolitan area, sex, or grade level (Harrison and Irwin, 1964). Eighty percent of the sample believed that "milk is a perfect food;" 47 percent agreed that "persons can clean their blood by eating certain foods;" and 39 percent believed that "most fat people are healthy."

Dwyer, et al. (1970) reported on a study of attitudes toward nutrition education and knowledge of nutrition among high school students in

a metropolitan area of Massachusetts. Students' mean score on the test of nutrition knowledge was 55.9 out of a possible score of 100. Girls scored higher than boys and college bound students scored higher than vocational students.

The original study design was cross-sectional in nature and was planned to assess knowledge and attitudinal differences among students in two grades in each school. The first group was one that had just finished the last required course dealing with nutrition (usually this was a health education class in the ninth or tenth grade) and the second group consisted of seniors ready to complete high school. It was found that twelth grade scores were not significantly higher than tenth grade scores which would indicate that nutritional knowledge did not change notably during the intervening period.

In regard to the attitudinal response, the majority of the students in all schools found nutrition to be "equally or less interesting" than other parts of the health education course they had taken (Dwyer et al., 1970). The most common reasons for the lack of interest in nutrition were that : 1) the subject matter was "boring;" 2) most of the nutrition information presented to them had been taught to them in previous grades or classes; 3) presentation of material was not satisfactory (involved memorization of "useless" facts or use of technical vocabulary); and 4) material was taught at too low a level and covered without enough meaningful detail.

If, in fact, the average adolescent is poorly nourished, and subscribes to many incorrect nutrition beliefs, and is dissatisfied with the traditional methods of teaching nutrition, the high school student should be a special target for nutrition educators. It can be

safely assumed that nutrutionally illiterate or misinformed adolescents become nutritionally illiterate or misinformed adults (Dwyer et al., 1970). In an era when health costs are rising rapidly, the concept of prevention-through-education should be applied in any forum that is conducive to dissemination of health-related information. According to The American Dietetic Association, a fundamental philosophy of nutrition education should focus on the establishment and protection of nutritional health rather than on crisis intervention (ADA Position Paper, 1978).

Elements of an Ideal Nutrition Education Program

The American Dietetic Association (1973) defined nutrition education as the

> ...process by which beliefs, attitudes, environmental influences, and understanding about food lead to practices that are scientifically sound, practical and consistent with individual needs and available food resources. (ADA Position Paper, 1973, p. 429).

Since nutrition education is concerned with individual needs, it should be a continuing process that reaches all people throughout the life cycle, regardless of income, location, or cultural, social or economic practices, or level of education. This would indicate that although the overall goal of nutrition education is the same for all people, the specific approach to teaching nutrition should vary according to the needs and capabilities of a particular group.

The American Dietetic Association stated that the objective of nutrition education is to:

> ...transmit knowledge to consumers about their nutritional needs and the nutritive value of foods in a way which will motivate them to transform this knowledge into eating behavior which promotes health and well-being (ADA Position Paper, 1978, p. 302).

Knowing how to meet the body's nutrient needs through the proper selection of foods should be one of the primary results of nutrition education. Simply providing nutrition information in terms of definitions and facts is not consistent with the stated objective. Nutrition educators must be concerned with not only the demonstrated knowledge of the student but also with the student's attitudes and behavior regarding food and nutrition. Until favorable changes in eating behavior can be observed in the population, the ultimate goal of nutrition educators will not be reached.

In determining the content of a nutrition education program, several concepts about nutrition were identified by the Federal Interagency Committee on Nutrition Education (ICNE) and slightly modified by the panel on nutrition education of the 1969 White House Conference on Food, Nutrition and Health (White House Conference, 1970). These are summarized by Maretzki as: 1) nutrition is the way the body uses food; 2) food is made up of different nutrients needed for growth and health; 3) all persons, throughout life have need for the same nutrients but in varying amounts; and 4) the way food is handled influences the amount of nutrients in food, its safety, quality, appearance, taste, acceptability, and cost (Maretzki, 1979). The American Dietetic Association builds on and expands these concepts to arrive at their recommendations for areas of focus in nutrition education.

They stress that consumers acquire some understanding of the following areas of nutritional science and food economics: 1) how the body uses food in health and disease (including ingestion, digestion, absorption and metabolism, functions and interactions of nutrients in the body; interrelationships of foods and drugs; and nutrient and

caloric composition of food); 2) components of a nutritionally sound eating pattern, with appropriate modifications for various periods of life in both health and disease; 3) criteria for critically analyzing published nutritional information and understanding areas of honest controversy; 4) factors affecting the economics, availability and quality of the food supply; and 5) social and emotional influences on personal use of food (ADA Position Paper, 1978). The way in which these concepts are communicated to children is perhaps the greatest challenge that nutrition educators must face.

In recent years, the idea of teaching children about nutrition sequentially from pre-school through high school, as an important element of their basic education, has been widely recommended (White House Conference 1970; ADA Position Paper, 1978; Maretzki, 1979). Acquiring nutrition knowledge should be viewed as a step-wise process that builds on basic concepts and vocabulary and relates to an individual's physical, mental and emotional readiness. Maretzki (1979) states that nutrition education should complement the child's changing perception of food and its utilization inside the body as these perceptions evolve through observation and analysis to insight and conclusion. The developmental stage, situational factors, and areas of interest of the child must all be considered in planning the content and sequence of presentation of a nutrition education program.

Primary objectives of nutrition education are change of attitudes toward food, change in food practices, and change in the ability to apply nutrition information. Thus, motivating an individual to "want to" to make proper food choices is as important as teaching the basic nutrition information. Hicks (1977) recommended a "guided discovery" learning process which allows the child to discover facts, relationships

and generalizations about food and nutrition. This can probably be most effectively achieved by involving the student in activities that relate to his life situation and require an active participation in a project or problem solving exercise. The student can then develop a food classification system that has personal meaning based on knowledge of nutrients and nutrient sources. This individualized guide to eating can include foods and food habits that appeal to the student but still fit within the framework of his or her specific nutrient needs.

An essential factor to consider in determining what to teach about nutrition, is to learn as much as possible about the group to be taught. It is helpful to have answers to the following questions: What are their attitudes toward food? What food choices do they make? Why do they choose as they do? What modifications in food practices would promote nutritional health? What are the specific nutritional needs of the group? When such answers are obtained, one can decide if attitudes need to be changed, if food choices need to be improved, what optional food choices may be offered, what basic nutrition information is required, and how their nutritional needs can be met by changes in eating habits.

Change in attitudes is essential to motivate change in habits. A specific formula for motivating change of any habit does not exist. However, appealing to the interests of a group at a particular time can go a long way to convincing them of their need for modification of eating habits. For example, in dealing with adolescents, it would be useful to appeal to their interest in body image (e.g., ideal weight, clear skin, and shiny, healthy hair) by relating it to their daily dietary intake. Hopefully, then the facts about physiological functions of particular nutrients would be more meaningful to the individual, and

attitudes regarding nutrition information might be improved, which could ultimately result in altered eating patterns.

Curriculum design is a process which should include conceptualizing, designing, pilot-testing, revising, implementing and evaluating (Maretzki, 1979). This process should include the input of parents, teachers, administrators, and food service personnel, and provide for continuing staff development in order to result in an innovative nutrition education approach. Maretzki (1979) concludes that the challenge is in combining discrete elements (teachers, food-service personnel, students, parents, materials and curricula) into a system which links learner, content and pedagogy to the elusive question of why and where nutrition education connects with the real lives of children.

Placement of Nutrition Education in Secondary Schools

Following the recommendation of the White House Conference on Food, Nutrition and Health in 1970, that a comprehensive program of nutrition education be included as an integral part of the curriculum of elementary and secondary schools, there was increased interest in determining what, if any, nutrition education was taking place in the secondary schools at the time. A second area of concern was where nutrition was being incorporated. Also, if particular programs were in progress how successful were they in reaching all young people. School systems became interested in learning the most efficient and effective methods of introducing nutrition information to children and adolescents on a consistent basis.

A number of studies which were reported on in the 1970's began to answer some of these questions. Johnson and Butler (1975) undertook a study to assess the current status of nutrition education in public schools of each of the 50 states and the District of Columbia. They found that ten states had legislated policy concerning nutrition in the public schools. Other states were currently involved in federally-funded projects ranging from development of comprehensive nutrition programs, to formulating policy to guide the direction of nutrition education within their state.

According to the survey, nutrition education was being carried out through a wide range of disciplines. Thirty-one states were reported to have someone who had a major responsibility for nutrition education within the state. Persons in charge of nutrition education in responding states included 16 school food service directors or consultants, 14 home economists and 8 nutrition education specialists. Of those indicating "other" persons, eight health educators, three registered dietitians, one physical education specialist and one school administrator were responsible (Johnson and Butler, 1975). There is some question as to the competency of the responsible individuals and their personal interest in teaching nutrition, in such a diverse group.

Because of the varied systems of nutrition education placement within school curricula and the variety of the educational formats utilized to present nutrition in public schools, the authors recommended that a qualified and competent nutrition education specialist coordinate state nutrition education programs. It was felt that states could then develop comprehensive and sequential nutrition education programs suited to their own needs and administrative structure. The newly enacted Public Law 95-166 (National School Lunch Act and Child Nutrition

Amendments) which provides funds for nutrition education in the school requires that in order to be eligible for federal assistance, each state must appoint a nutrition education specialist to serve as a state coordinator for nutrition education, undertake an assessment of nutrition education needs, and devise a state plan of action (Anonymous, 1977).

In 1975, the Utah State Board of Education conducted the Utah Nutrition Education Study, by surveying 380 teachers from all subject areas and at both elementary and secondary levels. Results showed that of the teachers who taught nutrition, 49 percent included it in health, 21 percent included it in home economics, 12 percent included it in science, and 12 percent included it in social studies. However, only 16 percent had ever taken a college nutrition course and 71 percent had never had a class in nutrition or in related subjects in which nutrition was included. Teacher's recommendations for training in nutrition education included 50 percent in favor of district workshops, and 12 percent favoring short workshops after school or in the summer.

More recently, Levine, et al. (1979) conducted a survey in New Jersey to assess nutrition education in the high schools. The purpose of the study was to determine what high school departments taught nutrition, which nutrition concepts were being taught, how much time was allotted for nutrition education, what types of methods and instructional materials were being used, what percentage of the total student body was enrolled in courses where nutrition was taught, and what background the nutrition educator had. Of those teachers who responded, more than one-half were home economics teachers. Between 20 and 25 percent of all respondents were either health or science

teachers (Levine, et al., 1979). Science teachers included those who taught general science, chemistry, biology and medical careers. School nurses were grouped with health teachers and school food service directors were included with home economics teachers.

In estimating the time spent teaching nutrition in each of the various courses, it was found that more teachers of home economics spent a larger percent of their course time dealing with the subject of nutrition. The nutrition concept that was often taught by all teachers was "diet affects health." Generally, home economics teachers gave the greatest responses for all of the six basic concepts listed, which indicates that not only more time is being spent teaching nutrition, but more concepts are being covered by home economics teachers.

In regard to methods used in teaching nutrition, the lecture and discussion methods were used "very often" or "often" as indicated by 75 percent of all teachers. Textbooks, student dietary recall, student projects, filmstrips and posters were methods reported as "moderately used methods." The most frequently named texts used as classroom resources had publication dates which were not recent. When given a list of organizations that provide nutrition education materials, a significantly higher percentage of home economics teachers claimed to use materials from those organizations than either of the other groups of teachers. The four most frequently used organizations were the U.S. Department of Agriculture, National Dairy Council, U.S. Department of Health, Education and Welfare, and the General Mills Nutrition Department.

In determining the nutrition background of teachers, it was reported that almost all home economics teachers have had one or more college

level courses in nutrition, whereas less than one-half of the health teachers and less than one-fifth of the science teachers ever had a nutrition course in college. Other sources of nutrition knowledge were found to be acquired through reading books and articles pertaining to nutrition in periodicals or professional journals.

Results of the study indicated that few New Jersey secondary school pupils are being exposed to nutrition education in any depth. A significantly larger percent of health instructors taught courses that included nutrition to a greater proportion of a high school's total population than did either home economics teachers or science teachers. Although health teachers have the opportunity to reach the entire student body in New Jersey, they were found to spend little time teaching nutrition and their background in nutrition is weak. On the other hand, home economics teachers most often had some educational background in nutrition, made use of a variety of educational materials, and spent a larger percent of their course time teaching nutrition; but they reached only a small percent of the student population. Levine, et al. (1979) suggested the possibility of coordinating the efforts of all teachers involved in nutrition education, so that they all play complementary roles to provide interesting and varied experiences in nutrition.

Based on results of the survey, the authors identified two basic needs which should be satisfied to further the effectiveness of nutrition education. One is to provide for some type of in-service training for teachers involved in nutrition education. A second need is for the provision of reliable resources and a variety of innovative ideas for presenting nutrition information.

Marr, et al. recently completed a similar study in Pennsylvania (Marr, Shannon, and Spanier; personal communication, 1980). The objectives of the statewide mail survey were to: 1) ascertain whether teachers and administrators perceived a need for nutrition education in grades seven to twelve; 2) determine which teachers were personally interested in teaching it; and 3) find out how they thought nutrition education could be best incorporated into those grades.

There was strong agreement among all respondents that nutrition should be taught in grades seven to twelve. Only 22 percent of the respondents indicated that they had taken a college nutrition course and 11 percent said that they had attended, since college, a workshop, seminar or in-service training session which emphasized nutrition. Those teachers who had taken college nutrition courses were concentrated in the subject of home economics, health-physical education and life sciences.

Both teachers and administrators preferred integration of nutrition into existing courses, rather than teaching it as a separate course. When asked to rank-order six courses where nutrition might best be taught, most respondents ranked health and home economics as their first or second choices, with biological sciences and physical education most often ranked third or fourth. Teaching nutrition as a "mini-course" at several points throughout grades seven to twelve also received considerable support.

Forty-five percent of all the respondents indicated a willingness to attend an in-service session on how to use a nutrition education curriculum. Those subject matter areas having the highest percentage

of teachers interested in such workshops, and most interested in teaching nutrition were home economics, health-physical education and the life sciences.

The recommendations of Marr, et al. (Unpublished) were similar to those of Levine, et al. (1979). If nutrition education programs are to be incorporated into established junior and senior high school courses, then it is important that the nutrition information be complementary to assure students a sound and complete nutrition training. The authors suggest that if the fundamental approach to diet and nutrition is based on its relation to health and is considered to be essential knowledge for all students, then it would be advisable to place these health-related concepts in the health curriculum, since the highest proportion of students are reached in health courses. Then other science-oriented and food-consumer-oriented nutrition concepts could be built into the biology and home economics curricula, respectively. In addition, other separate units or "minicourses" could be developed that apply nutrition principles in specific situations, such as sports, pregnancy, or weight reduction, to complement the comprehensive program and offer a higher level of nutrition knowledge to those interested.

The importance of developing nutritional concepts concurrently with the child's growing understanding of the biologic and social sciences is seen as the most logical method of providing the broad understanding of nutrition needed by today's consumer. The American Dietetic Association recommends that a systemized approach include the integration of nutritional concepts into appropriate subject matter areas, and/or as a separate series of instructional units, depending on the educational curriculum and needs of the students (ADA Position Paper, 1978).

Identifying the optimal placement of nutrition in secondary schools has been considered by many (Schubert, 1970; Sinacore and Harrison, 1971; Johnson and Butler, 1975; and Levine, et al., 1979). Schubert (1970) sees the well-structured curriculum in health education as a necessary and educationally acceptable part of the total school academic program, and further states that nutrition education would be best placed in the health curriculum. His observations that home economics teachers have been responsible for most nutrition teaching for many years, but only reach a small percentage of female students, is supported by the study by Levine, et al. (1979) in New Jersey. Similarly, the small percentage of students that receive bits of nutrition information from biology and physical education teachers does not indicate that a majority of adolescents are consistently receiving the nutrition education that is needed by that population.

Some states have mandated that health education be established within the high school curriculum, e.g., Utah, New York, New Jersey, California. Sinacore and Harrison (1971) cite this trend as a convincing argument for making health education the focal channel for nutrition education. An alternative to the nutrition education problem as suggested by Levine (1979), would be to mandate nutrition as a part of the health curriculum. This has been accomplished in several states already, e.g., California and New York.

The incorporation of nutrition into other disciplines of learning requires that a variety of people other than nutritionists, dietitians and home economists will be involved in disseminating nutrition information. The lack of success in classroom nutrition instruction has been attributed to poorly trained teachers, lack of appropriate instructional

materials, poorly planned curricula, lack of consistency between classroom and cafeteria, and the failure of home and school to provide mutually supportive learning environments (Hicks, 1977; and Maretzki, 1979). As mentioned earlier, few teachers are adequately trained in nutrition. Other barriers to implementing the integrated approach include the already heavy demands on the time and energy of school teachers, and teachers' lack of self-confidence and enthusiasm for nutrition education (Sinacore and Harrison, 1971; and Maretzki, 1979).

These problems point out the necessity for current, concise, and complete training of those individuals who are responsible for teaching nutrition in secondary schools. Initially, the creation of an awareness of the importance of nutritional health education and improved school lunch programs in school communities is essential to awaken the interest of individuals who will be involved in nutrition education (Schubert, 1970). Development of appropriate methods and materials by educators familiar with the educational process, the science of nutrition, and curriculum development is the next step in planning a comprehensive nutrition education program (ADA Position Paper, 1978). Providing in-service training in updated instructional methods and techniques in nutritional health, and the use of new materials and aids, to appropriate teaching personnel must follow if the program is to be a success. Without the direction of a carefully designed curriculum, individual teachers and food service workers are likely to be working in a nutrition education vacuum (Maretzki, 1979).

Thus, placement of nutrition in the secondary school curriculum is not a simple matter. It involves the cooperation of a wide variety of people including state and local officials, school administrators,

teachers of diverse disciplines, nutrition educators, and the students themselves. Finding the most appropriate location for, and the most efficient method of attaining a comprehensive nutrition program will vary according to local conditions. The necessity for well-coordinated planning, cooperation, and communication between people with different interests, and the provision for proper training of all persons involved, is evident if the nutrition education needs of young people are to be successfully met.

Nutrient Density Nutrition Education

Nutrient needs for humans have been outlined for about 30 nutrients in the Recommended Dietary Allowance (RDA) tables (Food and Nutrition Board, 1980). The 1980 revised RDAs include a table of "Estimated Safe and Adequate Daily Dietary Intakes of Additional Selected Vitamins and Minerals" besides those included in the traditional RDA publication. These recommendations are given for various sex and age groups, in terms of average daily needs. However, foods are the vehicles for nutrients and people consume foods rather than pure nutrients. What and how much food people eat depends on personal preferences, availability, and income, and to some extent their awareness of a food's nutritional value. Many people are unaware of the nutritional quality of their diets. A simple but meaningful food evaluation system is necessary so that individuals can translate their nutrient needs into terms of food intake so that nutritionally adequate diets can be selected.

Hansen (1973) developed a nutrient density concept called an Index of Nutritional Quality (INQ). The nutrient density of a food, or food combination in a meal or diet, is defined as the ratio of the nutrient

composition of the food, food combination or diet, to the calorie contribution of the food, food combination or diet (Wyse, et al., 1976). The INQ compares the nutritive content of a quantity of a specific food, food combination or diet, with its energy content in terms of the human requirement for various nutrients and energy. The following equation is used to calculate the INQ values.

$$\text{INQ} = \frac{\text{Amount of a nutrient in a 1000 kcal food portion}}{\text{Human requirement of that nutrient per 1000 kcal}}$$

The equation is applied to point out the extent to which human nutrient needs are met in proportion to the energy requirement obtained from a food.

The standard usually used to calculate the INQ is the RDAs of the Food and Nutrition Board. However, any nutrition standard can be applied, such as U.S. RDAs for nutritional labeling; international standards, such as those recommended by the Food and Agricultural Organization (FAO); or arbitrarily defined standards where current standards do not exist, as for fat, cholesterol and carbohydrate.

The basic need of an individual is for the provision of energy (Hansen, 1973). For proper maintenance of body weight, the intake of energy in the form of calories must be within a rather narrow range. Other nutrient requirements must be contained within this framework of energy need, if a diet is to be considered well-balanced or nutritionally adequate (Sorenson, et al., 1976; and Wyse, et al., 1976). Because of the variations in individual energy needs, it would be impractical to calculate the INQs for foods for specific individuals. Therefore caloric values which are thought to be most representative are utilized as the energy standard for the INQ system.

At Utah State University a computer program has been developed which calculates the INQs by application of the previously described equation and prints the INQ information in tabular and graphic format (see Appendix). The current data base for food composition is from the 1972 revised Agriculture Handbook No. 8. In graphic form, the INQ profile yields both qualitative and quantitative information. Index of Nutritional Quality information can be given for a food in terms of any nutrients for which the nutritional composition of a food is known, and may include vitamins, minerals, trace elements, fatty acids, amino acids, and fiber. The extent of the INQ evaluation thus is limited by the nutrient composition data which is available to be computerized. Frequently, 8 to 10 key nutrients are included in the computer printout as a general guide to the nutritional quality of a food or diet.

The computer printout (Appendix D) includes: the identification and amount of the food item being evaluated, a listing of the nutrients about which INQ information has been calculated, the amount of each nutrient contained in the food, a numerical INQ value and the percent of the total standard (% STD) for each nutrient supplied in the food, and a bar graph in which the length of the bars reflects the percent of the standard of the nutrients provided in the food. A vertical broken line is printed from the end of the energy line (or bar) to allow for a quick visual evaluation of the nutritional content of the food as compared to the energy (kilocalories) contained in it.

The quantitative evaluation of a food or diet can be determined by the INQ value assigned to the various nutrients. An INQ value greater than 1.0 for a nutrient indicates that an amount of a particular food

that would satisfy the total energy requirement would also provide a sufficient amount of the nutrient. Conversely, INQ values less than 1.0 would identify nutrients in a food where an excess of calories must be consumed to reach the required amounts of those nutrients (Wyse, et al., 1976; and Sorenson, et al., 1976).

The nutrient lines or the bars of the graphic printout which are proportional to the INQ values, can also be used to evaluate the nutrient quality of a food. When a nutrient line meets or exceeds the energy line (INQ $\geq$ 1.0), the nutrient is provided in sufficient amounts to meet the standard and the food is considered a good or adequate source of that nutrient (Wittwer, et al., 1977). When compared to the calories provided by that food, there is an equal or greater percentage of the nutrient need being met by consuming that food. If a specific nutrient line is shorter than the energy line (or does not meet the broken line (INQ < 1.0), it indicates that for the amount of calories in that food, the specified nutrient is present in lesser percentage amounts. Thus, the food is not considered an adequate or good source of that nutrient.

The INQ concept is useful for assessing the nutritional quality of individual foods, food combinations, or total diets. A composite profile of a meal, or snack, or a daily average of a diet can be calculated by adding the nutrient values of each of the separate foods in the meal or snack and printing the result in the standard profile form (Wyse, et al., 1976; Sorenson, et al., 1976). Because of this capability of the system, its practical application is limitless.

Sorenson, et al. (1976) described the application of the INQ approach to nutritionally analyze cycle menus in institutions and its

use to aid in planning clinical menus to fit a patient's special dietary needs. Similarly, Wyse, et al. (1976) showed how diets of various population groups can be nutritionally evaluated to identify their nutritional needs. The use of INQ in the food industry to plan and design new foods, evaluate current food fortification practices, and in the regulation of food advertising and food labeling, has been suggested (Wyse, et al., 1976). Other uses of the nutrient density concept have been to apply it to analyses of fad reducing diets, groups of foods, snack foods, vending machine items, vegetarian diets, and national nutrition trends (Sorenson and Hansen, 1975; Wyse, et al., 1976; Wittwer, et al., 1977; and Hansen and Wyse, 1979).

A nutrient density approach has been recommended as an effective method of teaching nutrition (Sorenson and Hansen, 1975; and Hicks, 1977). Brown (1979) recently reported on the development and evaluation of a nutrient density-nutrition education program for elementary schools. Nutrient density materials were used to teach food identification, nutrition labeling and food groups, which resulted in significant learning in these areas by the children (Brown, et al., 1979).

The program developed by Brown was designed to be integrated into existing curricula, where resident classroom teachers taught the nutrition information. It was found that with proper training and well-designed teaching materials, elementary school teachers with only a limited nutrition background could effectively use the nutrient density approach to teaching nutrition (Brown, et al., 1979). Generally, students, teachers, and parents responded favorably to the program.

The Index of Nutritional Quality has proved to be capable of quantitatively describing the nutritional properties of foods and

determining the relative adequacy of a food as a source of one or more nutrients. Using this technique, assessments can be made by both professionals and consumers concerning the nutritional value of individual foods, food combinations or food groups to the diet. It also addresses the current health concern regarding the importance of proper calorie control as it relates to body weight, while encouraging adequate nutrient intake. The applications of the INQ system are diverse and numerous, making it an important educational device at all levels of the population.

METHODOLOGY

Restatement of Objectives

The purpose of the study was to develop, implement, and evaluate a nutrition component for incorporation into secondary school health education curriculums. High school health teachers were provided with appropriate training materials and presented the nutrition information in a two-week block of the health education course. Pre- and post-tests and Food Frequency Indicators were utilized to measure change in nutrition knowledge and attitudes toward nutrition, of high school participants.

Research Approach

The research approach was to measure the effectiveness of an original nutrition education unit developed for secondary schools. An evaluation research method, as described by Talmage, et al. (1978) was applied. The evaluation research approach is a dynamic model where the evaluation process takes place within the confines of a classroom setting, where many variables are uncontrollable. Modification of the program may take place during the ongoing evaluation process as needed. A formative evaluation model was thus utilized in the pilot test to develop the final nutrition education packet that was actually field tested. However, a summative evaluation model provided the conceptual framework for the overall research study.

Research Design

Appropriate instructional materials were developed, based on behavioral objectives, derived from several basic nutrition concepts. Training materials pertaining to the nutrition unit were developed, and a workshop was conducted to introduce and describe the utilization of the nutrition education packet to the health teachers participating in the study. A pilot test of the materials was conducted in a Weber County High School, followed by evaluation and revision of the program prior to field testing it. The nutrition unit was field tested in the classrooms of two Cache County high schools. In each school, two groups (class sections) were exposed to the nutrition unit and a third group served as controls and did not receive nutrition information during the two-week test period. Pre- and post-tests and Food Frequency Indicators were administered to measure change in nutrition knowledge of the students and their attitudes toward nutrition.

Pilot Study and Revisions

During the course of the study, a variety of instructional materials were developed for the nutrition education component. These are described later in the chapter in detail, and include: written background information on three topics, lesson plans for each of ten proposed class sessions, a set of 16 food profile cards, slide reproductions of the profile cards, overhead transparencies, and several copies of a Nutrient Density Food Profiles Masterbook.

Three major nutrition topics were chosen to be discussed in the nutrition unit based on fundamental concepts developed by the panel on

nutrition education of the 1969 White House Conference (1970), perceptions of student weaknesses in nutrition knowledge, perceived interests of high school students, and the intention to introduce the INQ concept at a secondary school level. The three topics are: 1) nutrient needs and RDAs; 2) qualitative evaluation of foods using the INQ concept; and 3) energy balance and weight control.

The information in the sequential lesson plans was developed so that basic nutrition facts introduced in the beginning units were built on and expanded in later ones. For example, students should be knowledgeable of certain key nutrients, their basic physiological functions, recommended dietary needs, and common food sources before the INQ concept could be introduced. Index of Nutritional Quality principles could then be applied to nutritional evaluation of specific foods, snacks or meals, so that students could become aware of the importance of the proper selection of a diet. Since the INQ concept is based on energy needs, it could be further applied to the weight control portion of the nutrition unit.

Elements to be included in the three topic areas were derived from a number of resources, including basic nutrition texts, health education textbooks, available INQ information from journal articles, and current consumer information materials. Background written information and lesson plans were composed in a first draft form and reviewed by a nutritionist, a secondary education specialist, and a health education expert. They critically studied the first copy in terms of content, format, vocabulary, and grammar, and made suggestions for change. The written information was then revised according to the recommendations.

An example of the lesson plan format is included in the Appendix. A brief summary of the content of the lessons regarding each of the three nutrition topics provides an introduction to the lesson plan. This is followed by a list of the instructional materials and equipment needed to present the lessons. Behavioral objectives to be accomplished during the presentation of the information are itemized next. An outline form of the lesson content which can be used by the teacher as a guide during classroom delivery, completes the lesson plan format.

Other instructional devices were devised to complement the lesson plans and reading information. Food profile cards were developed from prototypes used in other nutrition education programs. Overhead transparencies were planned to include pertinent information and prepared by the Graphics Department at Utah State University. Printing and photography services were also utilized to develop the food profile cards, overhead transparencies, slides, and a food profiles masterbook. Consultation with professionals in these departments, and persons involved in the development of the nutrient density concept provided critical assistance in the evolution of the final instructional devices.

In early October, 1979, the nutrition education package, which was designed to cover ten class sessions, was pilot tested in Roy High School in Roy, Utah. The unit was incorporated into the health education course currently in progress which consisted of a total of 18 weeks (one semester). The nutrition information was presented to the students by two health teachers and a student teacher. They agreed to implement the program and evaluate its usefulness and effectiveness and offer suggestions for change. The principle teacher cooperating in the pilot study was an experienced teacher who had been teaching health

education for 12 years and teaching high school for 14 years. He was a football coach at the school and held a Master's degree in Health and Physical Education. The second health education teacher was experiencing her first year of high school classroom teaching and often team taught with the principle teacher. She held a Bachelor of Science degree in Health and Physical Education. The third individual involved in teaching the nutrition unit was a student from Weber State College who was completing her student teaching requirement at the time.

The author of the study observed the classroom presentation of the nutrition education unit for two or more class periods on a daily basis during the pilot test. She served as a consultant to the teachers, as needed, clarified any unclear information or instructions, and evaluated the ease of utilization and effectiveness of the test materials. A three hour workshop had been conducted to introduce the nutrition component to the participating teachers prior to the pilot test.

Although class periods were usually timed to last 50 minutes, other school and classroom activities shortened the actual teaching time to 40-50 minutes per class session. Announcements from the principal's office, roll call, fire drills, school assemblies, student homeroom announcements, and students obtaining signatures for absences or tardiness are examples of the typical time-consuming activities during a class period. A significant amount of time was also spent in disciplining students on some days.

Disinterested or unattentive students made up a notable portion of a particular class at any one time. Students were observed sleeping, reading newspapers or books, completing assignments for another class,

talking, writing letters, and passing notes on a consistent basis. Thus, frequent classroom disruptions due to students or outside factors were found to be rather typical of the pilot test school.

The actual time required to complete the unit was 11 days for all three teachers. Each kept their own pace and style in teaching for the most part and there were minor differences in how much material was covered in a class period. The lesson plans provided gave suggested amounts of information for individual class sessions but the teachers were to move ahead at a rate that was comfortable for them and met the capabilities of the students.

The participating teachers found the nutrition packet generally complete, and relatively easy to work with. However, they suggested changes on a daily basis, and at the conclusion of the pilot test each gave a summary evaluation of the nutrition education component.

Some of the suggestions for change were in regard to deleting information to shorten the length of time spent on the unit. In several instances more detail was recommended to explain a concept. Slight variations in student activities or the use of instructional materials were recommended occasionally. For example, originally, 8-1/2 x 11 inch food profile cards were used to demonstrate the INQ concept. However, the written information on the cards was not visible from the back of a standard sized classroom. It was suggested that slides or overhead transparencies be utilized when introducing the food profile cards and the information they contain, for better classroom visibility. Slides were developed for that purpose during the later field test. Another suggested change was to give a homework assignment earlier in the unit so that information from it could be

used later in the unit for the benefit of the student. A number of minor numerical and typographical errors were also noted in the written lesson plans and instructional materials, during the pilot test. Modifications in vocabulary level and content were also made as a result of the pilot test.

Appropriate corrections and revisions were made in the unit materials after the pilot test period. In their revised form, the materials were reviewed by two health education teachers and a nutritionist at Utah State University and found to be acceptable. Final copies of the materials were then reproduced for use in the field test.

Description of the Subjects

The subjects included in the study were students enrolled in three sections of the health education course offered in two schools in Cache County, Utah. The students in the first three class periods of the day where health education was taught were chosen as the study participants. The first period class was identified as the experimental 1 group, the second period class was the experimental 2 group, and the third period class was designated as the control group in both schools.

The two experimental groups in each school were exposed to the nutrition education unit over an approximate two-week period. The control group in each school did not receive any nutrition education in health class during the test period. Another unit of health education was presented to the control groups at that time. Both experimental and control groups were pre- and post-tested with the same instruments, and were assigned to complete the pre- and post-food frequency forms.

Logan High School and Sky View High School were the two schools selected to be included in the research study. The average number of students originally enrolled in the Sky View health education classes was 29 for each class period. At Logan High School, the average size at the beginning of the term was also 29 students. During the course of the research study period, a number of students dropped the class, transferred to other class sections or did not take the pre- or post-test due to absence from school on days they were administered.

The actual number of students who completed both pre- and post-tests during the study period was 137. Of these, 64 were from Logan High School, with 23 in the experimental 1 group, 19 in experimental 2 group, and 22 in the control group. Seventy-three students participated from Sky View High School, with 28 from the experimental 1 group, 22 from the experimental 2 group, and 23 in the control group.

The study subjects in both schools were from grades 10, 11, and 12. However, in Sky View High School, most of the students were in grade ten. In Logan High School, a majority of students were in the tenth grade. Table 1 provides information regarding the number, grade level, sex, and mean aptitude of each of the treatment groups included in the study.

Because of the various grade and age levels of the students in the experimental and control groups, another parameter was sought to perhaps account for any differences between groups. It was decided to obtain a mean aptitude score for each group. However, due to privacy policies at both schools, it was not possible to obtain an individual aptitude score for each student. Instead, a list of appropriate scores was made available so that a mean score for each group could be derived.

Table 1. Description of study subjects.

	n	SEX F	SEX M	GRADE LEVEL 10	GRADE LEVEL 11	GRADE LEVEL 12	APTITUDE SCORE (% ile)
Logan High							
Experimental 1	23	12	11	7	10	6	54†
Experimental 2	19	13	6	7	7	5	57†
Control	22	7	15	1	16	5	59†
Total	64	32	32	15	33	16	
Sky View High							
Experimental 1	28	18	10	14	14	0	68††
Experimental 2	22	5	17	19	1	2	66††
Control	23	9	14	21	2	0	68††
Total	73	32	41	54	17	2	
GRAND TOTAL	137	64	73	69	50	18	

† Henmon-Nelson Test of Mental Ability
†† Comprhensive Test of Basic Skills (CTBS)

At Sky View High School, the aptitude scores provided were taken from the Comprehensive Test of Basic Skills (CTBS) which is administered to students in the ninth grade. The scores provided were in percentile form based on national averages. Experimental group 1 had an average aptitude percentile of 68; experimental group 2 had an average of 66; and the control group had an average score of 68.

The aptitude scores obtained from Logan High School were taken from results of the Henmon-Nelson Test of Mental Ability. The test is also administered to students in the ninth grade. The scores were given in

the form of percentiles based on national averages. Experimental group 1 had a mean percentile score of 54, group 2 had an average score of 57, and the control group had a mean score of 59.

Description of Instrumentation

Three instruments were developed and utilized to collect data for the research study. These were the pre- and post-test, a Food Frequency Indicator, and a Health Education Resources Inventory. The pre- and post-test was used to measure change in cognitive nutrition knowledge of students during the test period. Several attitudinal questions were also included in the pre- and post-test. The Food Frequency Indicator was used to give an indication of the typical foods included in the diets of the subjects and give an indication of some of their eating patterns. The health education inventory form was utilized to learn of the nutrition education background of health education teachers in the state of Utah, the resources used to obtain nutrition information, time spent teaching nutrition, and the teaching methods used to teach health education in high school classrooms.

Pre- and Post-test

The pre- and post-test was based on the nutrition content in the nutrition unit. The same test was given to the subjects both before and after the field test. The test consisted of 5 attitudinal questions, 19 multiple-choice questions and 6 true-false statements (Appendix A).

Four of the attitudinal questions included the use of a semantic differential technique as described by Carruth (1979), for evaluating attitude changes, the semantic differential was designed to measure individuals' reactions to semantic objects utilizing ratings of bipolar

adjectives called scales (Carruth and Musgrave, 1979). Four or five bipolar adjective scales such as good-bad, valuable-worthless, up-to-date-behind-the-times, were printed below a single word or phrase which identified a single construct. The four constructs included in the test were: nutrition, nutrients, weight control, and the Basic Four Food Groups. The students were told to mark an X or ✓ in one of the seven blank spaces between the two words on each scale. The distance of the marked space from either end of the scale would indicate how strongly the student felt about the idea or words above the scales.

For purposes of computer analysis each of the blank spaces were assigned a numerical value ranging from one to seven. One referred to the most positive word of the semantic pair (e.g., good, healthy, interesting, valuable), and seven referred to the more negative response (bad, unhealthy, dull, worthless). Thus a mean value could also be derived in reference to each of the word constructs or categories based on the selections on each of the bipolar scales below it.

The fifth attitudinal question asked the students to choose five of twelve given nutrition topics which they would like to learn about. Traditional nutrition items (Basic Four, nutrients and their functions, etc.) were included as well as current nutrition topics of consumer interest (diet and athletics, food additives, vegetarian diets, etc.).

Of the 19 multiple-choice questions, five dealt with nutrient density. Three of those questions (20, 21, and 22) included the nutrient profile of a food (in bar graph form) and the subjects were asked to indicate which nutrients were found in low or high amounts compared to the energy content of the food, by looking at the nutrient profile. These questions were of particular interest to the researcher

since nutrient density is a relatively new concept and its effectiveness as a nutrition education tool has not been well established in a variety of situations.

The first draft of the pre- and post-test was reviewed by several nutritionists for content and understandability. Suggestions for change were made which included the deletion of several questions, rewording of others and the addition of new questions. The test questions were revised as recommended before being administered as the pre- and post-test for data collection in the research study.

Food Frequency Indicator

An attempt was made to learn more about the dietary habits of the teenage subjects through the use of a Food Frequency Indicator. Students were asked to mark the number of times per day or week that they consumed individually listed food items. One-hundred and ten separate food items were categorized into nine groups and listed on the two-page form (Appendix B). Brief directions for completing the form were written at the top of the first page. In addition, 17 questions were included at the end of the form. The questions dealt with which meals are consumed on a regular basis, where they are eaten, number of snacks eaten daily, and vitamin and mineral supplement usage, etc. Thus, the food frequency form was devised to give an indication of the types of foods consumed by high school students as well as their typical eating patterns.

Samples of a variety of food frequency forms were referred to during the initial development of the food frequency form. A number of nutritionists, food scientists, and dietitians evaluated it for the

intended purpose and gave suggestions for simplifying and improving it. Appropriate changes were made to modify the form after their assessment.

An early version of the form was intended to have the subjects indicate amounts of the various foods eaten in a day or week. However, it was found in a preliminary test of the revised form that high school girls at a summer camp found the form too tedious to complete, or they could not estimate amounts of food consumed. It was at that time that a decision was made to ask only for an indication of the frequency during a day or week that specified foods were consumed. Thus, amounts of foods, or the nutrient or calorie content of a diet could not be calculated based on the responses on the completed forms. The form could only provide information about the types of foods being consumed and their frequency of consumption.

The food frequency form was also seen as a device to measure behavioral change during the study period. It was felt that possible changes in the types of foods eaten or their frequency of consumption might be reflected in the students' increased awareness of nutrition and it's relation to health. Precise quantitative assessments of the subjects diets as indicated on the form, however, could not be made because of the limitations of the form itself.

As a part of the data collection in the study, the Food Frequency Indicator was given to each student who was asked to complete it as a homework assignment on two occasions. The first time it was assigned was on the same day that the pre-test was administered prior to the test period. The next assignment for completion of the form was given on the day of the post-test which immediately followed the field test period. There was an approximate five-week interval between the assignments.

Health Education Resources Inventory

A Health Education Resources Inventory form was developed and sent to health education teachers at all public high schools in the state of Utah (Appendix C). The purpose of the inventory was to determine current practices regarding nutrition education in the health curriculum. Information such as the teaching experience of health instructors, their previous training in nutrition, time spent teaching the nutrition segment, nutrition information resources, educational methods used to teach nutrition and the nutrition topics currently included in health classes, was obtained from the respondents. The above information was of interest to the researcher especially in reference to the participating teachers. It was subsequently decided to survey health educators across the state to determine if the teachers involved in the study were typical of most health education teachers in Utah.

A first draft form of the questionnaire was developed and assessed by a health education specialist. The form was evaluated for content, grammar, and comprehension. Modifications of the first draft were made according to suggestions, with the final version consisting of 18 questions.

One or more of the survey forms were sent by mail to the public high schools in the state of Utah. It was impossible to obtain a current listing of all health education teachers in the state, so the questionnaire was addressed to "Health Education Teacher" at each school. The number of questionnaires included in an envelope was based on the student population of the school. A total of 166 survey forms were sent out in December, 1979, with a return self-addressed stamped envelope. A letter of explanation was also included (Appendix E).

Description of the Procedures

After the development, pilot testing and revision of the nutrition education materials, teacher training materials, and the instruments to be used in the evaluation process, the nutrition education component was field tested. This was accomplished by integrating the nutrition component into the existing health education curriculum at two high schools. Prior to the actual implementation of the unit, however, two important procedures took place.

The first was the administration of the pre-test which occurred on October 15, 1979, preceding the post-test by approximately five weeks. On the same day, the assignment for completion of the Food Frequency Indicator was also given to the students. Written instructions for administering the pre-test and assigning the completion of the Food Frequency Indicator were given to both teachers (Appendix F). The students were not informed that they were the subjects of a nutrition education research study, in order to provide conditions that were as close to normal classroom environment as possible.

Both teachers were given the same written instructions to be given to the students regarding the pre-test. The students were to be told that the teachers were planning a nutrition unit which would begin in several weeks. It was to be explained that the completion of an introductory test and a Food Frequency Indicator would help the teachers to ascertain what the students knew about nutrition and help the students to become more aware of what their dietary habits consisted of. This information was to be used by the teacher in planning the nutrition unit.

The students were given twenty minutes to complete the pre-test. Most students completed it in fifteen minutes according to reports

from the teachers. The food frequency forms were distributed to the students to be completed as a homework assignment and returned within the following two days. Homework credit points were given to those students who completed the forms. The completed pre-tests and food frequency forms were collected by the teachers and returned to the researcher.

A second necessary activity which preceded the implementation of the nutrition education program, was a four-hour workshop held for the two health teachers participating in the study. The researcher conducted the workshop to introduce the nutrition education materials and familiarize the teachers with the sequence and content of the nutrition unit and demonstrate how the instructional aids could be utilized in the classroom setting. Selected portions of several lesson plans were actually presented to the teachers as a demonstration of how the nutrition information could be presented to students.

An in-depth discussion and explanation of the INQ concept and related materials was an important part of the workshop. Since the nutrient density concept is a relatively new one to health educators this was thought to be an essential aspect of the workshop. Classroom activities planned for the students were discussed and actually carried out by the teachers on a limited basis. The teachers had been provided with, and asked to read the related nutrition background information materials prior to the workshop. Clarification of nutrition information and answering the teacher's questions regarding the entire nutrition education packet were included during the workshop. The teachers were advised to carefully read and become familiar with all the nutrition education materials prior to the actual field test.

Three weeks after administration of the pre-test, on November 5, 1979, the field test began in the cooperating schools. During the approximately two-week period of the study, the principle researcher observed the implementation of the nutrition unit in the classrooms of both schools. The observation days were unannounced and occurred in both experimental groups in each school. Notes were taken by the observer regarding presentation techniques of the teacher, effectiveness of the instructional materials in the classroom, and the general classroom environment and activities.

During the observation periods, actual class time spent on presenting nutrition information ranged between 40 and 50 minutes. Similar to the events of the pilot test, roll call, school announcements, distribution of progress reports, and discipline of students, accounted for about 10 minutes of class time each period. Other general classroom observations included sleeping students, talking students, and students reading or writing about other subject matter. Generally, however, the groups of students participating in the study were more well-behaved and controlled than those students of the pilot test school.

The field test period was completed at Sky View High School on Friday, November 16, 1979. The post-test was administered to the students on that day, and a second homework assignment for completion of the food frequency form was also given. The post-test and food frequency homework assignment were given on Tuesday, November 20, 1979, at Logan High School. This was partially due to the fact that on Friday, November 9, 1979, no health classes were held at that school. It was also observed that the teacher at Sky View High School presented the nutrition information at a faster pace than the teacher at Logan

High School. At the conclusion of the test period the post-tests and food frequency forms were collected by the teachers and returned to the researcher for data analysis.

The health teacher at each school kept a log of daily notes with impressions of the day's class presentation. They were asked to note any unusual classroom activities, problems with the nutrition education materials, suggestions for change of the unit, and the general response of the students. At the conclusion of the test period, each teacher was individually interviewed regarding their evaluation of the program.

Data Processing and Analysis

Following the collection of the data, the information contained on the pre- and post-tests, Food Frequency Indicators, and the Health Education Resources Inventory forms was coded and key punched on computer data cards. The data were then statistically analyzed by computer.

Statistical analysis of the pre- and post-tests included the Student's t test used to compare the differences between the mean value assigned to the first four attitude questions on the tests. In this case μ was equal to the post-test value minus the pre-test value. The null and alternate hypotheses tested were:

$$H_o: \mu = 0$$

$$H_a: \mu \neq 0$$

A pair-wise t test was used to compare two semantic differentials for each of the categories (nutrition, nutrients, weight control, and Basic Four Food Groups) to check for reliability of answers indicated by the subjects. It was used to determine whether or not the students were

marking answers randomly rather than reading each semantic differential scale and selecting an appropriate attitude value.

The Pearson Correlation method was applied to determine if significant correlation could be made between the overall scores and the average attitudinal value assigned to the first four attitude questions based on the subjects indications. The hypotheses tested were:

H_o: There is no correlation

H_a: There is a correlation

A pair-wise t test was also used to determine if there was a significant difference in the pre- and post-test scores between the six groups. Again μ was to be equal to the post-test score minus the pre-test score. The null and alternate hypotheses were:

$$H_o: \mu_1=\mu_2=\mu_3=\mu_4=\mu_5=\mu_6$$

$$H_a: \mu_1\neq\mu_2\neq\mu_3\neq\mu_4\neq\mu_5\neq\mu_6$$

A similar test of hypothesis was used to derive the significant differences between both schools.

Analysis of variance (AOV) was used to determine whether there were significant differences in test scores due to sex, school, grade level, treatment and aptitude scores. The aptitude percentile score was a covariate factor in the model. The model used in the test was:

$$Y_{ijk} = \mu + \alpha_i + \beta_j + \gamma_k + b_\chi + \varepsilon$$

where, Y_{ijk} = the percent test score; μ = the overall mean; α_i = sex or grade level effect; β_j = school effect; γ_k = treatment effect; b_χ = aptitude percentile score; and ε = random error.

No statistical test procedures were used to interpret the data from the Health Education Resources Inventory form. For the Food

Frequency Indicator, the Student's t test was again applied to test for significant differences between the mean pre- and post-food frequency answers to the questions regarding the number of meals consumed at home or away from home, number of snacks per day, and times per week that food from a vending machine or a fast-food restaurant was eaten.

RESULTS

Restatement of the Problem

A necessary element to optimum health for people at all ages is adequate nutrition. The adolescent population has been shown to be at nutritional risk as determined from dietary and biochemical evaluation. Compounding the problem are the factors of poor nutritional knowledge, unfavorable attitudes toward nutrition, and sporadic eating habits of teenagers. From a preventive standpoint, the young generation should be made aware of the relationship of nutrition to the total health picture, and be given practical and concise guidelines which they can apply to their daily lives to assure them of a nutritionally adequate diet. Since health education reaches a majority of high school students, health educators need to be provided with appropriate nutrition information and methods of teaching nutrition, to meet the nutritional needs of the adolescent.

Results

Pre- and Post-Test

The pre- and post-test mean scores, standard error, and range of scores were computed for each of the treatment and control groups (Table 2). The overall range of scores for the pre-tests from treatment groups was 24 to 80 percent, and for the post-tests the range was 20 to 88 percent. In both schools, there was an increase in test scores between the pre- and post-administrations. The average score difference

Table 2. Pre- post-test score comparisons

Groups		Mean ± St. Error	Range	Pre- Post-Test Score Differences
LOGAN HIGH				
Experimental 1	(Pre)	51 ± 2.2	32 - 80	+15
	(Post)	66 ± 2.2	48 - 88	
Experimental 2	(Pre)	47 ± 2.5	28 - 72	+14
	(Post)	61 ± 2.6	32 - 76	
Control	(Pre)	53 ± 2.8	28 - 84	-1
	(Post)	52 ± 3.0	28 - 76	
Combined Experimentals	(Pre)	49	28 - 80	+14
	(Post)	63	32 - 88	
SKY VIEW HIGH				
Experimental 1	(Pre)	52 ± 2.5	24 - 80	+12
	(Post)	64 ± 2.5	20 - 88	
Experimental 2	(Pre)	49 ± 2.8	28 - 72	+7
	(Post)	56 ± 3.8	20 - 88	
Control	(Pre)	55 ± 2.0	32 - 68	-1
	(Post)	54 ± 2.1	28 - 68	
Combined Experimentals	(Pre)	51	24 - 80	+9
	(Post)	60	20 - 88	

for the two experimental groups at Logan High School was 14 percent points; for Sky View High, the test scores increased by an average of 9 points.

The test scores were compared to determine if there was a significant difference in the pre- and post-test scores among the six treatment groups. A paired t test was utilized to make the determination. The only significant difference (α=.05) noted in the pre-test scores was between the experimental 2 group at Logan High and control group at Sky View High, with the latter score being significantly higher than the former.

When the same statistical test was applied to the post-test scores, significant differences at the 5 percent level were found between the experimental 1 group and the control group, and the experimental 2 group and control group at Logan School. Significant differences at the 5 percent level were also found between experimental 1 group at Logan and experimental 2 at Sky View, experimental 1 at Logan and controls at Sky View. There were no significant differences noted at the 5 percent level between the combined experimental groups at each school, nor between the control groups.

Table 3 includes the pre- and post-attitude values which were derived from the marks on the bipolar adjective scales. The mean score for all of the semantic differentials within a construct (nutrients, nutrition, weight control, and Basic Four) is given, as well as the overall attitude score, for the treatment and control groups in both schools.

The Students t test was used to compare the difference between the pre- and post-test values assigned to the first four attitude questions on the test, among the treatment and control groups in Logan and Sky View High Schools. In both schools there was no significant difference at the 1 or 5 percent levels between the pre- and post-test attitude scores in the control groups. However, in the experimental 1 group at Logan High, there was a significant difference at the 1 percent level in the category of "weight control." A slightly more negative attitude value toward "weight control" was indicated on the post-tests.

A significant positive change at the 1 percent level was found between the pre- and post attitude scores in the categories of "nutrition," "nutrients," and "weight control," for the experimental 1 group at Sky View High. The experimental 2 group at Sky View High also indicated

Table 3. Mean pre- and post-attitude scores for experimental and control groups.

School and Group		Overall Attitude Score†	Attitude Score For Nutrition†	Attitude Score For Nutrients†	Attitude Score For Weight Control†	Attitude Score For Basic Four†
LOGAN HIGH						
Exp. 1	(Pre)	2.12	2.32	2.16	1.85	2.15
	(Post)	2.13	2.25	2.13	2.20**	1.92
Exp. 2	(Pre)	2.19	2.30	2.01	2.25	2.18
	(Post)	2.52	2.59	2.36	2.70	2.42
Control	(Pre)	2.42	2.23	2.33	2.65	2.47
	(Post)	2.49	2.57	2.58	2.43	2.39
Combined Exp.	(Pre)	2.15	2.31	2.09	2.05	2.17
	(Post)	2.32	2.42	2.25	2.45	2.17
SKY VIEW HIGH						
Exp. 1	(Pre)	2.69	2.88	2.56	2.70	2.63
	(Post)	1.96	1.82**	1.66**	2.25	2.11**
Exp. 2	(Pre)	2.61	2.67	2.74	2.51	2.50
	(Post)	2.15	2.45	1.88**	2.14	2.12
Control	(Pre)	2.55	2.74	2.43	2.53	2.48
	(Post)	2.60	2.80	2.64	2.52	2.44
Combined Exp.	(Pre)	2.65	2.78	2.65	2.61	2.57
	(Post)	2.06	2.14	1.77	2.19	2.12

†1 = Most Positive, 7 = Most Negative
**Indicates a significant difference at the 1 percent level

more positive attitudes toward "nutrients," on the post-test. These significant differences are indicated on Table 3 with two asterisks.

A paired t test was utilized to compare two semantic differentials for each of the four categories to check for reliability of answers indicated by the subjects. Its purpose was to determine if students were inadvertantly marking the bipolar scales rather than carefully selecting a personal attitude value. For example, the mean of a bipolar

scale such as essential-not essential was compared to the mean value assigned to the bipolar scale interesting-dull, indicated for the category of "nutrients." If a significant difference was found between semantic differentials with distinct meanings (e.g., essential-not essential and interesting-dull) it would be an indication of discrimination on the part of the subjects as they answer the questions. Thus the student might be indicating that nutrition is essential but not necessarily interesting. On the other hand, the absence of significant differences between two semantic differentials with similar connotations (e.g., good-bad and valuable-worthless) also strengthened the reliability of the responses to the first four attitude questions.

Table 4 outlines the selected bipolar scales which were compared in each of the categories. It also contains information regarding whether nor not there were significant differences between the bipolar scales compared.

Question 5 of the pre- and post-test asked the subjects to indicate 5 nutrition topics out of 12 that were of most interest to them. The most frequently given answers to this question were tabulated for total subjects and for female and male responses. The topics were then ranked according to the number of times they were indicated, with the most frequently indicated topic given a rank of 1, second most frequent answer given a rank of 2, etc. The pre- and post-test rankings of nutrition topics are presented in Table 5. The topics are listed in the order that they appeared in the pre- and post-test.

Among total subjects, "diet and athletics" was the most often indicated topic of interest on the pre-test, with "energy needs and weight control" second, "nutrition-related diseases" third, "Basic Four

Table 4. Comparison of selected bipolar scales within attitude question categories

Category	Bipolar Scale	LOGAN HIGH Pre Mean Score	LOGAN HIGH Post Mean Score	SKY VIEW HIGH Pre Mean Score	SKY VIEW HIGH Post Mean Score
NUTRIENTS	Essential-Not Essential	1.6 *	1.6 *	1.9 *	1.6 *
	Interesting-Dull	3.9	3.8	4.3	3.3
	Essential-Not Essential	1.6	1.6	1.9	1.6
	Valuable-Worthless	1.6	1.8	2.0	1.6
	Interesting-Dull	3.9 *	3.8 *	4.3 *	3.3 *
	Valuable-Worthless	1.6	1.8	2.0	1.6
WEIGHT CONTROL	Pleasant-Unpleasant	3.3 *	3.6 *	3.3 *	3.1 *
	Healthy-Unhealthy	1.6	1.5	1.8	1.5
	Up-to-date-Behind Times	2.5 *	2.5 *	3.0 *	2.5 *
	Essential-Not Essential	1.6	1.8	2.2	2.0
	Healthy-Unhealthy	1.6	1.8	2.0	1.8
	Essential-Not Essential	1.6	1.5	1.8	1.5
BASIC FOUR	Interesting-Dull	1.9 *	1.8 *	2.2 *	1.9 *
	Valuable-Worthless	3.6	3.8	4.0	1.5

*Indicates a significant difference between the two bipolar scales at the 5 percent level

food groups" fourth, and "food supplements" fifth. On the post-test, there was no change in the first two rankings, but the "Basic Four food groups" category was ranked third, "food supplements" ranked fourth, and "nutrition-related diseases" ranked fifth. Slight differences between male and female rankings were noted on both pre- and post-tests.

The Pearson Correlation method was utilized to determine if significant correlation could be made between the overall test scores and the average attitudinal value assigned to the first four attitude questions. No consistent statistically significant correlations were

Table 5. Ranking of nutrition topics by students

Topics	Total Subject Ranking		Female Ranking		Male Ranking	
	Pre	Post	Pre	Post	Pre	Post
Nutrients and functions	8	6	9	5	7	8
Diet and athletics	1	1	1	1	1	2
Energy needs and weight control	2	2	2	2	1	1
Food additives	9	8	8	10	9	9
Food supplements	5	4	3	4	4	6
Nutrition labeling	8	7	8	9	8	9
RDAs	7	5	7	7	8	5
World food supply	7	10	6	9	9	10
Vegetarian diets	10	9	10	11	6	9
Food facts and fallacies	6	6	4	6	5	7
Nutrition-related diseases	3	5	5	8	2	4
Basic Four food groups	4	3	4	3	3	3

found between test scores and attitude values at the 5 percent level. Of the few correlations indicated among the groups, some were negative and some were positive, but overall the findings are inconclusive.

Student's knowledge of the nutrient density concept was of special interest to the researcher because its application was a new approach to nutrition education at the secondary school level. Therefore, answers to questions 12, 19, 20, 21, and 22 in the pre- and post-tests were tabulated to determine the number of students who correctly answered the questions. Information regarding the number and percent of students in each group who answered the selected questions correctly is found in Table 6.

In both experimental groups in both schools there was an increase in the number of correct responses for questions 19, 20, 21 and 22, from the pre- to the post-test. For question 12, 2 of the experimental groups did not increase the number of correct answers from the pre- to the

Table 6. Number and percent of correct answers for nutrient density questions

Group		n	QUESTION NUMBER 12	%	19	%	20	%	21	%	22	%
LOGAN HIGH												
Experimental 1	(Pre)	23	16	70	10	43	14	61	21	91	11	48
	(Post)		15	65	12	52	22	95	21	91	22	96
Experimental 2	(Pre)	19	5	26	9	47	10	53	14	74	6	32
	(Post)		11	58	10	53	16	84	18	95	14	74
Control	(Pre)	22	12	55	5	23	7	32	14	64	13	59
	(Post)		14	64	11	50	12	56	13	59	10	45
Combined Experimental	(Pre)	42	21	50	19	45	24	57	35	83	17	40
	(Post)		26	62	22	52	38	90	39	93	36	86
SKY VIEW												
Experimental 1	(Pre)	28	12	43	14	50	21	75	26	93	12	43
	(Post)		17	61	17	61	25	89	28	100	26	93
Experimental 2	(Pre)	22	11	50	7	32	16	73	20	91	11	50
	(Post)		10	45	10	45	20	91	21	95	20	91
Control	(Pre)	23	12	52	11	48	23	100	22	96	7	30
	(Post)		12	52	8	35	20	87	23	100	8	35
Combined Experimental	(Pre)	50	23	46	21	42	37	74	46	92	23	46
	(Post)		27	54	27	54	45	90	49	98	46	92

post-test. However, when treatment groups were combined in each school and the average number and percent of students correctly answering question 12 was determined, there was an overall increase in the number of correct responses.

An analysis of variance (AOV) was applied to determine if there were significant differences in test scores due to sex, school, grade level, treatment and aptitude. Table 7 contains analysis of variance information for the pre-test where the model included the variables of sex, school, and treatment, and the aptitude percentile was a covariate factor.

Table 7. AOV for pre-test scores

Source of Variation	df	MS	F	p
Covariate	1	125.408	0.878	0.351
Aptitude Score	1	125.408	0.878	0.351
Main Effects	4	222.242	1.555	0.190
Sex	1	309.363	2.165	0.144
School	1	52.106	0.365	0.547
Treatment	2	302.746	2.119	0.125
2-Way Interactions	5	74.181	0.519	0.761
Sex & School	1	43.899	0.307	0.580
Sex & Treatment	2	150.226	1.051	0.353
School & Treatment	2	17.606	0.123	0.884
3-Way Interactions	2	67.484	0.472	0.625
Sex & School & Treatment	2	67.484	0.472	0.625
Residual	124	142.884		
Total	136	141.455		

There were no significant differences in test scores among treatments, between schools, or between sexes, according to the AOV table. The covariate factor (aptitude percentile) also did not exert a significant effect on the pre-test scores. Two- and three-way interaction of variables did not have a significant effect either.

Analysis of variance data for the post-test using the same model is found in Table 8. In this case, there was a significant difference in test scores between treatments at the 5 percent level. The effect of school, sex, aptitude, and two- and three-way interactions of variables did not cause a significant difference in test scores on the post-test.

Table 8. AOV for post-test scores

Source of Variation	df	MS	F	p
Covariate	1	306.261	1.762	0.187
Aptitude Score	1	306.261	1.762	0.187
Main Effects	4	797.284	4.588	0.002
Sex	1	87.616	0.504	0.479
School	1	8.931	0.051	0.821
Treatment	2	826.035	4.753	0.010*
2-Way Interactions	4	178.248	1.026	0.397
Sex & School	1	535.234	3.080	0.082
Sex & Treatment	2	17.866	0.103	0.902
School & Treatment	1	119.728	0.689	0.408
3-Way Interactions	2	22.074	0.127	0.881
Sex & School & Treatment	2	22.074	0.127	0.881
Residual	125	173.783		
Total	136	190.995		

*Indicates significance at the 5 percent level

A model which included the variables of grade level, school, treatment and the aptitude percentile score as a covariate was applied in the AOV data found in Table 9. The AOV table contains information which applies to the pre-test. There was no significant difference in pre-test scores at the 5 percent level due to the effects of grade level, school, treatment or aptitude scores.

A statistically significant ($\alpha = .05$) difference in post-test scores was found due to the treatment effect when the same model was applied (Table 10). No significant differences were found to be due to the covariate factor, school or grade level effect on the post-tests.

Table 9. AOV for pre-test scores

Source of Variation	df	MS	F	p
Covariate	1	125.408	0.847	0.359
Aptitude Score	1	125.408	0.847	0.359
Main Effects	5	187.823	1.268	0.282
Grade level	2	179.755	1.214	0.301
School	1	1.095	0.007	0.932
Treatment	2	310.927	2.099	0.127
2-Way Interactions	8	46.840	0.316	0.959
Grade level & Schools	2	55.469	0.375	0.688
Grade level & Treatments	4	71.264	0.481	0.750
School & Treatment	2	96.883	0.654	0.522
3-Way Interactions	2	12.605	0.085	0.918
Grade level & School Treatment	2	12.605	0.085	0.918
Residual	120	148.112		
Total	136	141.455		

Table 10 includes the AOV data that was obtained for the post-tests using the previously mentioned model.

Food Frequency Indicator

Due to food frequency forms that were not fully completed, or an absence of pre- or post-food frequency forms, the total number of paired forms which could be tabulated with regard to the questions on the last page was substantially reduced. The total number of acceptable forms from Logan High School was 61; with 22 from experimental group 1, 18 from experimental group 2, and 21 from the control group. Results of food frequency forms from Sky View High School were tabulated from a

Table 10. AOV for post-test scores

Source of Variation	df	MS	F	p
Covariate	1	306.261	1.726	0.191
Aptitude Score	1	306.261	1.726	0.191
Main Effects	5	662.534	3.734	0.004
Grade level	2	105.575	0.595	0.553
School	1	19.540	0.110	0.741
Treatment	2	1099.091	6.194	0.003*
2-Way Interactions	7	114.342	0.644	0.718
Grade level & School	2	16.311	0.092	0.912
Grade level & Treatment	4	158.610	0.894	0.470
School & Treatment	1	470.074	2.649	0.106
3-Way Interactions	2	43.298	0.244	0.784
Grade level & School & Treatment	2	43.298	0.244	0.784
Residual	121	177.433		
Total	135	190.995		

*Indicates significance at the 5 percent level

total of 67 acceptable forms. Experimental group 1 contributed 24 forms, group 2 acceptably completed 22 forms, and 21 completed forms from the control group were included.

The itemized food frequency sections of 87 forms were determined to contain reliable information. Many forms were excluded because they were not fully completed or had obviously distorted frequency indications, or contained conflicting information between daily and weekly frequencies. The 87 pre- and post-food frequency forms were hand tabulated to arrive at the frequency of weekly consumption of selected food groups.

Twelve separate groups were chosen to be studied. Most groups are self-explanatory in describing which foods are included. However, the "soft drinks and punch" category includes all regular and diet soft drinks, as well as fruit-flavored punches and drinks, such as Kool-Aid, Tang, etc. The category of "snack foods" consists of snack chips and crackers, nuts and popcorn. All desserts, candies and sweets, such as sugar, honey, syrup, jams, and jellies make up the "desserts, candy and sweets" group. "Mixed dishes" includes hamburgers, hot dogs, chili, etc.

Table 11 contains information regarding the average frequency of consumption of selected food groups by high school subjects. Both pre- and post-food frequency data is included in the table.

Table 11. Average weekly frequency of consumption of selected food groups by high school students

Food Groups	Experimentals (n=59)		Controls (n=28)	
	Pre	Post	Pre	Post
Milk and milkshakes	24	21	24	21
Soft drinks, punch, fruit drinks	14	7	9	7
Fruit and vegetable juice	8	4	6	4
Meat or fish	10	8	10	8
Eggs	4	4	5	4
Mixed dishes	8	8	7	6
Breads and cereals	24	19	30	20
Snack foods	7	6	6	6
Fruits	10	7	11	7
Vegetables	18	16	21	22
Desserts	31	26	36	29
Fats	21	19	20	16

A Student's t test was utilized to compare differences from pre- to post-food frequencies between control and experimental groups. No significant differences were found at the 5 percent level. This is an indication that for all food categories control groups and experimental groups showed the same trend in completing the food frequency form from the pre- to the post-administration.

Tabulation of answers to the questions on the last page of the Food Frequency Indicator were done by computer. Information from the last three questions on the form were not tabulated due to many missing answers, and extreme and obviously distorted responses. The first three questions on the form dealt with the regularity of breakfast, lunch and dinner. Table 12 outlines the number and percent of students from both schools that indicated that they consumed breakfast, lunch and dinner on a daily basis.

Sixty-five percent of all experimental groups indicated that they ate breakfast daily; 66 percent ate lunch daily; and 91 percent were reported to eat dinner daily, based on results of the first administration of the food frequency homework assignment. Results from the post-food frequency forms showed that 65 percent of experimentals ate breakfast daily; 67 percent consumed lunch daily; and 88 percent ate an evening meal on a daily basis.

With regard to pre-test responses from control groups, 69 percent ate breakfast daily, 81 percent consumed lunch daily, and 88 percent were reported to eat dinner on a daily basis. On the post-food frequency forms 71 percent of controls indicated that they ate breakfast daily, 79 percent consumed lunch daily and 93 percent reportedly ate dinner daily. There were no statistical differences in the pre- and post-responses

Table 12. Number and percent of students eating breakfast, lunch and dinner daily

School		n	Breakfast no.	Breakfast %	Lunch no.	Lunch %	Dinner no.	Dinner %
LOGAN HIGH								
Experimental 1 & 2	(Pre)	40	26	65	27	68	36	90
	(Post)	40	25	63	28	70	35	88
Control	(Pre)	21	14	67	16	76	19	90
	(Post)	21	14	67	15	71	21	100
SKY VIEW HIGH								
Experimental 1 & 2	(Pre)	46	30	65	30	65	42	91
	(Post)	46	31	67	30	65	41	89
Control	(Pre)	21	15	71	18	86	18	86
	(Post)	21	16	76	18	86	18	86
Total Experimental	(Pre)	86	56	65	57	66	78	91
	(Post)	86	56	65	58	67	76	88
Total Control	(Pre)	42	29	69	34	81	37	88
	(Post)	42	30	71	33	79	39	93

to the questions regarding consumption of breakfast lunch, and dinner, for experimental groups or controls.

The next seven questions on the form relate to where meals are usually eaten (at home or away from home), number of snacks per day and frequency of use of vending machine and "fast food" restaurants per week. Table 13 contains the mean and standard deviation of number of times per week that subjects practice these eating patterns. The number of snacks per day were translated into number of snacks per week.

The Student's t test was applied to questions four through ten on the food frequency form to note significant differences between pre- and post-answers. No significant differences were found on any of the questions.

Table 13. Mean and standard deviation of number of times per week that subjects practice certain eating patterns

	LOGAN HIGH SCHOOL			
	Pre		Post	
	Experimentals	Controls	Experimentals	Controls
Breakfast at home	4.3 ± 2.7	5.1 ± 2.7	4.4 ± 2.9	4.8 ± 2.7
Away from home	0.3 ± 0.7	0.1 ± 0.7	0.2 ± 0.7	0.5 ± 1.0
Lunch at home	1.7 ± 1.7	1.6 ± 1.4	1.7 ± 1.6	1.9 ± 1.4
Lunch away from home	3.4 ± 2.4	3.5 ± 2.5	3.6 ± 2.1	3.3 ± 2.5
Snacks	17.7 ± 5.6	20.3 ± 6.6	18.1 ± 8.5	18.7 ± 5.0
Vending machine	1.6 ± 1.9	2.4 ± 5.3	3.0 ± 6.7	1.6 ± 2.4
"Fast food" restaurant	1.8 ± 1.9	1.8 ± 1.8	1.5 ± 1.6	1.7 ± 2.1
	SKY VIEW HIGH SCHOOL			
	Pre		Post	
	Experimentals	Controls	Experimentals	Controls
Breakfast at home	4.7 ± 2.8	4.4 ± 3.1	4.7 ± 2.6	4.6 ± 3.0
Away from home	0.3 ± 0.6	0.2 ± 0.5	0.4 ± 0.8	0.1 ± 0.3
Lunch at home	1.6 ± 1.4	1.9 ± 1.3	1.6 ± 1.1	1.8 ± 0.4
Lunch away from home	3.5 ± 2.4	3.6 ± 2.4	3.9 ± 2.1	4.4 ± 1.6
Snacks	14.0 ± 2.5	14.0 ± 3.5	18.3 ± 5.1	12.0 ± 3.7
Vending machine	1.5 ± 2.1	1.0 ± 1.0	1.0 ± 1.3	0.9 ± 1.4
"Fast food" restaurant	1.6 ± 1.7	1.0 ± 1.0	1.4 ± 1.1	1.0 ± 0.7

The next eight questions on the food frequency form covered a number of topics relating to eating habits, such as: who the subject ate out with most often (friends or family), what type of eating establishment was most commonly utilized when eating away from home; whether or not salt was added to food at the table; whether or not butter or margarine was added to cooked vegetables; if a vitamin or mineral supplement or

food supplements were taken; and the subjects' perception of their body weight as related to height. Table 14 includes the breakdown of answers to each question by number of responses and in terms of percent, for combined experimental and control groups at Logan High, from both pre- and post-food frequency forms.

Table 14. Answers to questions 11 through 18 for Logan High School subjects

Question		Combined Experimentals (n=40) Pre (%)	Combined Experimentals (n=40) Post (%)	Control (n=21) Pre (%)	Control (n=21) Post (%)
11. Eat out with?	Friends	22 (55)	24 (60)	10 (48)	9 (43)
	Family	16 (40)	13 (33)	11 (52)	12 (57)
	No Answer	2 (5)	3 (8)	0 (0)	0 (0)
12. Eat out most often?					
Vending machine		0 (0)	4 (10)	1 (5)	2 (10)
Sit-down restaurant		5 (13)	5 (13)	4 (19)	4 (19)
Fast-food restaurant		17 (43)	9 (23)	6 (29)	5 (24)
School cafeteria		8 (20)	17 (43)	8 (38)	8 (38)
No answer		10 (25)	5 (13)	2 (10)	2 (10)
13. Add salt?	Do	17 (43)	17 (43)	11 (52)	8 (38)
	Do not	23 (58)	23 (58)	10 (48)	13 (62)
14. Butter on vegetables:					
	Yes	26 (65)	27 (68)	14 (67)	17 (81)
	No	14 (35)	13 (33)	7 (33)	4 (19)
15. Vitamin or mineral supplements?	Yes	14 (35)	17 (43)	8 (38)	6 (29)
	No	26 (65)	23 (58)	13 (62)	15 (71)
16. How often?	Daily	7 (18)	11 (28)	5 (24)	2 (10)
	Weekly	4 (10)	4 (10)	3 (14)	3 (14)
	Monthly	2 (5)	0 (0)	1 (5)	1 (5)
	No Answer	27 (68)	25 (63)	12 (57)	15 (71)
17. Food supplement	Yes	10 (25)	8 (20)	6 (29)	5 (24)
	No	30 (75)	32 (80)	15 (71)	16 (76)
18. Correct weight for height?					
	Yes	14 (35)	16 (40)	11 (52)	8 (38)
	No	26 (65)	24 (60)	10 (48)	13 (62)

Table 15 contains similar information derived from the pre- and post-food frequency forms from all subjects at Sky View High School.

Table 15. Answers to questions 11 through 18 for Sky View High School subjects

Question		Combined Experimentals (n=40) Pre (%)	Combined Experimentals (n=40) Post (%)	Control (n=21) Pre (%)	Control (n=21) Post (%)
11. Eat out with?	Friends	24 (52)	20 (43)	9 (43)	14 (67)
	Family	18 (39)	22 (48)	12 (57)	6 (29)
	No Answer	4 (9)	4 (9)	0 (0)	1 (5)
12. Eat out most often?					
Vending machine		2 (4)	2 (4)	0 (0)	0 (0)
Sit-down restaurant		10 (22)	9 (20)	1 (5)	2 (9)
Fast-food restaurant		7 (15)	8 (17)	4 (19)	6 (29)
School cafeteria		19 (41)	23 (50)	13 (62)	12 (57)
No answer		8 (17)	4 (9)	3 (14)	1 (5)
13. Add salt?	Do	26 (57)	29 (63)	11 (52)	12 (57)
	Do not	20 (43)	17 (37)	10 (48)	9 (43)
14. Butter on vegetables?					
	Yes	34 (74)	41 (89)	16 (76)	16 (76)
	No	12 (26)	5 (11)	5 (24)	5 (24)
15. Vitamin or mineral supplements?	Yes	21 (46)	20 (43)	10 (48)	11 (52)
	No	25 (54)	26 (57)	11 (52)	10 (48)
16. How often?	Daily	13 (28)	16 (35)	7 (33)	7 (33)
	Weekly	4 (9)	3 (6)	2 (9)	4 (19)
	Monthly	4 (9)	1 (2)	1 (5)	0 (0)
	No Answer	25 (54)	26 (57)	11 (52)	10 (48)
17. Food supplement	Yes	12 (26)	7 (15)	5 (24)	3 (14)
	No	34 (74)	39 (85)	16 (76)	18 (86)
18. Correct weight for height?					
	Yes	23 (50)	23 (50)	14 (67)	12 (57)
	No	23 (50)	23 (50)	7 (33)	9 (43)

Results from the pre-food frequency forms showed that total subjects generally indicated that eating out with friends (53 percent) was slightly more common than eating out with family members (40 percent).

The most frequent type of eating place outside the home was usually the school cafeteria, with the "fast food or drive-in" restaurant the second most popular eating establishment. About one-half of the subjects indicated on the first food frequency assignment, that salt was added to their food after cooking and the other half did not add salt. More students reported that butter or margarine was added to cooked vegetables (70 percent) than not (30 percent). Fifty-nine percent of respondents reported that they did not take a vitamin or mineral supplement and 41 percent did. Food supplement usage was indicated by 26 percent of the experimental subjects. Forty-three percent of experimentals indicated that they were at the correct weight for height, with 57 percent indicating the opposite, on the pre-food frequency forms.

The post-food frequency forms indicated similar answers to the same questions. Again it was more common that subjects ate out with friends (51 percent) than with family (41 percent). The school cafeteria was the most common place indicated for eating out, with the "fast food" restaurant second, and sit-down restaurant third. Fifty-three percent of respondents reported the addition of salt to food after cooking, with 47 percent not adding it. More students indicated the addition of butter or margarine to vegetables (79 percent) on the post-food frequency than the pre. Regarding the use of vitamin and/or mineral supplements, 43 percent indicated use and 57 percent did not use them. A significant decrease in the number of students consuming food supplements (17 percent) was reported on the post-food frequency form. Fifty-five percent of subjects indicated that they were not at the correct weight for height, with 45 percent who felt they were at the correct weight, based on the post-food frequency forms.

Table 16 contains the mean responses of males and females to questions 4, 5, 6, 7, 8, 9, 10 on the Food Frequency Indicator. Both pre- and post-food frequency data is included. Male and female responses to all other questions on the form are presented in Table 17. The actual number and percent of subjects giving a specific answer to the questions are included in the table.

Table 16. Mean answers to questions #4, 5, 6, 7, 8, 9 and 10 on Food Frequency Indicator among males and females

Question	Female (n=60)		Male (n=68)	
	Pre	Post	Pre	Post
4. Breakfast at home per week	4.0	4.1	5.2	4.4
5. Breakfast away from home per week	0.2	0.2	0.3	0.2
6. Lunch at home per week	1.5	1.3	1.8	1.8
7. Lunch away from home per week	3.1	3.2	3.8	4.1
8. Snacks per week	15.5	13.7	18.7	25.7
9. Vending machine use per week	2.1	2.6	3.2	1.8
10. Fast-food restaurant per week	2.6	1.6	1.3	2.0

Health Education Resources Inventory

Of the 166 health education inventory forms which were sent out, 74 were returned. The response rate was approximately 45 percent. The mean, standard deviation, and range of answers for some questions (1, 2, 6, 7, and 8) were tabulated by computer. For other questions (5, 10, 11, 12, 13, 14, 15, 16, 17, and 18), the most frequent answer, and the percent of respondents indicating it, were determined.

Table 18 contains the mean, standard deviation and range of answers to questions 1, 2, 6, 7, and 8. The mean number of years that teachers

Table 17. Male and female responses to questions #1, 2, 3, 11, 12, 13, 14, 15, 16, 17 and 18 on Food Frequency Indicator

Question		Female (n=60)		Male (n=68)	
		Pre (%)	Post (%)	Pre (%)	Post (%)
1. Breakfast daily?	Yes	33 (55)	36 (60)	51 (75)	50 (74)
	No	27 (45)	24 (40)	17 (25)	18 (26)
2. Lunch daily?	Yes	33 (55)	35 (58)	58 (85)	56 (82)
	No	27 (45)	25 (42)	10 (15)	12 (18)
3. Dinner daily?	Yes	52 (87)	52 (87)	63 (93)	63 (93)
	No	8 (13)	8 (13)	5 (7)	5 (7)
11. Eat out with?	Friends	31 (52)	31 (52)	34 (50)	36 (53)
	Family	25 (42)	23 (38)	32 (47)	30 (44)
	No Answer	4 (7)	6 (10)	2 (3)	2 (3)
12. Eat out where?					
Vending Maching		1 (2)	3 (5)	2 (3)	4 (6)
Sit-down Restaurant		7 (12)	10 (17)	13 (19)	10 (15)
Fast-food Restaurant		19 (32)	18 (30)	15 (22)	10 (15)
School cafeteria		19 (32)	23 (38)	29 (43)	37 (54)
No Answer		14 (23)	5 (8)	9 (13)	7 (10)
13. Add salt?	Do	31 (52)	28 (47)	34 (50)	30 (44)
	Do not	29 (48)	32 (53)	34 (50)	38 (56)
14. Add butter or margarine?					
	Yes	39 (65)	41 (68)	51 (75)	60 (88)
	No	21 (35)	19 (32)	17 (25)	8 (12)
15. Vitamin and mineral supplements?	Yes	24 (40)	25 (42)	29 (43)	29 (43)
	No	36 (60)	35 (58)	39 (57)	39 (57)
16. How often?	Daily	15 (25)	16 (27)	17 (25)	20 (29)
	Weekly	4 (7)	8 (13)	9 (13)	6 (9)
	Monthly	5 (8)	0 (0)	3 (4)	2 (3)
	No Answer	36 (60)	36 (60)	39 (57)	40 (59)
17. Food supplements?	Yes	8 (13)	4 (7)	25 (37)	19 (28)
	No	52 (87)	56 (93)	43 (63)	49 (72)
18. Correct weight for height?					
	Yes	20 (33)	22 (37)	42 (62)	42 (62)
	No	40 (67)	38 (63)	26 (38)	26 (38)

had been teaching high school was 8 and the mean number of years teaching health education was approximately 7. An average of 8 class sessions were devoted to nutrition in the current health education curriculum, with an indication that 9 sessions per semester would be a necessary amount of time to adequately teach nutrition. The average number of students enrolled in health classes was reported to be 28.

Table 18. Mean, standard deviation and range of answers for questions # 1, 2, 6, 7 and 8

	Question	Mean ± St. Dev.	Range
1.	Number of years teaching high school	8.2 ± 6.6 yrs.	1 - 29 yrs.
2.	Number of years teaching health	6.9 ± 5.6 yrs.	1 - 25 yrs.
6.	Number of nutrition class sessions per semester currently	7.6 ± 4.8 sessions	1 - 20
7.	Number of nutrition class sessions necessary to adequately teach nutrition per semester	9.1 ± 6.2 sessions	1 - 30
8.	Average number of students in health class	27.7 ± 8.2 students	10 - 39

Forty-two of the 74 respondents (57 percent) indicated that they received credit for a college nutrition class, with 32 (43 percent) having no college nutrition training. Since college, 24 (32 percent) of the health teachers reported that they had attended a nutrition workshop or in-service training session, or taken a nutrition class. Fifty of the respondents (68 percent) did not attend nutrition-related training sessions after college.

When asked to rate their ability to teach nutrition, the most frequent answer was "good" (43 percent); with "very good" being indicated

by 32 percent of the respondents; "fair" reported by 20 percent; and "excellent" chosen by 4 percent. None of the respondents rated their ability as "poor."

Teachers were asked to rate the overall student response to the nutrition segment of health education in question #17. Forty-one (55 percent) indicated that students were "moderately interested." Twenty-one respondents (28 percent) considered students "slightly interested," and 10 (14 percent) indicated that students were "very interested" in nutrition. Two respondents did not answer the question.

When asked what amount of control high school students have over their own food choices the most frequent answer was "almost total," as indicated by 38 respondents (51 percent). Twenty-three (31 percent) indicated "some," 7 (9 percent) indicated "very little," and 4 (5 percent) indicated that students had "total" control over their food choices.

In question #15 the health educators were asked if they felt that the nutrition topics covered in general health textbooks were sufficient to meet the needs of the student. Forty-two teachers (58 percent) answered negatively and 32 respondents (43 percent) answered "yes."

Table 19 shows the number and percent of respondents that reported the use of selected nutrition information resources when preparing for class presentations. In a subsequent question the "3 most used resources in the order of importance," were found to be: 1) General Health Textbook; 2) Basic Nutrition Book; and 3) Newspaper Articles.

Health educators were also asked to "indicate the various teaching methods and instructional materials" that they used when teaching nutrition, in question #12. Table 20 contains the information relating to the question. Question #13 asked the respondents to list the "3 most common

Table 19. Number and percent of respondents indicating use of various nutrition information resources

Nutrition Resources	Number Indicating Use (n=74)	% Indicating Use
General Health Text	73	99
Newspaper Articles	47	64
Basic Nutrition Books	46	62
Popular Magazine Articles	30	41
State Curriculum Guide	27	36
Home Economics Teachers	26	35
Workshop or In-Service	24	32
TV Programs	21	28
Professional Journals	17	23

teaching methods" utilized in the classroom. The lecture method was reported as number one most often, class discussion was second, and films were rated third.

Table 20. Number and percent of respondents indicating various teaching methods and instructional materials used to teach nutrition

Teaching Methods and Instructional Materials	Number Indicating Use (n=74)	% Indicating Use
Lecture	73	99
Class Discussion	70	95
Films	59	80
Blackboard	54	73
Filmstrips	37	50
Guest Speakers	37	50
Group Activities	34	46
Games	22	30
Overhead Projector	17	23
Slides	10	14
Role Playing	8	11
Field Trips	3	4

In question #14 the health teachers were asked to rank nine components of health education in order of importance to overall health status. Six of the respondents did not answer the question indicating that it was a "bad question" or that all elements are equally important. The overall ranking of health components as indicated by respondents was:

1) Emotional and mental health
2) Physical fitness
3) Nutrition
4) Prevention of communicable and noncommunicable diseases
5) Use and abuse of alcohol, tobacco, and other drugs
6) Safety and first aid
7) Environmental health concerns
8) Selection of health products and services
9) Sexual education and marriage and family life education

The last question of the health education inventory form asked the health teachers to indicate the five topics which they felt would "be most beneficial to the high school student." The replies were tabulated by computer and the 5 most frequently indicated topics were: 1) Energy needs and weight control; 2) Food facts and fallacies; 3) Nutrients and their functions; 4) Basic Four food groups; and 5) Nutrition-related diseases and food supplements. "Vegetarian diets" and "world food supply and distribution" were the least often indicated.

Question #9 of the survey asked the health teachers to list the nutrition topics that they usually included in the nutrition segment of health class. Table 21 contains the 15 most frequently mentioned topics, the number of times they were indicated and the percent of respondents listing them. A wide variety of topics was listed but related topics were condensed into general categories. Topics that were mentioned 6 times or more are included in the table. Five respondents did not answer the question.

Table 21. Nutrition topics usually included in health education classes

Nutrition Topics	Number of Times Indicated (n=69)	% of Respondents Indicating Topic
Energy needs, calories, weight control	51	74
Basic Four food groups (balanced diet)	50	72
Vitamins and minerals	49	71
Essential nutrients & functions	35	51
Nutrition-related diseases, deficiencies	23	33
Food fads, facts, fallacies	20	29
Food supplements, additives, preservatives	15	22
Protein, fat, carbohydrate	15	22
Recommended Dietary Allowances	9	13
Food buying, preparation and storage	9	13
"Junk" foods	9	13
Nutrition labeling	8	12
Processes of digestion	7	10
Water	7	10
Eating Habits and patterns	6	9

DISCUSSION

Purpose of the Study

The purpose of the study was to develop, implement, and evaluate a nutrition education unit for inclusion in the health education curriculum of secondary schools. The two-week unit of study included information on the general topics of nutrient needs and Recommended Dietary Allowances, qualitative evaluation of foods by use of the INQ method, and energy needs and weight control. Teacher training material relating to the subject matter was also developed to enhance the effectiveness of the nutrition education packet in the classroom.

Methods and Procedures

After development, pilot testing and revision of the nutrition education and teacher training materials, the ten-lesson unit was field tested in the health education course of two high schools. Two class sections in each school served as treatment groups and were exposed to the nutrition unit. An additional class section in each school served as controls and received no nutrition information during the test period. Pre- and post-nutrition tests were administered to both treatment and control subjects to measure changes in knowledge of and attitude toward nutrition. Food frequency forms were completed by the subjects at the same time. The latter was used to elucidate food habits of the sample and note any changes in eating behavior. Participating health teachers submitted their evaluation of the effectiveness of the nutrition education program in their classrooms, at the end of the test period. A Health

Education Resources Inventory form was constructed and sent to health educators in the public high schools of Utah to determine current nutrition education practices in health classes, and the nutrition training background of health teachers.

Major Findings

The nutrition test scores increased from the pre- to the post-administration for experimental groups with an average increase of 12 percentage points. Average test scores from both control groups indicated a 1 percentage point decrease from the pre- to the post-tests.

The attitude scores of experimental groups demonstrated a slightly more positive attitude (2.19) toward nutrition on the post-tests than on the pre-tests (2.40). Treatment groups at Sky View High School showed the most pronounced improvements in attitude scores.

Subjects' responses to the semantic differential attitude scores were marked with reliability. This was indicated by the significant numerical differences which were consistently found between semantic differentials with distinct meanings and the absence of significant differences between two semantic differentials with similar meanings.

Correlations between the nutrition test scores and the average attitude values were inconsistent. At both schools, the control groups showed significant correlation more often than the treatment groups did. In both cases, of the few correlations which were indicated, some were negative and some were positive, so that the findings appear to be inconclusive.

Analysis of variance revealed that there were no significant differences in test scores due to school, sex, grade level, aptitude, and two- and three-way interaction on either the pre- or post-nutrition tests. However, a significant difference in test scores was noted between treatments at the 5 percent level on post-tests.

Experimental groups from both schools demonstrated a notable increase in the number of subjects correctly answering the nutrient density questions (#12, 19, 20, 21, and 22) on the nutrition test after being exposed to the nutrition unit in the classroom. It should also be noted that even on the pre-tests a considerable number of students provided correct responses to questions 20 and 21 which required interpretation of nutrient density bar graphs. An average of 66 percent of all subjects correctly answered #20, and 85 percent chose the right answer to #21 on the pre-test.

Total subject ranking of the top five nutrition topics on the pre-test were of the following order: 1) Diet and athletics; 2) Energy needs and weight control; 3) Nutrition-related diseases; 4) Basic Four food groups; and 5) Food supplements. On the post-tests, the first two topics were ranked in the same order, but the topic of "Basic Four food groups" was ranked third, "food supplements" ranked fourth and the "RDA's" ranked fifth along with "nutrition-related diseases." The major changes appear to be an increased interest in the "Basic Four" and the "RDA's," and a slightly decreased interest in "nutrition-related diseases."

Data from the Food Frequency Indicator showed that both treatment and control groups generally indicated a decreased frequency of consumption of food in all categories from the pre- to the post-completion

of the form. Few notable differences between the pre- and post-responses to the questions regarding regularity of meal intake or other eating practices were indicated among all groups. One should be reminded that the changes noted on the pre- and post-food frequency forms reflect short-term changes during an interim period of 5 to 6 weeks. These changes may or may not be significantly different at a later date. Overall, total experimental groups indicated an increased number "eating out" at the school cafeteria and fewer "eating out" at "fast food or drive-in" restaurants on the post-food frequency forms. Fewer of the students in treatment groups indicated the use of food supplements in their post-responses.

Several notable differences were evident between male and female responses to questions on the food frequency form. The data showed that a greater percentage of males indicated the consumption of breakfast and lunch, than females; a larger percentage of males consume food supplements than females; and a smaller percent of females indicated that they are at their correct weight for their height, than males.

Responses from health educators on the Health Education Resources Inventory indicate a wide range of actual class time devoted to nutrition among teachers, and a wide variety of nutrition topics are discussed in the health education curriculum. Nutrition was found to rank third in importance among other components of health education in the survey.

Another finding of the research was the differences among students' interest of nutrition topics and the topics considered important by the health teachers. "Diet and athletics" was not considered important by the health teachers but it was of most interest to students. The

topics of "food facts and fallacies" and "nutrients and their functions" were listed in the top five by health teachers but students indicated that they were of less interest to them.

Discussion

The increase of nutrition test scores for experimental groups on the post-test, is an indication that the nutrition education unit was effective in significantly increasing the nutrition knowledge of the students exposed to it. Analysis of variance indicated that the difference in nutrition test scores was due to the effect of treatment (i.e., exposure to the nutrition education unit) rather than to other variables such as sex, school, grade level or aptitude. The overall slight improvement in attitude toward nutrition as shown by the mean lower attitude values, is a positive aspect of the research project. These positive changes in knowledge and attitude were the anticipated outcomes as stated in the research hypothesis in Chapter I of this thesis.

Verbal evaluation of the nutrition unit in individual interview sessions with the cooperating health teachers was very positive. When asked what were their overall impressions of the unit, responses from the teachers included: "very effective," "new approach," "challenging," and "I liked it." Both teachers indicated that the background reading information, lesson plans and the workshop were adequate to prepare them to present the nutrition information in class. Both participating teachers said that they would use the unit materials when teaching nutrition in the future. The positive responses to the unit and the willingness to use it in the future are indications that the nutrition resource and training needs of the health teachers were met in this instance.

When asked what nutrition topics should be expanded upon in the nutrition component, both teachers preferred more INQ and nutrient addition information. They felt that it brought the previous factual information about nutrients and their functions and the Basic Four into perspective and allowed the students to evaluate particular foods and combinations of food. The nutrient addition learning activities were reported to be enjoyed by the students. Neither teacher recommended that any of the information included in the nutrition packet should be deleted or shortened in length or content.

The application of semantic differential bipolar scales in measuring attitudes of high school subjects toward nutrition has not been reported elsewhere. Results of this study (Table 4) indicate that high school students were able to discriminate between semantic differential scales and appropriately mark them to reflect their feelings toward a variety of word constructs. The literature regarding nutrition education emphasizes that change in attitude is essential to motivate change in habits or behavior (Dwyer, 1970; Hicks, 1977; ADA Position Paper, 1978; and Maretzki, 1979). Thus the measurement of attitude is considered an important element in evaluating the effectiveness of nutrition education programs. Because of the findings that high school students were capable of reliably marking the described attitude questions, it may be a valuable instrument in measuring attitude in future nutrition education studies.

It should be noted that controls from both schools indicated slightly higher attitude scores (which indicates a more negative attitude) on the post-tests. This may be accounted for by dissatisfaction with tedious repetition of completing the same form twice. If that is the

case, it may have had an effect on the two experimental groups, which also showed a more negative attitude on the post-test.

An attempt was made to correlate nutrition knowledge with the subjects' attitude toward nutrition. However, the inconsistent results that were identified do not allow for a conclusive statement to be made regarding such a correlation. In several instances, a positive correlation was found where an increase in test score could be directly related to a more positive attitude indication or a decrease in test score was associated with a more negative attitude. Other instances showed an inverse correlation between thw two measurements. These findings were true of both experimental and control groups and for both pre- and post-test results. Thus, in this instance, no consistent trend is evident.

Data regarding the number of correct responses to the nutrient density questions in the nutrition test, indicate that, although it was an entirely new concept for the teachers to teach and the students to learn, significant improvements were made between the pre- and post-test measurements. This, plus the interest and enthusiasm on the part of students when the INQ concept was being taught, as indicated by their teachers, is evidence that the nutrient density concept can be mastered at the secondary school level, and is an effective tool in nutrition education. Perhaps even more important is the relatively high percentage of subjects correctly answering the nutrient density questions which included bar graph nutrient profiles (#20, 21, and 22) on the pre-tests. This corroborates the findings of Mohr, et al. (1980) in which the graphical nutrient density nutrition labeling format was found to be easily understood and effective in communicating nutrition information without previous explanation of the concept.

Overall, questions 12 and 19 showed an increased number of correct responses on the post-test but the change was not as dramatic as for the other nutrient density questions. This may be due to poor statement of the questions causing them to be invalid questions. Another factor may be that these questions did not include any kind of graphic illustration as the other three questions did.

As indicated in Table 5, high school students in this study were most interested in "diet and athletics" and "energy needs and weight control" on both pre- and post-tests. This is probably related to the adolescent's concern for a positive body image (e.g., slim figure, proper muscle development, etc.). Their expressed interest in "food supplements" and "nutrition-related diseases" may also be associated with body image (e.g., clear skin, muscle development, appropriate height, etc.).

Two changes of note in the topics of interest on the post-test are the inclusion of the "RDA's" as one of the five most often indicated topics and the greater interest in the "Basic Four food groups." An attempt was made in the nutrition unit to not only point out the key nutrients and their functions but also what the nutrient needs are during adolescence and throughout the life cycle. A classroom activity involved the student's input in evaluating changes in nutrient needs at different life stages and accounting for those changes in terms of body processes that may be taking place during specified periods. This may explain why there was a reported increase in interest in the RDA's.

Dwyer, et al., (1970) reported that second to an interest in "weight loss and dieting," junior and senior high school students expressed a "desire for more detailed coverage of the proper foods to eat for a well-

balanced diet." Similar indications were reported by the subjects of this study as shown by their increased interest in the "Basic Four." The INQ concept was applied to the "Basic Four" in the nutrition unit. A composite nutrient profile was developed and graphically presented to the students for each of the four food groups. Also, selected nutrient profiles of individual foods (in the form of food profile cards) representative of all four groups as well as the "others" or fifth group were frequently utilized throughout the nutrition unit. Again, the graphic nutrient representation of food groups or individual foods may be an important factor to the increased effectiveness in communicating nutrient content of common foods creating an increased interest in the "Basic Four" concept.

Food frequency data from the post-Food Frequency Indicator showed a consistent trend of decreased frequency of intake of almost all food categories for controls as well as experimental groups (Table 6). One notable decrease was seen in the experimental groups in the category of "soft drinks, punch, fruit drinks." Subjects indicated that their frequency of consumption of these items was one-half of the amount indicated on the initial food frequency forms. A similar dramatic decrease was not true of the control groups in this instance.

A significant part of the nutrition unit discussed the qualitative evaluation of foods using the INQ method. The concept of "empty calorie" foods was introduced to the students. "Empty calorie" foods are those food items that provide a significant amount of calories but at the same time provide very little or no nutrient value. Soft drinks, sugar, honey and other similar items were discussed in this context. Food profile cards of selected "empty calorie" items were compared to other

foods containing significant amounts of nutrients (e.g., fruit juice or milk) to show that the nutrient value was minimal in "empty calorie" foods. It was further explained that a large consumption of "empty calorie" foods would make it very difficult or impossible to meet their nutrient needs without exceeding caloric needs. Thus, it may be that the dramatic change in frequency of consumption of soft drinks, etc., was due to the student's increased awareness of their poor nutrient value.

The reliability of food frequency records has been discussed and questioned as a result of numerous studies of various population groups. It may be that the most important aspect of the results from the food frequency form is the necessity to include a control group with which to compare the data obtained from experimental groups. What might have been considered as rather significant changes in food frequency by the experimental groups in the present study was tempered by the very similar changes in the control groups. All respondents completing food frequency forms may have a tendency to become more or less accurate in their responses when completing such a form for the second time. Comparison of treatment groups with control groups would help to diminish misinterpretations of such results.

Regarding the changes in frequency of eating at the school cafeteria and at "fast food or drive-in" restaurants, a partial explanation for the shift may be that fewer persons gave no answer on the post-form. However, the data may indicate that more students were consuming lunch meals at the school cafeteria rather than eating off campus at "fast food" restaurants. When discussing the nutrient evaluation of foods, teachers were encouraged to refer to common food items found in the school cafeteria setting. Again the nutrient density concept was

utilized and students had the opportunity to see a wide variety of nutrient profiles in the Nutrient Density Food Profiles Masterbook. This reference was used by students to plan nutritious meals and snacks within specified calorie guidelines. It was observed by the teachers and the principle researcher during these exercises that students frequently referred to nutrient profiles of foods of interest to them.

The decreased use of food supplements as indicated by total subjects on the post-food frequency form can be considered as a positive result. Throughout the nutrition unit an emphasis was placed on consuming foods of good nutritional quality within the student's caloric needs. Food supplements such as high protein drinks, or vitamin and mineral tablets were de-emphasized and discouraged. A point was made to inform students that consumption of such items was costly and totally unnecessary if the proper foods were chosen for their diet. A similar decrease in consumption of vitamin and/or mineral supplements was not evident from the food frequency data. Instead a slight increase in use was noted.

The few differences noted between male and female responses to the questions on the food frequency form are consistent with certain trends in teenage food patterns as noted in the review of literature. Females reportedly consume breakfast and lunch less frequently than males in this study which may be related to their concern for maintaining slim figures and losing weight. This is compatible with their dissatisfaction with their weight in reference to their height. Fewer females than males considered themselves to be at the correct weight. It cannot be determined whether they consider themselves to be overweight or underweight. An attempt was made to make this distinction by including the second to last question on the form which asked respondents to indicate if

they thought they were overweight or underweight. However, that question and the last one were frequently not answered or the answers given appeared unreliable due to their distortion, so data from those questions were deleted.

Males reported a more frequent use of food supplements than females which may be related to their interest in gaining weight and muscle mass. This may also explain why a greater percentage of males than females consume breakfast and lunch on a daily basis. Males also indicated a greater number of snacks per week (Table 16), than females. These findings are not consistent with those reported by Huenemann, et al. (1968) regarding the food and eating practices of teenagers. Results of that study which were based on weekly food diaries, indicated that teenage boys consumed 9.3 snacks per day and girls consumed 11.5 snacks per day.

A notable difference is evident between the frequency of snacks per week in the 1968 study (10 per week) and the present study (19 per week). The difference may be due to the two distinct instruments which were used to gather eating pattern data. The food frequency instrument may be less accurate than a daily food diary. On the other hand, the contrasting results may reflect increased snacking trends of teenagers that have developed in the past decade.

The data from the Health Education Resources Inventory showed that health teachers consider nutrition as a relatively important component of health education by ranking it third among a total of nine. These results are similar to the findings of Marr, et al. (personal communication, 1980) where health teachers strongly agreed that nutrition education is needed in grades 7 through 12. All teachers reported that they do

include some nutrition education as a part of the total health course, however the amount of class time spent teaching it is greatly variable. The range of class sessions devoted to nutrition in the health education course per semester (18 weeks) was from one to twenty. The amount of time spent may be due to the individual teacher's interest or their feelings of adequacy in terms of ability to teach it. Marr, et al. (personal communication, 1980) reported that respondents who had taken a college course covering nutrition indicated a significantly greater interest in teaching it than those who had not taken such a course.

The wide variety of nutrition topics that were mentioned is another indication that there is very little consistency in the type of nutrition information presented to students. It appears that no guidelines are currently being uniformly followed in regard to time spent teaching nutrition, and the content included in that component of health education. This is consistent with the findings of the informal telephone survey conducted prior to the beginning of the research project. A formalized guideline to integrating nutrition into the health curriculum and availability of appropriate nutrition education materials would be of great benefit to both health teachers and students by providing a more uniform and sequential nutrition education program.

The current state curriculum guide to nutrition education (1978) was reportedly used by 36 percent of the health teacher respondents. It outlines instructional objectives based on eight nutrition concepts that should be incorporated into a variety of courses of study (e.g., health, home economics, science, etc.) at various levels (e.g., primary, intermediate junior high and high school). These guidelines are general in nature, but must be considered a step in the right direction in

planning for a uniform and sequential nutrition education program. Development of related nutrition education materials would be a logical next step in meeting the nutrition education needs of health and other teachers and all students. Perhaps then more teachers would use the curriculum guide as a reference in planning and implementing nutrition units.

The most used nutrition resources were reported as general health textbooks, basic nutrition books and newspaper articles. Popular magazine articles were also frequently mentioned (41 percent indicated use) as a resource. Newspaper and magazine articles on nutrition cannot always be considered as reliable sources of nutrition information and general health textbooks are somewhat limited in their nutrition content. Fifty-eight percent of the respondents indicated that the nutrition topics covered in general health textbooks did not sufficiently meet the needs of the student. Thus, some of the most used resources may not be providing enough or the appropriate nutrition information needed to adequately teach nutrition. The use of home economics teachers, professional journals and nutrition workshops or in-service sessions were indicated as references by about one-third of the respondents. These could be considered as some of the better qualified, comprehensive and current sources of nutrition information. Several respondents listed "other" nutrition resources as dietitians, state nutritionist, nurses, Utah State University Extension, county health department, films, and college class notes.

Considering the reported nutrition training of health teachers (nearly half had no college training in nutrition and 68 percent had not attended nutrition-related training sessions since college) the provision

for nutrition resources should be a priority for nutrition educators. Findings of this study are consistent with those of Marr, et al. (personal communication, 1980) and Levine (1979) which determined that health educators reach the largest proportion of students as compared to other teachers, but generally have minimal nutrition training. Frequent offerings of nutrition update and training sessions for high school health teachers and development of current and concise nutrition education materials which can be integrated into the health curriculum could perhaps fill the present nutrition knowledge gap that exists for a notable number of health educators.

A rather wide variety of nutrition teaching methods and instructional materials were reportedly used by the respondents. The lecture, class discussion and use of films were reported as the most common teaching methods and materials used. This is similar to the findings of Levine, et al. (1979). Filmstrips, guest speakers and group activities were frequently mentioned as other teaching methods. This indicates that health teachers are attempting to incorporate a variety of teaching methods into their classrooms and may be willing to try new classroom activities and teaching techniques if offered to them. Although a few of the teaching methods and certain equipment (overhead projector) had not previously been utilized by some health teachers in the pilot study and field test of the nutrition unit, they expressed their intent to make use of such equipment and teaching techniques in the future.

In reference to the differences between students' indications of nutrition topics of interest and the topics considered important by health teachers, two major points of difference were expressed. Students reported that "diet and atbletics" was of most interest to them on both

pre- and post-tests. This is a very popular nutrition topic for many people currently and is probably related to the increased recognition of health and physical fitness. Many articles and books are being published on the relationship of diet to a variety of physical activities. This increased awareness of nutrition and physical fitness in the general population may have influenced the choices of the students in selecting topics of interest.

Nutrition, physical fitness and health certainly are interrelated, but nutrition-related issues can be clarified by a good discussion of basic nutrition facts, in most cases. For example, the issue of need for protein supplements could be dealt with as part of a lesson describing needs and functions of protein in the body. This type of strategy was used in the development of the nutrition education materials for this research project.

The health teachers indicated that "energy needs and weight control," "Basic Four food groups," "nutrition-related diseases," and "food supplements" were important to student's knowledge of nutrition and students reported their interest in these topics. Additionally, health teachers expressed the need for the inclusion of information about "food facts and fallacies," and "nutrients and their functions." Teachers tended to be concerned about the nutrition misinformation that is evident in the student population,in the principle researcher's contacts with them. This probably explains their reported need for both topics to be discussed in high school nutrition classes.

It is the author's opinion that the basic principles of nutrition must be discussed initially so that other "popular" or current nutrition issues can be better dealt with as necessary. Certain nutrition-related

fallacies and fads were incorporated into the nutrition unit in the appropriate topic area. For example, fad weight reduction diets were discussed in the lessons about weight control, and need for vitamin and mineral supplements was included in the lessons dealing with vitamins and minerals. Dealing with the issues of interest at the appropriate time and in the proper context will probably make the information more meaningful to the learner.

Summary and Conclusions

A review of the literature, findings of an informal telephone survey, and results of a Health Education Resources Inventory identified a relative lack of nutrition training, lack of sufficient nutrition resources and nutrition education materials and lack of guidance for integrating nutrition into the health curriculum, for health teachers. In order to meet the reported needs of health educators a great deal of planning and coordination on the part of nutrition educators is required. Also of importance to nutrition educators is the need to increase the nutrition knowledge of adolescents, as indicated in the literature, so that their health and well-being can be optimized by the application of appropriate eating habits.

Implementation and evaluation of the nutrition education unit described in this thesis, indicated that it was effective in increasing the nutrition knowledge of high school students. The related teacher training materials were found to meet the needs of the health teachers implementing the unit in the health education classes. Many of the nutrition topics of interest to students and those considered important by health teachers were incorporated into the nutrition component. The

nutrient density concept was reported to be of interest to students and they demonstrated an understanding of it by successfully applying it in practical classroom activities and by increasing the number of correct responses to nutrient density questions after being exposed to the nutrient density information.

An attempt was made in this study to measure attitudinal and behavioral changes regarding nutrition in the subjects, in addition to measuring change in knowledge. The results indicate that the semantic differential method in which bipolar scales are used to determine subject's attitude toward various word constructs, can be appropriately utilized in the high school setting. The importance of including control groups was also identified in the present study. Comparison of eating patterns and frequency of food intake between control and treatment groups allowed for a more accurate report of results and notable changes.

Recommendations

In order to meet the nutrition education needs of adolescents, it is recommended that a comprehensive and sequential nutrition education program be developed for incorporation into one or more existing curriculums in junior and senior high schools. Since the health education program is mandated in the state of Utah, and therefore reaches a majority of students, it is thought to be the most desirable curriculum in which to integrate nutrition. Other subject areas such as home economics and science could certainly be utilized to present complementary nutrition information, but it appears that the core of nutrition education should be made available in courses that reach all students, both male and female, college-bound or not.

Any and all nutrition education programs which are developed should be pilot and/or field tested to determine their effectiveness in meeting the needs of adolescent students and the teachers responsible for implementing them. It is recommended that control groups be included in the studies so that appropriate comparisons can be made and accurate conclusions can be reached.

The semantic differential method of measuring attitude is viewed as a plausible one that could be utilized in studying nutrition attitudes of high school subjects in future studies. The bipolar scale instrument appeared to be understood by high school students and appropriately marked by them. It is recommended that it be applied in subsequent nutrition education research projects to determine its efficacy in other settings.

Taking into account the relatively inadequate nutrition training of health and many other teachers, special consideration of their needs is essential. Appropriate training materials and in-service sessions that relate specifically to a proposed nutrition education program are recommended to be a part of the total package. It is likely that a well-planned, tested and proven effective nutrition education program would lose its impact if the responsible teacher is not well-informed of its content and not familiar with methods of implementing it. Regular nutrition training sessions in reference to new programs and later revisions of them could keep the teachers updated in nutrition knowledge and may improve their personal attitudes toward and ability to teach nutrition. Improved effectiveness of teachers in teaching nutrition would most probably affect the student's attitude toward and knowledge of nutrition in a positive way.

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APPENDIX A

NAME _____

Indicate on the following sets of scales the word which you feel best describes your feelings about the underlined words above the scale. Do this by making an X or ✓ in one of the blank spaces between the two words on the scale. The distance of the blank which you check from either end of the scale should depend on how strongly you feel about the idea or the words above the scales.

1. Nutrition

Good	____	____	____	____	____	____	____	Bad
Dull	____	____	____	____	____	____	____	Exciting
Worthless	____	____	____	____	____	____	____	Valuable
Up-to-Date	____	____	____	____	____	____	____	Behind-the-times

2. Nutrients

Not essential	____	____	____	____	____	____	____	Essential
Interesting	____	____	____	____	____	____	____	Boring
Valuable	____	____	____	____	____	____	____	Worthless
Bad	____	____	____	____	____	____	____	Good

3. Weight Control

Pleasant	____	____	____	____	____	____	____	Unpleasant
Behind-the-times	____	____	____	____	____	____	____	Up-to-Date
Worthless	____	____	____	____	____	____	____	Valuable
Essential	____	____	____	____	____	____	____	Not Essential
Healthy	____	____	____	____	____	____	____	Unhealthy

4. Basic Four Food Groups

Dull	____	____	____	____	____	____	____	Exciting
Good	____	____	____	____	____	____	____	Bad
Worthless	____	____	____	____	____	____	____	Valuable
Interesting	____	____	____	____	____	____	____	Boring

5. The following is a list of nutrition topics. If there was only time to study 5 of these topics in Health class, which 5 would you choose to learn about? Mark the 5 topics you choose with an X.

Nutrients and their functions _____

Diet and athletics _____

Energy (kilocalorie) needs and weight control _____

Food additives _____

Food supplements (vitamin pills, protein powders, etc.) _____

Nutrition labeling of foods _____

Recommended Dietary Allowances (RDA) _____

World food supply and distribution _____

Vegetarian diets _____

Food facts and fallacies _____

Nutrition-related diseases _____

Basic Four Food Groups (a guide to good eating) _____

Select the correct answer to the following questions by marking a letter in the space provided in the left margin.

_____ 6. Recommended Dietary Allowances (RDA) are:

a) The amounts of different foods a person should eat every day.
b) The amount of food a person should eat to maintain the correct weight.
c) The amounts of nutrients that should be provided in the diet daily.
d) The minimum amount of nutrients needed to prevent deficiency diseases.

_____ 7. Iron is important to the human body because:

a) It contributes to strong bones and teeth.
b) It is a part of hemoglobin.
c) It helps to digest foods.
d) It holds body cells together.

_____ 8. A good source of Thiamin is:

a) Banana
b) Milk
c) Butter
d) Roast Beef

_____ 9. A food which is a good source of vitamin A is:

a) Fish
b) Broccoli
c) Whole wheat bread
d) Salad oil

_____ 10. Which food is the best source of vegetable protein?

a) Peanuts
b) Banana
c) Oatmeal
d) Corn

_____ 11. What are the "Basic Four" food groups?

a) Fruits; Vegetables; Meats, Poultry, Fish and Beans; Milk and Cheese.
b) Nuts and Seeds; Fruits and Vegetables; Meats and Fish; Milk and Cheese.
c) Milk and Cheese; Breads and Cereals; Fats and Sweets; Fruits and Vegetables.
d) Milk and Cheese; Meat, Poultry, Fish and Beans; Fruits and Vegetables; Breads and Cereals.

_____ 12. A nutrient dense food:

a) Is low in its nutrient and calorie content.
b) Has a lot of calories or energy.
c) Has a high amount of nutrients compared to calories.
d) Contains a large amount of protein.

_____ 13. Vitamin C is important to the body because it:

a) Holds body cells together.
b) Helps to improve vision in the dark.
c) Maintains healthy nerves.
d) Provides energy.

_____ 14. Which of the following food substances does not contain calories?

a) Protein
b) Carbohydrate
c) Alcohol
d) Vitamins
e) Fat

_____ 15. To lose weight a person must:

a) Eat less calories than are used up daily.
b) Buy and eat low calorie foods.
c) Eat the same amount of calories as are used in daily activities.
d) Stop eating sweets and desserts.

_____ 16. Basal Metabolic Rate (BMR) is:

a) The amount of energy needed to digest, absorb and metabolize foods for use by the body.
b) The amount of energy needed for physical activity or exercise.
c) The amount of energy required to maintain involuntary body activities such as breathing.
d) The rate of the heart beat.

_____ 17. Which of the following foods would have the least kilocalories.

a) Whole milk (1 cup)
b) French fries (15 pieces)
c) Hot dog on bun (1)
d) Cantaloupe (1/4 of melon)

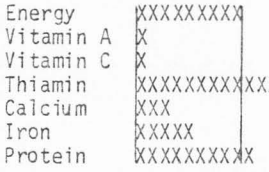
_____ 18. If a meal or snack was low in vitamin A, which of the following foods would best provide it at another meal?

a) Peas
b) Corn muffin
c) Fried shrimp
d) Sherbet

_____ 19. When kilocalories are added to a food in the form of fat or sugar:

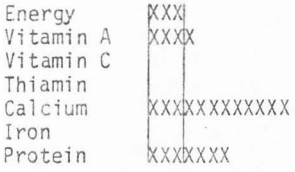
a) The nutrient value per kilocalorie is increased.
b) The nutrient value per kilocalorie is decreased.
c) The food is made more nutritious.
d) The nutrient value per kilocalorie is not changed.

_____ 20. Look at the following nutrient profile. Which nutrients are provided in good amounts compared to the energy, in the food profile shown? The length of the row of X's refers to the amount of the energy and nutrients contained in the food.



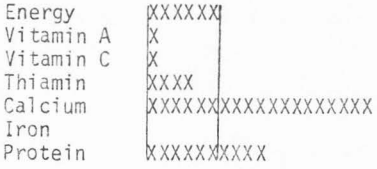
a) Vitamin A, Vitamin C, Thiamin, Calcium, Iron, Protein
b) Thiamin, Iron and Protein
c) Thiamin and Protein
d) Thiamin, Calcium and Iron

_____ 21. Look at the following nutrient profile. What nutrient is provided in the largest amount per kilocalorie from this food? The length of the row of X's refers to the amount of the energy and nutrients contained in the food.



a) Vitamin A
b) Energy
c) Protein
d) Calcium

_____ 22. Look at the following nutrient profile of a snack. Which of the following nutrients should be added to make the snack more nutritious (nutrient dense)? The length of the row of X's refers to the amount of the energy and nutrients contained in the food.



a) Carbohydrate and fat
b) Vitamin A, vitamin C, thiamin and iron
c) Calcium and protein
d) Energy (kilocalories)

_____ 23. A food which contains a "naturally occurring" simple carbohydrate is:

a) Orange juice
b) Table sugar
c) Flour
d) Mayonnaise

_____ 24. A food which contains complex carbohydrates is:

a) Milk
b) Watermelon
c) Eggs
d) Bran cereal

Circle the T if the following statements are true and circle the F if the following statements are false.

25. T F Carbohydrate has more kilocalories per gram than protein.

26. T F Vitamins and minerals contain kilocalories.

27. T F Thiamin is a B vitamin and is needed to release energy from foods.

28. T F Saturated fats are found mostly in vegetable fats such as margarine or corn oil.

29. T F Polyunsaturated fats have been shown to lower blood cholesterol levels.

30. T F Snacks can add needed nutrients and calories to the diet.

APPENDIX B

Name _____

FOOD FREQUENCY INDICATOR

Please indicate the number of times that you eat the foods listed below in a day or in a week under usual or typical eating conditions. If you do not eat a food on a daily basis indicate how many times you would consume it in a week. Use the past two weeks as a guide to help you remember the kinds of foods you usually eat.

	Times Per Day	Times Per Week
BEVERAGES		
Milk — Whole		
Milk — 2% (Lowfat)		
Milk — Skim (Nonfat)		
Chocolate Milk		
Buttermilk		
Milkshake		
Beer		
Wine		
Other Alcohol (Vodka, Gin, Whiskey)		
Soft Drinks — Regular		
Soft Drinks — Diet		
Fruit Juice or Lemonade		
Fruit Flavored Drinks (Punch. Tang, Hi-C or Kool-Aid)		
Vegetable Juice		
Coffee		
Tea		
Cocoa (Hot Chocolate)		
PROTEIN FOODS		
Liver		
Beef, Lamb or Pork — Fried		
Beef, Lamb or Pork — Baked, Broiled		
Chicken or Turkey — Fried		
Chicken or Turkey — Broiled, Baked		
Fish, Shellfish — Fried		
Fish, Shellfish — Baked, Broiled		
Ham, Corned Beef or Pastrami		
Cold Cuts (Salami, Bologna)		
Cottage Cheese — Regular		
Cottage Cheese — Low Fat		
Yogurt — Plain		
Yogurt — Flavored		
Eggs — Fried, Scrambled		
Eggs — Boiled, Poached		
Cheese — Processed		
Cheese — Natural		
Peanut Butter		
Dried Beans or Peas (Limas, Kidney, Pintos, etc.)		
MIXED DISHES		
Pizza		
Chili Con Carne		
Taco		
Burrito		
Hamburger		
Cheeseburger		
Hot Dog		
Sloppy Jo		
Soup — Broth Base		
Soup — Cream Base		
BREADS AND CEREALS		
Whole Grain Bread or Rolls		
White Bread or Rolls		
Dry Cereal — Whole Grain		
Dry Cereal — Refined		
Hot Cereal — Whole Grain		
Hot Cereal — Refined		
Crackers — Saltines		
Crackers — Graham		
Noodles, Macaroni, Spaghetti or Rice		
Pancakes or Waffles		
SNACK FOODS		
Popcorn — Salted		
Popcorn — Unsalted		
Pretzels		
Snack Chips (Potato, Corn, etc.)		
Nuts — Salted		
Nuts — Unsalted		
Sunflower Seeds — Salted		
Sunflower Seeds — Unsalted		
Snack Crackers		
FRUITS		
Fresh Fruit		
Dried Fruit (Raisins, Figs, etc.)		
Canned Fruit — With Sugar		
Canned Fruit — Without Sugar		
Frozen Fruit — With Sugar		
Frozen Fruit — Without Sugar		
VEGETABLES		
Cooked Vegetables (Peas, Carrots, Broccoli etc.)		
Lettuce or Tossed Salad		
Other Raw Vegetables		
Potatoes — French Fried, Fried		
Potatoes — Baked, Boiled		
Sauerkraut, Olives, Pickles		

		Times Per Day	Times Per Week
DESSERTS, CANDY, SWEETS			
Cake or Brownies	With Icing		
	Without Icing		
Cookies	Plain		
	With Nuts or Fruit		
Pudding or Custard			
Pie	Cream		
	Fruit		
Gelatin (Jello)			
Ice Cream			
Ice Milk			
Frozen Yogurt			
Sherbet			
Sweet Roll or Donut			
Popsicle			
Other Desserts			

		Times Per Day	Times Per Week
Candy Bar	With Nuts		
	Without Nuts		
Chocolate Candy	Plain		
	With Nuts		
Plain or Hard Candy			
Sugar			
Jam or Jelly			
Honey			
Syrup			
FATS			
Butter			
Margarine			
Mayonnaise			
Salad Dressing			
Sour Cream			
Coffee Cream			
Whipped Cream			
Bacon or Sausage			
Cream Cheese			

Answer the following questions by putting an X in the appropriate space or by indicating a number.

Do you usually eat breakfast every day? YES____ NO____

Do you usually eat lunch (noon meal) every day? YES____ NO____

Do you usually eat dinner (evening meal) every day? YES____ NO____

How many times per week do you eat breakfast at home? ____ Away from home____

How many times per week do you eat lunch at home? ____ Away from home ____

How many times per day do you eat a snack? ____

How many times per week do you eat food from a vending machine? ____

How many times per week do you eat at a fast-food restaurant? ____

Who do you eat out with most often? Friends ____ Family members ____

Where do you eat out most often? Vending Machine Area ____ Sit-down Restaurant ____
Fast Food or Drive-in Restaurant ____ School Cafeteria ____

When food is served to me I usually do ____ do not ____ add salt.

My cooked vegetables usually have butter or margarine added. YES____ NO____

Do you take a vitamin or mineral supplement? YES____ NO____

If YES, How often? Daily ____ Weekly ____ Monthly ____

Do you eat any food supplements? (High Protein Powders or Drinks, High Calorie Drinks, Lecithin, etc.) YES____ NO____

Do you feel that you are at the correct weight for your height? YES____ NO____

OVERWEIGHT? ____ UNDERWEIGHT? ____

What is your present height? _____ Feet _____ Inches

What is your present weight? _____Pounds

APPENDIX C

HEALTH EDUCATION RESOURCES INVENTORY

1. How many years have you been teaching at the high school level? _____

2. How many years have you been teaching health education? _____

3. Did you receive credit for any specific nutrition courses while attending college? YES ____ NO _____

4. Since college, have you taken any nutrition classes or attended nutrition workshops or inservice training sessions on nutrition? YES _____ NO _____

5. On a scale of 1 to 5 how would you rate your ability to teach the subject of nutrition to high school students? Circle the number that is appropriate

Excellent	Very Good	Good	Fair	Poor
5	4	3	2	1

6. Estimate the number of class sessions per semester in the current health course that you devote to nutrition. _____

7. How many class sessions per semester do you feel are necessary to adequately teach nutrition in the health curriculum? _____

8. What is the average size (number of students) of your current health education classes? _____

9. List as specifically as possible the nutrition topics that you currently include in the nutrition segment of health class.

_____ _____

_____ _____

_____ _____

_____ _____

10. Which of the following resources do you use in obtaining information about nutrition for class presentation?

General Health Textbook _____ Home Economics Teachers _____

Basic Nutrition Books _____ Popular Magazine Articles _____

Newspaper Articles _____ TV Programs _____

Professional Jounals _____ State Curriculum Guide _____

Information from Workshops or In-Service Sessions _____

Other (please specify) _____

11. Of the items indicated above, list the 3 most used resources in the order of importance.

1. _____

2. _____

3. _____

12. Indicate the various teaching methods and instructional materials that you use when teaching nutrition.

Lecture _____ Filmstrips _____
Games _____ Slides _____
Class Discussion _____ Films _____
Group Activities _____ Overhead Projector _____
Role Playing _____ Blackboard _____
Guest Speakers _____ Field Trips _____
Other (please specify) _____

13. Of the items indicated above, list the 3 most common teaching methods that you use when teaching nutrition.

1. _____
2. _____
3. _____

14. Rank the following components of health education in order of importance to overall health status:

Emotional and Mental Health _____
Safety and First Aid _____
Use and Abuse of Alcohol, Tobacco and Other Drugs _____
Nutrition _____
Physical Fitness _____
Sexual Education and Marriage and Family Life Education _____
Environmental Health Concerns _____
Prevention of Communicable and Noncommunicable Diseases _____
Selection of Health Products and Services _____

15. Do you feel that the nutrition topics covered in general health textbooks are sufficient to meet the needs of the student? YES ____ NO ____

16. On a scale of 1 to 5 circle the number which corresponds to the amount of control which you think high school students have over their own food choices.

Total	Almost Total	Some	Very Little	Not at All
5	4	3	2	1

17. How do you perceive the overall student response to the nutrition segment of health education? Circle the number of your choice.

Very Interested	Moderately Interested	Slightly Interested	Not Interested
4	3	2	1

18. Check 5 of the listed topics that you feel would be most important to include as part of the nutrition component in health education classes? Indicate the five (5) topics which you feel would be most beneficial to the high school student.

Nutrition Labeling _____

Energy Needs and Weight Control _____

Nutrients and Their Functions _____

Food Additives _____

Vegetarian Diets _____

Food Facts and Fallacies _____

Nutrition-Related Diseases _____

Recommended Dietary Allowances _____

Basic Four Food Groups _____

Food Supplements (vitamin pills, protein powders, etc.) _____

World Food Supply and Distribution _____

Diet and Athletics _____

APPENDIX D

1 BLUE CHEESE
ANALYSIS OF 28 GRAMS WHICH IS 1 OZ

NUTRIENT	AMOUNT	INQ	% STD	0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
ENERGY	100.00 kcal	1.00	5	EEEE
VITAMIN A	200.00 IU	1.00	5	AAAA
VITAMIN C	0.00 mg	0.00	0	-
THIAMIN	0.01 mg	0.20	1	T
CALCIUM	150.00 mg	3.33	17	KKK|KKKKKKKKK
IRON	0.10 mg	0.13	1	I
PROTEIN	6.00 g	2.40	12	PPP|PPPPPP
CHO	1.00 g	0.07	0	-
FAT	8.00 g	2.05	10	FFF|FFFF

****

2 CAMEMBERT CHEESE
ANALYSIS OF 38 GRAMS WHICH IS 1 WEDGE

NUTRIENT	AMOUNT	INQ	% STD	0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
ENERGY	115.00 kcal	1.00	6	EEEEE
VITAMIN A	350.00 IU	1.52	9	AAAA|AA
VITAMIN C	0.00 mg	0.00	0	-
THIAMIN	0.01 mg	0.17	1	T
CALCIUM	147.00 mg	2.84	16	KKKK|KKKKKKKK
IRON	0.10 mg	0.11	1	I
PROTEIN	8.00 g	2.78	16	PPPP|PPPPPPPP
CHO	0.00 g	0.00	0	-
FAT	9.00 g	2.01	12	FFFF|FFFF

****

3 CHEDDAR CHEESE
ANALYSIS OF 21 GRAMS WHICH IS 3/4 OZ

NUTRIENT	AMOUNT	INQ	% STD	0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
ENERGY	83.58 kcal	1.00	4	EEE
VITAMIN A	275.10 IU	1.65	7	AA|AAA
VITAMIN C	0.00 mg	0.00	0	-
THIAMIN	0.01 mg	0.15	1	T
CALCIUM	157.50 mg	4.19	17	KK|KKKKKKKKKK
IRON	0.21 mg	0.31	1	I
PROTEIN	5.25 g	2.51	11	PP|PPPPP
CHO	0.44 g	0.04	0	-
FAT	6.76 g	2.07	9	FF|FFFF

****

APPENDIX E

December 20, 1979

Dear Health Educator:

Enclosed is one or more "Health Education Resources Inventory" forms. I would appreciate it if you would take several minutes to complete the form and send it back to me as soon as possible. If you are not the only person who teaches health at your high school, please distribute any extra copies to other health teachers and ask them to complete the forms and return them in the stamped, addressed envelope which is provided. It is not necessary to include names or high schools which you represent.

Presently I am a graduate student in Nutrition and Food Sciences at Utah State University. For my graduate research project I developed a two week nutrition education unit which was recently field tested in several health education classes at two local high schools. Dr. Jan Pearce from the Health, Physical Education and Recreation Department at Utah State University is assisting me in my research as a committee member. Bob Leake from the State Board of Education has also been kept informed of the study and is interested in its outcome.

The nutrition component was developed to include basic nutrition information and current nutrition concerns related to the overall health of the high school student. It was meant to serve as a concise, up-to-date resource in nutrition for the health teacher. The test packet includes background reading information, lesson plans, classroom activities, and visual aids to make the nutrition unit as complete as possible for the classroom use.

As an adjunct to the study, I am interested in learning about the past nutrition training of health education teachers, as a whole, as well as the current practices utilized in presenting nutrition information to high school students. With this in mind I would be grateful if you could assist me.

Thank you for your assistance.

Sincerely,

Mary Jane German

Mary Jane German
Graduate Student

APPENDIX F

INSTRUCTIONS FOR ADMINISTERING PRE-TEST
AND FOOD FREQUENCY INDICATOR

The students are to take the enclosed pre-test at the beginning of Health class on Monday, October 15, 1979. It should be given to three (3) sections of Health class. The first class or section will be the experimental 1 group. The second class or section of the day will be the experimental 2 group and third class or section of the day will be the control group.

When introducing the pre-test you should refer to it as an introductory test or quiz. Do not use the term pre-test. Tell the students that you will be having a nutrition unit later in the semester and that you want to get an idea of their present knowledge of nutrition. The introductory quiz will help you to plan a nutrition unit that will include the nutrition information they need to learn depending on what they know right now. The students will not be graded on the introductory quiz but everyone must take it. The quiz will have a time limit of 20 minutes. They should do the best they can to answer all the questions as quickly as possible.

After you hand out the pre-test, tell them to read the instructions carefully. Then read through the instructions for the first 4 questions and give the students the following example of how to interpret them.

They are to indicate how they feel about a word or phrase by marking an X on the scales provided below the underlined word. The word FOOTBALL can be used as a practice question. Write the following on the blackboard:

FOOTBALL

Exciting _____ _____ _____ _____ _____ _____ _____ Dull

Healthy _____ _____ _____ _____ _____ _____ _____ Unhealthy

Tell the students to look at the first line and decide which of the spaces would indicate their feelings about football. If they think it is very exciting they they should put the X next to the word "exciting." If they think football is just a little exciting the X should be marked one or two spaces away from the word "exciting." If they think it is very dull, the X should go next to the word "dull." If they think it is neither exciting nor dull their X should go in the middle space. The students should go through each scale in the same way and mark the X's as quickly as possible, and then go on to the other questions.

Allow the students 20 minutes to complete the quiz. Make sure each pre-test has a name on it. Count the number of pre-tests returned to you and place them in the appropriate envelope provided. Write the number of students who completed the pre-tests in the space on the envelope.

Then hand out the Food Frequency Indicator. The students are to complete this form as a home assignment. They will receive credit for this only if they complete it. It will be a part of their nutrition unit grade later in the semester. The assignment is due within the following two days. Those who do not complete it will receive no credit or points. They will not be graded on what they write down or what types of food they eat. They will either get a specified number of points for filling out the form or they will get no points for failing to fill it out.

The completion of the food frequency form is part of the nutrition unit assignments. It is an exercise that should help them to become aware of the types of foods they are eating. Later when different types of foods are discussed in class they will be asked to think about the food they usually eat and decide if their diet is nutritious.

When the assigned forms are filled out make sure there is a name on each one. Count the completed forms and put them in the appropriate envelope along with the pre-tests from the same group. The students are not to know at any time that they are part of a research study.

Thank you for your cooperation.

Mary J. German