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NUTRITION EDUCATION - PROBLEMS AND PROGRESS

INTRODUCTION

Throughout the ages, man has always had the problem of securing enough food for survival. Even without knowledge of nutrition, it was known that food held a life or death importance. With the development of farming, food supply became more reliable. Variety of food, by standards today, was extremely limited, but it was sufficient to allow man to survive. Despite this availability of food, many people died as a result of what are now known to be nutrient deficiency diseases. Certain nutrients are required by all people to maintain health and present day knowledge of nutrition has enormously reduced the incidence of, for example, scurvy, rickets and beriberi.

However, there are other nutritional problems which our society must face. Anemia is a common nutritional problem in many parts of the world and it is thought (13) that this is determined not only by the degree of poverty, but equally by dietary habits and prejudices with a racial or religious background. In developing countries, protein-calorie malnutrition (PCM) causes a very large number of

children to waste away and die because ignorance and poverty combine to deprive them of the foods needed by their growing bodies (25). Even in North America, as in other developed areas where there is an abundant food supply, nutritional problems are far from unknown. Many people overeat, or eat a poorly-balanced diet, frequently resulting in obesity. Especially distressing, is the increasingly clear relation between the eating habits of infants and young children and probable lifelong overweight problems (28). Dietary habits of the adolescent often give cause for concern at this very important stage of life and the nutritional requirements to assure adequate growth and maturation need to be clarified (13). Among all age groups, though especially in children, dental caries gives rise to much concern, due to the frequent consumption of an unnecessarily large quantity of sugar.

Today's food market affords a great variety and volume of products and the consumer should be informed of the place in the diet of new and hitherto unavailable foodstuffs. In many cases, a new food added to the diet will replace another food product and the often unanswered question is "Does the new food item supply the nutrients formerly supplied by the food it replaced?" (39). Thus, there is a great need for nutritionally well-educated professional people to educate the public in sound nutritional practices.

✓ Nutrition education is universally needed regardless of income, geographic location, cultural, social or economic

patterns, or level of education. There is no instinct that guides man to select those foods which meet the nutritional needs of the body. Knowledge is not inherited and therefore, each new generation must be taught what foods to select and why, and how food affects health. Today, food technology, industrial development, and rapid transportation continue to greatly increase the number, kinds, and availability of prepared foods; fresh, canned, frozen, heat & serve, mixes, and instant foods, all in packages of every size, shape and weight. Thus, the shopper has a difficult problem in properly selecting the best buys in both nutritional and monetary value (69).

Nutrition education, as an important factor in preventing malnutrition, is repeatedly emphasized in current literature in many parts of the world. The problem of malnutrition in North America is, perhaps, most critical in the low socio-economic sector of the population, largely due to poverty and the inability to obtain the food essential for proper nutrition. A point that should be remembered, however, is that malnutrition due to ignorance - the lack of basic information as to what foods are needed for good health - can and does occur to a significant extent in all segments and at all socio-economic levels of the population (63). Nutrition education must be for life as there may be no later opportunity to revise the facts learned.

Authorities believe that education in nutrition should form an integral part of the curricula both in elementary and high schools, colleges - especially those involved with the training of teachers, medical schools, nursing schools and in dental health programs.

It is hoped that the recent dietary survey (12) - "Nutrition Canada" - and the proposed practice of nutritional labeling (5) for the public will facilitate the learning and practice of sound nutritional principles by all segments of the population.

It has been noted (61) that a continuous and cumulative experience in nutrition education during elementary and secondary years is desirable. Welsh (77), speaking of the problems faced by nutrition workers, stated that "... one problem seems to recur more often and cause greater concern than any other. It is the lack of a graded curriculum in nutrition education that spans the public school years." The White House Conference on Food, Nutrition and Health in December 1969 considered the need for nutrition education in the schools, and stated (79):

"A dynamic nutrition education program that begins in early childhood and continues through the elementary and secondary schools can help young children to acquire positive attitudes towards food. Also, it can help older children to assume responsibility for their own food selection and prepare

them for adult and parental responsibility. As future citizens in a democracy, children must develop acceptable nutritional practices and a sense of social consciousness to enable them to participate intelligently in the adoption of public policy affecting the nutrition of people." The White House Conference went on to recommend that adequate nutrition on the undergraduate level and strong continuing education programs in nutrition be provided for teachers (80).

Nutrition is taught to medical students as fag-ends of physiology, bio-chemistry, clinical medicine, and paediatrics. This was borne out by a report on nutrition education in medical faculties received at the 1971 conference of the International Union of Nutritional Sciences (35). The report recommended that professorial chairs and departments of nutrition should be established in medical schools, and it outlined a scheme for teaching the physiology, bio-chemistry, and pathology of nutrition and its effective application to community medicine and medical practice. Waterlow (76) believes that nutrition is neglected in medical curricula and that doctors are unable to interpret the results of recent advances in this branch of medical knowledge in a balanced and well-informed way. The attitudes of interns and residents in two Harvard-affiliated hospitals were surveyed through a detailed questionnaire (46) and the results suggested that they are aware of the weakness in nutrition education in their curriculum and are eager to improve their knowledge.

In a pilot program at the University of Miami, increased emphasis was given to nutrition (27), especially in the medical-surgical nursing area, but throughout the entire program as well. Benefits of the program were seen as tangible in terms of the students' attitudes and their performance in a number of situations, including:

a) interest in the subject matter and appreciation of the methods used,

b) abilities to demonstrate skill and understanding in handling nutritional aspects of patient-care studies,

c) recognition of nutritional problems in patient centred seminars,

d) abilities in application of principles in public health practices (27).

The need for information on the dietary intake and nutritional status of Canadians has been recognized for many years and recent reports in medical literature (12) have cast doubt on the validity of the widely held assumption that Canadians are well fed. Evidence obtained (32, 33) by the Food and Drug Directorate indicated the incidence of malnutrition may be higher in this country than is generally appreciated. Approximately 10% of human liver samples collected at necropsy in an Ottawa hospital had no vitamin A present. In Vancouver the figure was 2% and in Montreal it was 22% (12). The liver is well known to be the organ in which vitamin A is stored,

and absence of hepatic stores of the vitamin is strongly suggestive of inadequate intake or utilization of vitamin A. It was also reported that (72) 400 cases of rickets were hospitalized in 1967 and 1968 in 3 hospitals in Montreal and Toronto. Results of U.S. surveys indicate that there is an unexpectedly high incidence of certain nutritional deficiences, especially iron, vitamin A and iodine (59).

In the light of the above information, there was an urgent need for a systematic and comprehensive survey of a representative sample of the Canadian population to determine the food intake and nutritional status as a basis for corrective action by appropriate agencies (12). This survey was "Nutrition Canada" and was conducted in 1972. The data collected will, when available, be a useful basis for:

a) The improvement of public health and welfare programs.

b) The development of federal legislation on the addition of nutrients to foods and dietary supplements.

c) Estimating the intake by Canadians of such items as food additives, food contaminants and pesticides, in order to evaluate possible health hazards and to take corrective action by legislative or other methods.

d) Evaluating advertizing claims of manufacturers regarding adequacy of the diet and need for supplements.

e) Assessing the impact of new convenience foods on dietary habits and nutritional status (12).

The addition of nutritional information to the labels of food products sold at retail outlets was recommended "to enable consumers to follow recommended dietary regimens"(21). The primary purpose of nutritional labeling is to (5):

a) Help people select balanced diets.

Other purposes which contribute to the primary purpose but are of lesser importance, are:

b) Help select the most nutritious foods at point of purchase.

c) Encourage the production of nutritious foods.

d) Stimulate nutrition education.

e) Improve confidence in the food industry.

f) Satisfy the consumers' "right to know".

The Food and Drug Administration (FDA) has proposed (21) adding nutrient composition data, expressed primarily as percentages of the "Recommended Dietary Allowances" (22) per serving. This proposal has been criticized by a number of persons (58). An entirely different approach, in which the nutritional values of fabricated and formulated foods are related to the nutritional values of standard reference foods, has been proposed by Babcock (4).

It is generally accepted that the primary aim of nutrition education is the establishment of good eating habits but, eating habits are interwoven with culture, traditions, superstitions and religion. True education in nutrition must

result not only in the acquisition of knowledge and skills but in a change in eating habits, attitudes and values. The question regarding nutrition education should not be how much or what information should be provided but rather, what is one attempting to achieve (39)? Acceptance or rejection of food by children can be evaluated only in the light of the teacher's knowledge of the availability of food, its preparation, and service within the homes.

Nutrition education, today, must be imbued with freshness and vitality if world malnutrition is to be overcome (43). To be effective, nutrition education must motivate people to adopt food habits which will enable them to achieve adequate nutrition. Innovative educational programs that will be accepted and followed are a major need. Current studies involving a socio-cultural approach should produce information helpful in solving these problems (63).

The responsibility of educating the general public in sound nutritional practices lies not only with those directly involved with nutrition - the home economist, the dietitian, the nutritionist, the bio-chemist and the teacher; but also with the physician, the dentist, the nurse and the government - the latter through law enforcement and the sanctioning of necessary surveys.

However, the scope of this paper in dealing with progress in nutrition education will be limited to that which is possible in the classroom.

I. PROBLEMS IN NUTRITION EDUCATION

Nutrition Defined

Although it depends heavily on the related sciences of bio-chemistry and physiology, nutrition is a separate science. It can be defined as that science which deals with the identity and function of those substances in food and water required by an organism for growth, maintenance, and reproduction; with the foodstuffs which enable the organism to meet these; and with factors involved in the consumption and utilization of such foodstuffs by the individual (10).

(a) Research into Human Needs

i. Research findings in identity and function of nutrients.

Many people have contributed to the development of the science of nutrition. Application of the findings of research in the area of human nutrient requirements, body processes, and caloric needs has made man healthier and able to live longer (16).

Vitamin research is one example of how nutrient deficiences were discovered by scientists and efforts made to correct them. Vitamins are organic compounds present in some

foods and Casimir Funk (16) advanced the idea that certain diseases known to occur as the result of faulty diet were due to a diet deficiency rather than to a poison or toxin as was previously believed. He stated that certain substances which he called "vitamines" (16) could prevent and cure deficiency diseases.

The functions of vitamins in the human body are regulatory ones. The vitamins are needed in only small amounts but are essential for normal growth and health (16).

Vitamin A is an important one. Deficiency is known to cause blindness and even death in children (57). At the time of a symposium on vitamin A and Metabolism in Switzerland in 1960, two remarkable achievements in the field of vitamin A research had already been made (57):

a) Chemists had discovered the exact structure of the vitamin and had succeeded in synthesizing it.

b) Bio-chemists had unravelled the exact function of the vitamin in the visual system.

In addition to being required for the normal functioning of the eyes, vitamin A is also needed for the maintenance of the epithelial tissue and for the promotion of growth (16).

Vitamin A is found in plant foods as vitamin A and in the plant pigment carotene. The latter, when eaten, is converted into vitamin A in the body. This process occurs mainly in the intestinal wall during digestion (16). Because of its ability

to change from carotene to vitamin A, carotene is known as a provitamin (16). The amount of vitamin A in foods varies widely. Primarily, it is supplied from the fat of dairy products and from egg yolks. Skimmed milk contains only traces. Margarines which have been fortified by having vitamin A added to them in the production process are sources of this vitamin. The livers of fresh water fish and fish liver oils also provide vitamin A.

The consumption and utilization of the necessary foods by an individual often poses problems to the nutrition educator. The potential learner may refuse to apply sound nutrition information to food choices for meals or between-meal snacks. The responsibility of finding the means by which to have food acceptability coincide with nutrient needs of the person rests on the dietitian in the hospital, school cafeteria, military installation, or university food service and on the nutritionist in teaching and research (3), and not, as in the past, on the individual.

ii. <u>The need for nutrition-related research</u>.

Since nutrition is a relatively recent science, the amount of factual information on human nutrition is still somewhat limited. Areas where research is much needed are:

a) Absorption of calcium in order to set a level of requirement.

More concise delineation of the mechanisms which normally regulate the intestinal absorption of calcium has led to better

understanding of calcium malabsorption and its resistance to vitamin D (a pattern often considered the hallmark of patients with chronic renal disease). However, the actual mechanism underlying the defective intestinal absorption of calcium in uremia can be established only when there is a more specific understanding of membrane and cellular transport processes which normally regulate calcium absorption (2).

b) Absorption of iron in order to set a level of requirement.

Except for the iron in meat, food iron is poorly absorbed. Ferrous iron is absorbed three times more readily than ferric; absorption is aided by such dietary constituents as ascorbic acid and fructose, which form soluble complexes with iron. Gastric hydrochloric acid facilitates absorption of ferric iron, probably by increasing chelation with ascorbic acid (29). More research is required to set a definite level of requirement.

c) Maternal and neonatal serum vitamin A levels.

Thirty-six Egyptian mothers and their newborn infants were subjects of this investigation (1); twenty-four non-pregnant women served as controls. Serum vitamin A levels of the fetuses were slightly lower than those of both the pregnant and non-pregnant women, but the differences were not statistically significant. There was a highly significant correlation between the serum vitamin A level of the mother and her fetus. Extent of transfer of vitamin A across the placenta thus seemed to

depend on the vitamin content of maternal blood. (It has been thought by some researchers that the placenta acts as a barrier to the passage of vitamin A to the fetus.) Further research would seem to be required to investigate the absorption of vitamin A during pregnancy.

d) Nutrition and the outcome of pregnancy.

Evidence has been presented which suggests that nutrition intervention during pregnancy can have a significant influence in the subsequent growth and development of the infant (30). The Montreal Diet Dispensary gave nutrition counselling and necessary food supplementation to 1,636 indigent public clinic patients of the Royal Victoria Hospital between 1963 and 1971. During the service the average intake of the pregnant women was increased by 531 calories and 32 grams of protein. The perinatal mortality (14.9/M) and prematurity (7.6%) were similar to those of the private patients and significantly lower than for the other public clinic patients. The mean birthweight (3,276 gm) in the study group was the same as for private patients. Birth weights were significantly higher for the higher pregravid weights, larger maternal weight gains and for the longer periods of Diet Dispensary service (30) (Appendix a, Table 1).

It is thought that (36) the diet of a pregnant woman should provide all of the required nutrients with sufficient calories to support a steady gain in weight of 0.5 to 0.8 lb. a week to a total of approximately 24 lbs. (36). Appendix a,

Figure 1 shows the outcome of an adequate weight gain in pregnancy of a 29 year old mother (30).

An immediate, major problem in nutrition services is how the knowledge gained from on-going studies can be incorporated into the nation's maternity services (36).

Effective nutrition education must be based on properly qualified and continuing research. There is a great need to support and intensify basic and applied research in human nutrition and nutrition education (10). This requires a growing and effective nutrition education task force, that will reach all segments of the teaching profession and the general public. The task of promoting good nutrition must involve many qualified workers in all phases of nutrition, nutrition-oriented organizations, and new teaching and promotion methods. In spite of limited knowledge of human nutrition, sufficient scientific knowledge is available upon which to conduct sound programs of nutrition education.

iii. Areas where nutrition-related research findings are not applied.

"Advances in nutrition-related research are only useful when extensively applied. The link between research advancement and application is currently very weak" (10).

a) Appendix b shows the food apparently consumed in 1965 in terms of amounts per person per day and compared with recommendations in Canada's Food Guide (62). Comparison is

difficult since Canada's Food Guide does not recommend specific amounts, apart from milk and vitamin D. A range is allowed for ages, size and activity. These figures represent national per capita averages. Many people consume above the average and many must be well below. The average consumption by adolescents of fluid whole milk is shown as 1.6 C. Since the recommended quantity for this age group is 4 C, it means that many were consuming too little. In this respect, a recommendation of Canada's Food Guide was not being followed.

b) Recent studies (55) indicate a link between early childhood malnutrition and mental development among poor people. Consequences of malnutrition depend on the time in the life of the individual when nutritional deficits occur and on their severity and duration. The critical period is from about 5 months before birth to about 10 months after birth. Severe protein-calorie malnutrition can cause permanent intellectual damage if it occurs before 12 months of age. Metabolic studies by King et al (40) indicate that the present dietary allowances for protein (65 gm) recommended by the American National Research Council are not adequate to permit maximum protein storage during the third trimester in young pregnant women.

c) Practices which are common during pregnancy are the restriction of weight gain through low calorie regimes, restricted salt intake and the use of diuretics. Lowe (44)

believes that there is no justification for these, yet the practices continue.

d) It has already been seen that deficiency of vitamin A is known to cause blindness and even death in children (57). It is surprising that, although many aspects of the metabolic function of vitamin A have been investigated and despite the fact that it is possible to synthesize and produce the vitamin at very low cost, this public health problem has not been overcome, nor has this disease been eradicated (57).

(b) Research Concerning Foods and Their Nutrient Composition

i. Changes in food values due to industry.

Farmers today have a more mechanized operation than in previous years. They have made better use of fertilizers, pesticides and other farm chemicals (16). Additionally, they have adopted better cultural practices in crop growing and have improved the management and breeding of livestock. A larger and better supply of food for the consumer is therefore possible.

As farm mechanization grows, farm operators are able to handle more land, thus, more farms are being combined to make efficient use of modern power and equipment (16). Many farmers are growing crops for processing - indeed, many products are grown under a contract signed early in the season, before the crop is planted, in some cases (16).

Many changes have taken place in the processing of food. Many small processing plants have been incorporated into large processing factories which operate with a lower cost per unit. The primary factor influencing processing changes (16) is the increasing number of innovations - machine chicken pluckers and eviscerators and new kinds of packaging.

Another change currently being explored is the addition of soy products and fish protein concentrate (FPC) to meat (51). Their high protein content makes them a logical substitute for or extender of meat, as well as being a possible means of combating future food shortages.

Meat loaves were prepared with soy textured vegetable protein (TVP), fish protein concentrate (FPC), and micro-crystalline cellulose (MCC) (51). Those with FPC were less well accepted regarding flavour and texture. The meat loaves prepared with TVP were well accepted for both flavour and texture. Those containing MCC had lower scores for texture, but were well accepted on the basis of flavour. None of the three additives affected the juiciness of the meat loaves (51).

ii. Threats to increased food production.

The mounting hazards of unrestricted world population growth are leading to an uneducated solution - mass starvation.

World population, currently about 3.4 billion is expected to double itself in the next 30 - 40 years. The food population ratio is, at present, in such imbalance that it could well

result in disaster within the space of a single generation.

A mounting threat to increased food production in North America stems from many sources: water and air pollution, domestic and industrial effluent and solid waste disposal, raw sewage, insects and pests, and the constant subversion of prime agricultural lands by the physical structures connected with housing, service and recreation complexes, and airports.

Briggs (10) believes that all of our education and science forces must be assembled and supported in a crash program toward the conservation of natural resources; first to protect the food supply, then to develop new technology through research to both maintain and increase the food supply, and finally and most importantly, to develop ways and means for the advanced and continuing academic training of a growing and effective task force of educators, researchers, and technicians, that is, hopefully, able to cope with the mounting problems emanating from population density.

These are problems for society. Their complexity makes them impossible to be dealt with by the class-room teacher but it is desirable that students be at least made aware of the problems.

Nutrition research and education play a dominant role in conservation through the proper utilization of one of nature's most important basic resources - food. Just as we subvert prime agricultural lands to less basic needs, so do we

subvert foods by improper handling, processing and utilization. In so doing, we promote nutritional problems (10).

While the population of North America is, at present, fortunate to have a plentiful and broad variety of nutritious foods, the general level of human health is not as high as it should be. Food selection is sometimes unwise, and the difficulty in obtaining proper choices of foods for adequate diets is aggravated by low incomes.

iii. Food faddism.

Probably almost everyone has held some idea about a food that is not true, or adheres to some eating practice that has no basis in science. Even professional people are sometimes dogmatic in their pronouncements concerning the specific foods they believe people require. On occasion, most people are guilty of some faddism or subscribe to some fallacy concerning food. The reasons for this are many and varied.

The problem of faddism is not with the person who holds an occasional harmless notion about food, but rather with the individual who allows fake ideas about food to become his way of life or who tries to impose his ideas on other people. Many people who succumb to faddism are simply ignorant of sound nutritional principles. They are often in search of health and may try anything to secure it. One study (37) showed that older people with limited general education were much more likely to believe in faulty nutritional ideas and

apply them in daily practices than were younger people with higher levels of education. Faddists were found to have more rigid personalities than non-faddists. As long as there are people seeking some magical solution to problems of health, beauty, youth and vitality, there will be those who prey upon the public simply for financial gain - the quacks or charlatans who engage in nutritional quackery.

The allure of food cults and nutrition quackery (11) has very deep reaching roots. The question of why people turn to quackery instead of to the legitimate health profession cannot be understood in isolation. Victims of quackery are often denounced as uneducated, ignorant, superstitious, gullible, seekers of magical cures who want something for nothing in a quick and easy way. This seemingly unreasonable and wasteful behaviour must be heeded for the message it conveys - that in some important aspect, our rational scientific approach fails to fulfil the desperate needs of suffering people. It is to these needs that quacks and cultists address themselves.

The contributions of the victims must be recognized - the denial of illness, the uncritical belief in bizarre and unrealistic promises and the deep-seated mistrust of the medical profession and its methods of treatment. The problem must also be examined against the background of the whole social climate, the type of health education and health care and its delivery. The sales pitch of promoters would not make

customers for quackery and food fads if there were not people with unfulfilled needs and if the merchandise, worthless as it is from a scientific point of view, did not give some kind of relief, however temporary and imaginary, namely by offering hope where there had been despair.

Quackery and food fads become unmitigated evils when their fake promises prevent people from seeking medical aid which might have saved their lives or spared them unnecessary pain and suffering. More effective laws are necessary as protection against such exploitation. However, laws cannot achieve the goal without more effective health education and this requires a better understanding of the underlying factors which traditional health care has often disregarded.

The fatally ill are not the only people to seek help from mysterious remedies of folk medicine and from "health" foods. Many are not physically ill at all but are anxious about the uncertainties and threats of living. Many suffer from discomforts and chronic aches and pains which are not well-defined and for which medicine can offer no clear-cut remedy. It seems that the more chronic a condition, the more susceptible a sufferer to the fake promises of "cure".

The nutrition quacks who prey on health fears swindle Americans out of half a billion dollars every year. They tout their products by propounding the four often repeated myths of nutrition (20):

a) All diseases are due to faulty diet - something is always missing from the diet and must be taken in supplement form.

b) Soil depletion causes malnutrition. There is no scientific basis for the theory that crops grown on poor soil with the help of chemical fertilizers are nutritionally inferior. What primarily affects the nutritional composition of a food is the genetic make-up of the seed.

c) Myth of overprocessing. This is basically an exaggeration of the fact that some methods of processing and cooking food do result in loss of vitamins and minerals. Ignored is the fact that much food enrichment has improved the nutritional value of many foods.

d) This concerns the so-called sub-clinical deficiencies - everyone who has an ache or a pain in any part of the body is probably suffering from a sub-clinical deficiency and needs to supplement his diet with various concoctions. The fact is that no normal person can go through life without experiencing some aches or pains or feelings of tiredness. There is no basis for believing they are due to dietary deficiencies.

Many people find it easier to worry about their digestion or an arthritic pain and to seek a cure for this rather than face the frustrating and often insoluble problems of their lives. It is not surprising that the underprivileged and poor, the uneducated and sickly often become the victims of quackery. They are more prone to be below par in health and more apt to convert stresses and strains and deprivations in their lives into physical symptoms. A major feature of

illness is helplessness and therefore sick people, too, are peculiarly open to exploitation. Decrease in strength and efficiency, loneliness and fear of being deserted make many of the elderly susceptible to the promises of quackery. "The dream of the Fountain of Youth" (11) has a long and respectable history. This seems especially applicable today when society is very youth-oriented.

The field of nutrition appears to be particularly vulnerable to distortion into fads and cults. Some food fads are exemplified in Appendix c. Why do food fads persist in spite of scientific evidence that denies their validity? Olson (52) believes it is because food has emotional rather than intellectual value to the average person and that food faddists capitalize on this fact, appealing to the emotional drives rather than the intellects of their believers. The food faddist appreciates the symbolic value of food much better than does the professional concerned with scientific nutrition. The faddist plays on the hopes, fears and superstitions of the individual.

In an exposé of food fads, Deutsch (17) concluded that fake food cures are perhaps the biggest public health problem in America today. It must be remembered that eating is a function of high and complex emotional significance. What we eat, when we eat, how we eat and with whom we eat are determined in innumerable ways - by social and national

tradition, moral commands and restrictions, individual psychologic experiences and only incidentally, by nutritional needs. Emotional aspects of eating pervade our lives to such an extent that they are taken for granted as the normal, natural way of eating. People cling to their food habits with great tenacity because their sense of well-being depends on having the "right" kind of food.

Fear of starvation has haunted mankind throughout its history. Primitive man learned to differentiate between edible and non-edible foods; between healthy and poisonous foods. Food intake always requires the co-operation of another person and thus is always charged with the emotional complexities of the mother-child interaction. Food can relieve discomfort, tension and even pain and if it is used as a universal pacifier it can seem to become the reason that people who are obese misinterpret any discomfort as need for food. Thus, they may eat far beyond their nutritional requirements.

With the expansion of fundamental knowledge of nutrition, the public has become conscious of the vital importance of nutrition and wants to know more about it in order to provide the best nutrition for self and family. Sebrell (60) believes it is this very receptiveness on the part of the public which now provides such a good opportunity for food faddism to flourish. The whole industry of "health" foods is based on

the fear that something valuable has been removed from the food sold in the ordinary grocery store.

Nutrition teaching, too, will sometimes prey on fear and anxiety to promote good eating habits. The attack on obesity frequently threatens overweight people with the dire consequences of staying fat. The number of diets suggested is endless but their long-range effectiveness is rather limited. "Weight Watchers" (9) appears to succeed. By making reducing a group enterprise with mutual emotional support, the clients are relieved of the frustrating isolation which dieting normally involves.

The great progress of modern medicine has led to a model of medical practice in which the patient is dealt with as a passive object. This overlooks that doctor - patient interaction rests on a number of shared assumptions and social roles. When a patient is treated purely as an object, his contribution becomes zero, leaving him frustrated and dissatisfied. Therefore, the patient may then turn to a quack or cultist for help where he feels he is contributing something.

There seem to be two general answers to combat food faddism: education and law enforcement to protect the public. In the long run, a less gullible public must be the answer. However, before the general public can be educated, as has been said before, the professionals on whom they depend for facts must be informed. It is sad indeed that, on occasion, the

professional himself propagates food faddism either through ignorance and lack of scientific background, carelessness, lack of discrimination in information passed on, or even indifference.

Sebrell (60) stresses the role of the scientist in relation to food fads. He sees the scientist's responsibility as being threefold: "First, he must constantly guard against initiating fads - a hazard in speculating upon experimental results. Moreover, in the pursuit of knowledge, in the acceptance of hypotheses and sometimes conclusions, the scientist himself is not immune to faddism. He should be careful not to impart his unfounded enthusiasm to the public. Secondly, the scientist can attack faddism by subjecting current fads to experimental evaluation. With definitive answers derived from research, he can state not only that the faddists' claims are groundless or implausible, but also untrue. Third, the scientist is obligated to be a leader in nutrition education, and to lend his authority in combating falsehood. The best ammunition against food fads has come from the research laboratory, and the public, by and large, will continue to turn there for guidance."

Sebrell (60) also has said that there is no substitute for an enlightened consumer. The incorporation of nutrition education into the curricula of teacher training institutions would mean the ultimate education in nutrition of all children in the schools - an ideal but long range solution to the problem.

Responsible use of mass media such as magazines, newspapers, television, radio, etc., to inform the public about sound nutritional practices would help. This could be handled either directly by reputable scientists or by scientific writers whose materials could be checked by appropriate, competent scientists.

The Food and Drug Administration and the Better Business Bureau (48) have campaigns against nutritional quackery. Articles are prepared for newspaper syndicates and national magazines. Legal actions are being publicized. Law enforcement is another means of attacking food faddism (38). The law prohibits the making of false claims about a food - it does not prohibit the marketing of "unnecessary" foods. The Food and Drug Administration may take proceedings against all forms of nutritional quackery in which labeling is involved - shippers and distributers of special dietary preparations making exaggerated claims, doorstep peddlers of "shotgun" mixtures and lecturers who rent halls and give pseudo-scientific lectures and prescribe their own special preparations to cure all ills. It is unfortunate that the law does not also prevent the sale of books and magazines promoting fads.

Many reliable sources within a community may be consulted - the faculty of the nutrition department of a local university, a hospital dietitian, a nutrition specialist, a physician or

"Dial-a-Dietitian".

In the long run, the most effective answer to food faddism will be a nutritionally well-educated professional person who, in turn, can educate the public.

(c) Research into factors involved in the consumption and utilization of foodstuffs by individuals.

The reasons people accept some foods and reject others has been studied extensively. Undoubtedly, many underlying factors influence dietary practices - culture, traditions, superstitions and religion are some of these factors. During World War II, many disciplines, including the military, investigated who ate what, when and how much (42). Research tried to identify parameters involved with those who deviated from a prescribed standard of eating.

If a man has certain basic knowledge, it is possible to inform him through techniques in education about the performance of an atomic-powered device - here his racial, cultural, religious, socio-economic and personal preferences are not involved.

An understanding of food acceptance and rejection would be a beginning to help to avoid frustration of the teacher as well as a step toward a constructive educational program to improve nutritional status.

a) Physiological Reactions

Milk, usually in powdered form, has caused more evident physiological reactions than any other type of introduced food, according to reports. Several instances of unfavorable physiological reactions in children were mentioned in connection with a joint milk program of AID and the Peace Corps in Peru (50). Stomach aches and diarrhea occurred when powdered milk was prepared with unboiled water. Also, when villagers had received the powdered milk without instructions for its use, their children became ill from eating the dry powder. Children are always more willing to try new foods than adults since they have not developed the biases of their own cultures with such strong emotions as have their parents. Project reports show that foods must be properly introduced to be accepted and used as a desirable food. Rejection of new foods, such as powdered milk, can be expected when the method of introduction fails to convey information as to proper preparation and use of the food.

Even though some aspects of accepted and rejected foods are very similar for persons of a given age, socio-economic level or educational background of the mother, basic physiological differences occur which are considered to be individualistically genetic. Nevertheless, Snyder (65) concurred with results from research that as many as 40 per cent of individuals do not possess taste sensitivity for certain bitter compounds. Snyder reported 31.5 per cent of 440 subject

members of 100 families were unable to detect a bitter compound which the other 68.5 per cent responded to with great rejection. He found the response to be related neither to age, sex, nor race. He attributes the taste deficiency to a single recessive gene.

Pfaffmann (53) presents a thorough analysis of the sensory properties of taste as differentiated from flavor. Taste is a receptor sensitive to different ions and molecules with selectivity giving rise to an afferent neural code in the taste nerves to the brain resulting in the sensations of salty, sweet, sour, bitter, or some other quality. These sensations control ingestive behaviour, either that of acceptance or rejection of the item.

Glanville and Kaplan (24) describe a highly involved research design involving 187 adults, which included 39 husband-wife pairs, 16 pairs monozygotic twins and 10 pairs of dizygotic twins. Repeated determinations of the taste threshold of an individual have shown that under controlled conditions thresholds are relatively stable. However, a number of factors affect these thresholds such as a decline in sensitivity with increasing age, heavy smoking is related to insensitivity, and physiological disturbances which increase sensitivity.

Analyses of taste are only a fragment of food acceptance. To illustrate, sweet is universally well-accepted, provided it occurs in the "right food", that is, not one which custom,

culture, or family has designated to taste otherwise. However, cravings for certain tastes develop, such as for sweets, in prisoners of war whose supply of carbohydrate is sufficient in the form of starch, but lacks sucrose. Pfaffman (53) believes "the so-called 'sweet tooth' illustrates the fact that certain innately positive stimuli not only instigate ingestion of food but also could serve as rewards or reinforcement for learning." The specific hunger response for sodium chloride is also described by Pfaffmann, who expresses concern for the many unanswered questions as to the precise physiological mechanism by which such hunger is guided and regulated. These reports illustrate the complexity of food acceptance even from the aspects of precise chemical and physiological measurements.

Babcock (3) stresses the complexity of the task as centering on "communication of knowledge and aptitude appropriate to the healthy use of food."

b) Food Aversions and Neuroses

Numerous research reports indicate that food dislikes are associated with unknown, unfamiliar foods and that a fear of the unknown is associated with rejection. Wallen (75) suggests that food aversions should be based only on those foods which have been actually tasted and then rejected. Wallen (73, 74, 75) whose research in the 1940's is basic to many current concepts about food aversions, has indicated the following reasons for development of food aversions:

1) emotional experience at meals,

2) faulty and capricious training methods especially as related to basic physiological processes such as eating and toilet training,

3) fear of the new and strange,

4) unpleasant image association aroused by the food,

5) neuroses-disorder associated with any one or special combination of anxieties, compulsions, obsessions, phobias, and motor or sensory manifestations resulting in disorganization of personality.

Smith and Ross (64) tested Wallen's ideas that food aversions are related to inadequate emotional control by securing simultaneous information about anxiety, biographical data, and food aversions on 318 college and 107 high school students. No difference in food aversions and age level was found; in fact, the higher the anxiety score the greater number of food aversions were indicated. Further analysis of personality characteristics indicated that fear and anxiety predict food aversions, that subjects with a large number of food aversions have neurotic characteristics, and that these subjects will tend to report dislikes and not to eat foods which they have never tasted.

c) Perception

It is not realistic to evaluate the acceptance of new foods solely in terms of their nutritional value. New foods must be fitted into the existing cultural pattern which

contains the core of beliefs which give meaning to a group's existence.

Perception by the individual of the advantages to be gained from change is the key to adoption of changes. It is important that the change agent shall have both the willingness and the ability to understand and to deal with the sociological and psychological differences between his own cultural patterns and those of the people being helped. The change agent's success lies in augmenting and supplementing an existing local cultural pattern, not in replacing it (50).

d) Cultural Influence

All cultures have changed and continue to change in response to contact with other cultural systems, chiefly through cultural competition. Each culture can improve its competitive position when it gets an advantageous new food resource, and great numbers of new foods have been adopted by different cultures throughout history. It used to take years and even centuries to accomplish this interchange of new foods and food habits. Our concern today, in the era of induced change, is to cause the change process to evolve quickly and easily. In some areas of the world, change is necessary - where local food supply is insufficient for a growing population.

Wheat has been introduced into many of the agricultural developing countries and, though there has been some resistance

to it - especially among rice eaters - indications are that it is accepted, if the economic advantages are large. In the Comilla Academy project in East Pakistan, construction workers were paid partially in American wheat. Although they were rice eaters by tradition and some of them believed that they would die without it, they learned to use the wheat for food. The advantage was that they got considerably more wheat for their work than they would have got rice (50).

To change food habits successfully, we must know something about food traditions in different cultures - with emphasis on the fact that tradition is both meaningful and conservative (50).

Every man has been taught what is "proper" and "improper" in his own cultural system. This learning has been largely unconscious and powerful emotions have been generated to support the attitudes. Men are taught what foods are "proper", and positive emotional feelings, especially taste, become associated with them. A "proper" food is one which is familiar and accepted within any given culture. Unfamiliarity is one of the most frequent problems affecting acceptance of new foods. North Americans are strongly averse to eating insects which are relished by many other peoples (50). Southeast Asians do not drink milk. In both cases, negative feelings occur when the individual is exposed to what he considers "improper" foods. Positive feelings occur for "proper" foods.

Many people accept the idea that what they like must be what they need and that appetite is a reliable indicator of physiological need. "Only the pessimist holds the dim view that everything he likes is either fattening or immoral" (42).

From the viewpoint of the educator and nutritionist, the challenge is how to make food wants coincide with nutritional needs and how to do this in early childhood when attitudes and habits are formed and nutrient needs are most crucial. Children learn food habits from parents and others, including what is considered edible and even when to eat it. The use of food is identified - to relieve hunger, to cement friendship, to celebrate, to honor someone, to punish, and to attract attention by "hunger strikes" (47).

e) Economy

Economic necessities may become supported by taste preferences. Taste reactions on record (50) indicate that meat, eggs, vegetables and fruits are generally considered the most desirable kinds of foods in the U.S. and Europe. The poorer peoples of the tropical countries depend much more heavily on starch foods, whether from grains or roots. This is true particularly of rice-eating peoples, for whom a little meat with plenty of rice is the preference. A study of Indian migrants conducted on the island of Trinidad (50) pointed to the fact that, although the economic structure differed from that in India and they were in a full market economy, the

migrants continued to treat rice as a subsistence crop. They grew rice in the old traditional manner, and felt insecure if they did not have enough in their bins for the whole year.

The cost of a food is perhaps the greatest barrier to acceptance of new foods in the developing countries. Foods introduced for improved nutrition fail to be accepted when they are beyond the purchasing power of the local people. In the Dominican Republic, a Peace Corps volunteer managed to get eggs and yeast bread placed in a locally organized co-operative, but shoppers did not buy them. In the same co-operative, rice, beans and oil, which are much cheaper in most of the developing countries, were selling well (50).

As long as new items are donated or part-subsidized, local people will use them but, as soon as the people themselves are expected to use their own purchasing or productive power, they tend to give them up. Project reports from Colombia, Cyprus, Cameroons, Dominican Republic, Peru, Liberia, Santa Lucia, and the Philippines have mentioned this difficulty. The difference in cost between vegetables and the starch staples may cause the villagers to sell the vegetables they raise and eat the starch foods (50).

f) Beliefs and Habits

Beliefs and customs in a culture are interrelated. Beliefs are more conscious and related to other cultural motifs. Customs are usually followed just because they have become habitual.

Few if any, change agents will ignore religious concepts or beliefs. For example, orthodox Jews do not eat shell-fish, or fish with scales or gills, as part of their religious beliefs. The Islamic prohibition against eating pork, and the Hindu belief that cows are sacred, are well known and respected (50). Not so folk beliefs, or "superstitions". In the Western mind, superstition and religion are two separate things. In Taiwan, their hogs are black. White Yorkshire hogs were introduced to improve pork production but, to the Chinese, white is the color of mourning and the white hogs frightened them (50).

Some food biases are based on nothing more than habit. When a given practice has been followed by a group, they will tend to continue it simply because it is easier than learning new habits. This is classic cultural conservatism. A Peace Corps volunteer in the Philippines stated that the villagers and their children in one area would eat the vegetables they knew and had been used to eating, but would not eat most of the vegetables introduced from outside. The same kind of reaction was reported from villagers in Liberia and British Honduras.

Prestige motivation was noted by the volunteer who found that local people did not wish to eat more fruit or vegetables but were quite interested in learning to make a three-layered cake. The volunteer then started each meeting by mixing up a cake and giving a nutrition lecture while it

was baking. Her conclusion, however, was that these women were seeking prestige as cake-makers but were not interested in concepts of nutrition (50).

Unfortunately, the word nutrition means little if anything to the vast majority of people. They show no real concern about nutrition, they read nothing on nutrition, and they pay little attention to nutrition information disseminated by the various forms of mass media. In short, the population in general is not being reached with good nutrition education. The reasons for this must be found and overcome if we are to adequately educate the population in good nutritional practices.

II PROGRESS IN NUTRITION EDUCATION

(a) Consideration of Teaching as Changing Behaviour.

A distinction may be drawn between what a person can do - achievement - and what he will do - habit (71). In defining teaching as changing behaviour, Vargas (71) states that what the students are doing must be emphasized; not what the teacher is doing. At first, this emphasis may seem strange because customarily, everything but the students is concentrated on. Content, style of presentation, use of audio visuals, clarity or explanation are discussed - but where is the student? A teacher can present content in an empty classroom. Is she teaching? She is certainly not changing behaviour. To change behaviour, the focus must be moved to what the learner does and teaching methods must be planned accordingly (71). In large classes, it can be difficult to keep each student responding but, for example, instead of showing the student where to find a specific topic in a book, the student can be encouraged to do this independently. Written answers to questions can help to keep all students responding. The questions asked might be the same ones used

by the teacher during discussion.

The students' initial skills must be determined before it is possible to proceed, in small steps, to teach new things; each one a little more difficult, until the student is able to perform all the tasks set (71).

The same process can be used to build the self-control necessary for good habits - in this case - good eating habits. To change habitual behaviour, motivation must be provided by building immediate positive consequences for the desired behaviour. Effective reinforcement varies with the individual e.g. favourite T.V. program, favourite food etc.

Recent developments in operant psychology have suggested some simple methods of changing behaviour which have been remarkably effective. Behaviour, according to this view (7, 31, 70), is maintained by the consequences which immediately follow it. Acts which produce favourable consequences tend to be repeated, and those which are ineffective or punished tend to be discontinued. Lack of self-control may be the result of undesirable behaviour gaining immediate rewards, even though long range consequences may be disastrous.

When teaching is thought of as changing behaviour, the behaviour of teachers is likely to change. It is possible to stop regarding the goals only as content to be covered and to start specifying behaviour desired in the students. Treating everyone alike may be avoided by presenting content after

consideration of individual capability and level of progress.

Learning experiences must be designed to encourage the learner to do and say what, formerly, was done by the teacher in lectures and demonstrations. When a student is having trouble with, or baulking at, the requirements to be met, the task can be broken down into more manageable steps. To further encourage the student, immediate reinforcing consequences should be arranged. By having each learner actively behaving, and by rewarding for successful completion of each step, behaviour can be changed more efficiently to result in the learner doing these things which are the goals of teaching (71).

(b) Sustained Behavioural Change.

When changes in behaviour result from an educational program, how long are these changes sustained after the program is discontinued? Some insight into this question has been gained from a study of Louisiana participants in the Expanded Food and Nutrition Education Program being conducted with low-income families throughout the U.S. (23).

In Louisiana, this program was directed toward children and their parents. Classes conducted for children in individual communities were considered to be one way to get nutrition information into the homes. These classes were taught by program aides who lived in the community. The aides also

personally visited the parents of the children weekly and gave demonstrations and instructions related to the lesson taught to the children that week.

The following are the topics of the weekly lessons:

a) The Basic Four Food Groups (in general).

b) Vegetables in the Diet.

c) Milk in the Diet.

d) Bread and Cereals in the Diet.

e) Meat in the Diet

f) Importance of Some Food in the Morning.

g) Between-meal Eating.

h) Putting It All Together.

Specific learning experiences were selected and organized for each lesson. The basic teaching techniques included demonstrations (show and tell) and practice by the learners (23).

Research Procedure

As subjects for a study of behavioural change, a sample of equal numbers of rural and urban homemakers was selected in a six-parish (county) area. Homemakers in the sample were questioned before the Nutrition Education Program began, immediately after completion of the eight lessons, and four months after the last lesson had been taught. Questions tested their knowledge of the foods they thought people should have to keep healthy and a recall of the foods they had eaten in the

previous 24 hour period. It should be pointed out that no personal contacts were made by the aides during the four-month period following the completion of the eight lessons. It was assumed that the last check point (four months later) would give some idea as to how long any changes in eating habits were sustained (23).

Increased Knowledge

With the exception of bread and cereals, the respondents had an exceptionally good knowledge of the kinds of food necessary for adequate diet even before the program began. In all cases, the knowledge level improved after the eight lessons. The composite change in knowledge between the "before" and "immediately after" levels was significant at the 0.01 level (Appendix d, Table 1). In the case of bread and cereals, the change in knowledge level was greater than in the other three groups. The slight increase in knowledge between the "immediately after" and "four months later" interviews was not statistically significant, indicating that the total change in knowledge was sustained.

The percentage of homemakers naming at least one drink or food from each of the major groups as being necessary for good health moved upward from 47% before the program to 83% immediately after the program (Appendix d, Table 2). This change was significant at the 0.01 level, and it was fully sustained after four months.

Although the percentage of individuals with minimum adequate diets after four months was the same as before the program began, there were some definite positive changes in both knowledge levels and in the practice of nutrition. Many of these changes were sustained four months after completion of the program. This finding seems to indicate a need for more extensive educational programs which would provide repeated learning experiences. Perhaps eight weeks is only enough time to tell - it may take a longer period to teach (23).

"Nutrition education in the schools can be effectively integrated into many curriculum areas, or nutrition can be taught separately. School nutrition programs should be extended to include parents and other adults" (78). Curriculum material that weaves nutrition teaching into many other subjects and at all levels in both elementary and high schools is needed and has actually been implemented in some areas (78).

(c) Programs in Nutrition Education.

i Elementary school

Cooking activities in kindergarten help to give young children confidence and a sense of pride, introduce them to the subject of food and nutrition, and teach them basic academic skills such as mathematics and vocabulary (15). At this level, it is not necessary to teach nutrition as such

but it is possible and desirable to do this indirectly by ensuring that the children are able to distinguish foods which belong to the five foods groups used in Canada's Food Guide.

A sense of intellectual power, with all the positive emotional ramifications is what is being sought in the kindergarten cooking program described by Cohn (15). Cooking as a means towards this goal is a happy experience for the children, the teachers, and occasional participating parents, in great measure because of the children's pride and satisfaction in providing for such a basic and recognized need. It is difficult for an adult to imagine this sense of power the child feels in a world where everyone is apparently bigger, apparently wiser, and certainly bossier.

There are several objectives of the cooking program. Some of them are aimed at influencing and changing nutrition behaviour, and others contribute to general academic competence. The objectives and examples of achieving them (through the example of making a grilled cheese sandwich) are shown in Appendix e.

The "cooking" includes a wide range of learning experiences: tasting chunks of comb honey before and after a visit to a beehive; making whole-wheat yeast bread, peanut butter, and ice cream in individual open freezers (15).

Equipment is assembled prior to the lesson by the adults. The recipe is written pictorially on a large chart and sometimes also on small charts, which are placed on the cooking table. The project is discussed with the class in meeting time and ingredients are inspected and discussed, and the recipe is "read". The children who are cooking wash their hands, assist the teacher in distributing utensils, and discuss these and their safety. Activities such as reading the recipe, measuring, comparing quantities and sizes, describing texture, colour, taste and smell are not new to primary teachers, but they are often new to parent volunteers in the program. Parents are encouraged to assist the teacher one or more times before taking charge of the activity. Busy working parents are interested to find that they can help children learn basic skills as they go about necessary household tasks (15).

Puppets also proved to be an effective teaching device at the kindergarten level (81). In fact, they were so effective that the children passed on what they learned from food puppets and created interest in nutrition at home, thus paving the way for visits from nutrition aides.

As the year progressed, the children learned how to manipulate the puppets and this helped to hold their interest during the weekly programs. After each show, a brief discussion on nutrition was held and some of these centred on

one or two of the food characters, whether the children liked the food, how many ways it might be prepared and what it gives them in terms of good health (81).

By the end of the year the children had a basic understanding of nutrition, an idea of which foods they should eat every day, and could categorize various foods into the four food groups (81) as used in U.S.A.

While nutrition education is needed for all ages, the programs must obviously vary to suit the needs, interests and abilities of the age group involved. A program of nutrition education for fourth and fifth grade children is described (6).

A 1964 - 65 survey of the diets of school children in Monroe County, Iowa, indicated that intakes of calcium, iron, vitamin A and ascorbic acid were generally low (6). Because of this, a study was designed to measure the influence of a specially-prepared program of nutrition education on knowledge of nutrition, diet and related factors (6). Fourth and fifth grade children were selected for the study because they were thought to be the age group most likely to respond to nutrition education.

Experimental lessons were taught in Fall, 1967. Follow-up experiences were presented in late winter. Control groups received no special instruction. Dietary recalls and records, scores on a nutrition test, ratings of vegetable preferences, and scores of scholastic achievement were obtained before the nutrition education program. Changes in these variables among

the experimental groups were compared with changes among the control groups to determine the influence of the program (6).

Design of Program

a) Setting Objectives - four broad objectives were delineated (Appendix f, Table 1), and behaviours needed to obtain them were incorporated into sub-objectives (6). Sub-objectives were arranged in hierarchies, according to complexity, under the broad objectives. For each behaviour, a level of competence and/or internalization from taxonomies of educational objectives (8, 41) were identified to test whether objectives were arranged within true hierarchies.

Generalizations and facts were selected to correspond to the stated objectives. Appendix f, Table 2 shows examples (6).

b) Testing Procedure - two multiple-choice test items in the form of questions were proposed for most of the stated objectives (Appendix f, Table 3). A specialist in evaluation scrutinized the proposed test items for validity and difficulty. The children saw the test only during its administration, and items were never discussed with them. Thus, the same test was used as both the pre-test and the post-test.

c) Learning Experiences - the objectives and generalizations guided the selection of learning experiences (Appendix f, Table 4). The experiences were organized into daily lessons (over 13 school days) of 30 minutes each and two follow-up

lessons. Lesson plans for fourth and fifth grades were identical (6). Most daily lessons were planned to help children achieve from one to three sub-objectives.

Each day, children were to observe or participate in simulations, demonstrations, or discovery projects and to discuss findings and applications of facts and generalizations. Reviews were incorporated into successive lesson plans. Textbooks were not used because they varied among the classes (6).

The Nutrition Unit

During the unit, the children made growth charts, observed cells under a microscope, simulated cell division by using clay models, fingered milk ash, bent a decalcified bone, and blew into lime water to detect the presence of carbon dioxide in their breath (6). In addition, they watched milk clot with both trypsin and rennin, blotted food with writing paper to detect fat, dropped iodine on food to test for the presence of starch, and compared the physical properties of different foods. They evaluated their diets, kept a record of daily activities, and tasted squash - many for the first time (6).

Follow-up experiences included a bulletin board in January, 1968, and an animal feeding demonstration early in February. The bulletin board illustrated the variety of nontraditional foods that could constitute nutritious breakfasts (6).

For the animal feeding demonstrations, weanling rats were fed meat, potatoes, and bread for three weeks. Half the rats were given chocolate bars in addition to the basal diet. The other half received dry milk and raw carrots. The children evaluated the animals' diets and compared sizes and appearances of the animals (6).

ii High School

The junior and senior high school years present the only opportunity for the formal nutrition education to which most North Americans are exposed. Therefore it is important that the subject be taught thoroughly and in an interesting manner (18).

Students are bombarded daily with facts which they may accept or reject or ignore (45). They can take or leave the facts. Often they leave them. MacReynolds (45) believes we cannot educate a student. He must educate himself. She believes educators are charged with helping the student with the means and that educators can be much more creative and make nutrition education more meaningful to the students. Nutrition education can be made exciting to the average student; however, it must be integrated into his life experience (45).

MacReynolds (45) suggests asking students what they like or dislike about learning nutrition. She believes that they will tell if they feel the educator is sincerely concerned.

"It is so vitally important that teaching nutrition becomes a prime opportunity for affecting the physical and mental health of society" (45).

Groups of high school students from middle to lower socio-economic groups were asked what they were interested in from a nutrition standpoint (45). Appendix g shows the responses (45).

The beliefs that junior and senior high school years present the only opportunity for the formal nutrition education of most North Americans, and that it is, therefore, important that the subject be taught thoroughly and interestingly, led to the undertaking of a study of selected schools in a large metropolitan area in Massachusetts (18).

The goals were to:

a) Discover the general level of interest in nutrition as it was taught at the high school level and, if possible, reasons for such attitudes.

b) Find topics of special interest or disinterest within the high school nutrition curriculum.

c) Measure the nutritional knowledge of high school students and its variations by school, sex, grade, and type of academic program chosen (18).

It was hoped that an assessment of this type might shed light on the strengths and weaknesses in knowledge which existed and suggest improvements which could be made to heighten

interest in nutrition among adolescents. Further, using the criterion of poor performance on an objective test of nutritional knowledge as a guide, it might be possible to identify some of the demographic characteristics of students who were most in need of further nutrition education (18).

Below is a brief description of the school systems and the schools within them which were tested (18):

System 1 - School system in an upper-middle class suburb: School A: 9th grade in the only high school in the system. Approximately 80% of the students go on to college or some other training after high school. Both college and commercial (vocational) programs are offered. None of the students tested had studied the nutrition unit of the health course at the time of testing.

System 2 - School system in a nearby middle to lower-middle class urban area: School B: 9th grade in the only high school in the system. Approximately 40% of the students go on to college. Both college and commercial programs are offered. All of the students had studied the nutrition unit in health before being tested.

System 3 - Large metropolitan school system: School C: 10th and 12th grades. This boys' school offers only a college preparatory course. Virtually 100% of the graduates go on to college. Students take health in the 10th grade in this city and all students had studied the nutrition unit of health at

the time of testing.

School D: 10th and 12th grades. Girls' school, identical in type to School C though smaller.

School E: 10th and 12th grades. Middle to lower-middle class regional high school, both sexes. Approximately 40% of the students go on to college. Both college and commercial programs are offered. All students had completed the nutrition unit in health before being tested (18).

The schools which were selected were higher, not lower, than average in terms of their reputations for quality education in the area. Thus, they were by no means a random sample of the schools in the systems in the region involved in the study (18). Appendix h, Table 1 presents the per cent of students by sex in each grade and school who completed the questionnaires.

Questionnaires

A five question open-ended interest questionnaire was devised. Students were asked whether nutrition was more, equally, or less interesting than other parts of the health education course they took and why. They were also asked to list topics related to nutrition they would have liked to have discussed which were not covered and to mention parts of the nutrition unit they had found particularly interesting or dull (18).

A review of literature revealed that relatively few studies of nutrition knowledge had been done in the past, therefore, a test based on nutritional concepts believed to be important for the general public to know was developed (18). The concepts to be covered by the questionnaire on nutritional knowledge were identified by culling the chapters on nutrition in several health, home economics, and general science textbooks widely used in high schools. Multiple choice questions based on these concepts were then formulated. A draft of the test was sent to ten expert judges (five nutritionists, two high school teachers, two home economics professors, and one agricultural extension worker specializing in home economics) who had extensive subject matter competence and experience in dealing with the public in the field of nutrition. The draft was revised in line with their suggestions (18).

Most of the 100 questions on the nutritional knowledge test had only one correct answer, but a few questions, such as those on the subjects' estimates of their caloric intakes, had a range of possible correct answers. Full credit was given for all reasonable answers on such items. Each correct response was given a score of 1; thus, the range of possible scores was 0 to 100 (18).

Questionnaires were completed during school time and 30 - 35 minutes was allowed. Students were encouraged to guess

if they were not positive of the right answer. Data obtained from the precoded questionnaires were analyzed on data processing equipment and computer (18). Appendix h, Table 2 shows a page from the 100-item questionnaire (18).

Since students learn in a variety of ways, teachers need a varied approach to any area of study. Individualized instruction, which allows the student to be responsible for his own learning, was used as a method of educating high school students in nutrition (14). Illustrated programmed instruction units were developed featuring a cartoon character named the "Sleuth". The expression, stance, or activity of the Sleuth "captured the eye" and was planned to motivate conceptual learning in an appealing way. Each illustrated frame in the media presented nutrition and/or consumer concepts, some of which were "caught rather than taught". Since reading is considered difficult by marginal students, the target population, limited text was used. The concept to be learned was to obtain the most nutritional value for food dollars spent (14).

Test Groups - two urban high schools were chosen as test centres. Two classes received the programmed instruction materials; two used learning packets, and one served as a control group. A total of 105 students completed all segments of the research (14).

An objective pre-test, based on behavioural objectives, was developed and administered to the groups prior to use of the media. The test, designed for pre- and post-testing, measured the knowledge before and after students completed the programmed instruction. No time limit was involved and students worked at individualized rates. As individuals finished the media, post-tests were given. Student reaction to and teacher evaluation of the media were recorded. All groups received a retention test six weeks after completing the material (14).

The programmed instruction material was planned as a supplement to the existing curriculum at the secondary level and could be used in several other ways (14).

a) The illustrations and cartoons could be easily converted to transparencies without printed text. The portrayal would then become a vehicle for class discussion of more than the one concept as given in the original written text.

b) The programmed instruction media could be photographed and used as slides either to introduce or to review a unit in nutrition and/or consumer education.

c) For the accelerated student, a teacher might supplement the programmed instruction with additional resource media and teaching-learning experiences for an in-depth study.

d) A home-bound student or late enrollee could receive the media as "make-up" material.

Carruth and Foree (14) recommend a revision of portions of the media, test items and future retesting of the media with additional groups, including students of various ethnic and cultural backgrounds.

Results of Tested Programs

The results of the nutrition education program for fourth and fifth grade children as described on pages 48 - 51 follow (6).

The nutrition test was administered before and after the teaching of the experimental unit in the Fall, and a third time, five months later, in the Spring. Between the first and second testing periods, scores of the experimental groups improved significantly more ($p \leq 0.01$) than did those of the control groups (6) (Appendix f, Table 5).

Between the second and third tests, subjects in experimental groups had time to forget what they had learned, and control subjects had time to acquire knowledge of subject matter included in the test. As expected, mean scores for Test 3 declined among experimental classes and improved among control classes compared with scores on Test 2. The experimental groups maintained their improvement over the control groups, however, when compared with Test 1 (6) (Appendix f, Table 6).

Changes in mean scores of the Iowa Every Pupil Test of Basic Skills were not significantly associated with the nutrition education unit. Therefore, improvement in overall scholastic ability did not account for improvement in test scores among experimental groups (6).

Nutrition and caloric values of diets changed little as a result of the nutrition education program. However, diets of fourth and fifth grade children in Monroe County had already improved between the 1964 - 65 survey and the 1967 pre-measurement period (6).

In Spring, 1970, a questionnaire was sent to the parents of 50% of the children in the study. They were asked to select one of each pair of factors as being more important in influencing their child's change of diet from 1965 to 1967. Thirty-two of eighty questionnaires were returned (6). On the basis of selections made by parents, "T.V. and radio advertisements" and "changes in school lunches and snacks" seemed to be the most important factors. Parents did not select "report of a nutrition survey in Monroe County", eliminating as a factor recommendations sent to parents after the 1964 - 65 survey (6).

Whether advertisements led to improved diets is questionable. Changes in school lunches and snacks may have had some influence because it was noted that ascorbic acid in the foods served at school was greater in 1967 than in 1965 (6).

Some misconceptions shown by the children about food composition seemed to reflect food advertising claims. Children probably need additional experiences in identifying major nutrient sources over several years to reinforce and expand learning; otherwise facts learned will be quickly forgotten (6).

Although it was not measured, enthusiasm for learning nutrition may have been an important outcome of the experimental nutrition program and in the future, these children may approach the study of nutrition enthusiastically (6).

The results of the study by Dwyer et al (18) of "Nutritional Literacy of High School Students" as seen on pages 52 - 56 are given.

Appendix h, Table 3 presents the students' reported interest in the nutrition unit of the health education course. Variations from school to school existed, but the majority of students in all schools found nutrition to be equally or less interesting than other parts of the health education course they had taken. Girls generally found nutrition more interesting than boys. Within schools in which several grades were tested, the seniors, who had taken the course several years before, remembered it as somewhat less interesting than students who had just completed it.

Responses were further analyzed for students who indicated that nutrition was more or less interesting than other areas of the health education course. The greatest number of responses (in rank order) to the question of why nutrition was considered to be less interesting than other areas of health education mentioned that the subject matter was "boring". The second ranking response, given by an almost equally large proportion of students (predominantly girls), was that most of what they had been taught in the nutrition section of health was "old hat" which they had already encountered (18). Criticisms on presentation were third in rank. The most recurrent complaint about this was that most of the learning involved memorizing "useless" facts and technical vocabulary rather than giving a real understanding and discussion of the principles involved. The fourth ranking complaint was that the material was taught at too low a level and was covered in a superficial manner without enough meaningful detail. The fifth most frequent response was that the teacher appeared to be uninterested in nutrition and consequently, presented material poorly and in a dull manner (18).

The responses (ranked in order of frequency) of the students who found nutrition more interesting than other parts of health were: 1) they liked nutrition for its practical value; 2) it helped them to improve their food habits; it was

helpful to know how to eat in a manner beneficial to health; and 3) they enjoyed studying the functions of the body, how nutrition could influence growth and development, and how the body used foods (18).

Special Interest Topics

Students were also asked to mention topics in nutrition which they would have liked to have discussed which were either not dealt with at all or not in sufficient depth to please them (18). The highest ranking topic was weight loss and dieting; second was a desire for a more detailed coverage of the proper foods to eat for a well-balanced diet, and third, more explanation and discussion of the effects of deficiencies and excesses of nutrients on the body. Fourth in rank was the desire for greater coverage of meal preparation, cooking practices, and budgeting of family meals; fifth, metabolism of various nutrients; and sixth, the relationship of nutrition to skin diseases, particularly acne. Other topics mentioned with lesser frequency were nutrition in underdeveloped countries, "calories", and nutritional diseases, including inborn errors of metabolism.

When students were asked which of the topics discussed they did not find interesting, the answers most frequently given were: 1) "calories"; 2) nutrient composition of foods; 3) detailed discussion of the vitamins; 4) the anatomy of digestion and absorption; and 5) over-emphasis on the Basic

Four and on the food groups (which many of the students remarked that they already knew) (18).

Responses to questions on the parts of the nutrition section of the health course which they enjoyed and found interesting were fewer in number. The most frequently liked topics were (18): 1) overnutrition; 2) undernutrition; 3) diseases due to malnutrition; 4) the study of the foods necessary for health and growth; 5) metabolism (especially energy metabolism); and 6) digestion.

Nutrition Knowledge Scores.

Appendix h, Table 4 presents the mean scores on the test of nutrition knowledge for the high school population tested. The grand mean score over sexes, grades, and schools was 55.9 with a standard deviation of 11.59. The scores ranged from 14 - 85.

The mean scores for the nutrition knowledge test were further analyzed by the type of program in which the students were enrolled - college or commercial courses. Data from Schools B and E, only, are included. The Analysis of Variance Table and the Test for the Difference between Means for these scores is presented in Appendix h, Table 5. College-bound girls' means scores were the highest, followed by college-bound boys, then girls in the commercial programs and lowest of all, by boys in the commercial program. All means were significantly different from each other. These findings also held true when

examined within each school (18).

Appendix h, Table 6 gives the mean per cent of subjects by sex answering correctly items in the eight different subject matter areas covered on the test of nutrition knowledge. As would be expected from their higher overall scores, girls had a higher mean per cent of correct answers on items in five of the eight areas of the test.

1,338 students, representing 42% of all students in selected grades in five high schools in an urban area of Massachusetts were surveyed by means of questionnaires on their attitudes towards and knowledge of nutrition. The majority of the students considered nutrition to be equally or less interesting than other parts of the health education courses they had taken. On the test of nutrition knowledge, girls scored higher than boys, and college-bound students higher than commercial (vocational) students. In spite of their higher overall scores on the test and their greater interest in weight control, girls scored lower on areas of the test having to do with weight loss and gain, energy metabolism, and energy output (18).

Carruth and Foree (14) conducted the nutrition education study - "Cartoon Approach to Nutrition Education" - as described on pages 56 - 58. The results of this study are shown below.

Pre- and post-test scores for the participants were analyzed statistically and are summarized in Appendix i, Table 1.

An inter-group comparison of pre-test scores indicated that the groups were homogeneous regarding their knowledge prior to initiation of the study. Appendix i, Table 2 illustrates the significant differences in groups for the pre-, post-, and retention test score means. When the post-test scores were analyzed, computed t-values for groups who received the programmed instruction were highly significant.

These findings support the teaching effectiveness of the media and indicate that students acquired concepts by way of the media. The retention test scores revealed that the amount of information lost during the six weeks time lapse was not statistically significant. In determining the per cent of retention, the programmed instruction groups showed a greater gain initially in concepts and retained them better than the groups using different media (14).

The time element evolved as an important factor in the study. The programmed instruction groups required five class days for completing the media, including the completion of testing; the learning packet media required thirteen class days. A longer instructional period for students using the learning packet did not result in higher scores or greater retention. Since adolescents have a short attention span, a variety of experiences is recommended to stimulate interest and motivation for learning (14).

Use of cartoons as a teaching medium resulted in a variety of student responses (14). Overall, the students felt less pressured to learn "facts" and were more inclined to read and react with enthusiasm to a new approach. Teachers reported that interest was generated to "see what is on the next page"; competition arose among the students as "they attempted to be on the same frame as their peers".

Teacher evaluations indicated that the vocabulary limitations of many students hampered their ability to recognize the meaning of terminology such as : "tart", "ingredient", "informative", "intensity", "descriptive", adolescent", and in turn, inhibited their effective use of these new words in the media (14).

Research results indicated that the contemporary approach of using cartoons in combination with programmed instruction proved effective in increasing the ability of students with reading handicaps to grasp nutrition and consumer concepts. The findings also support the theory that learning can be enjoyable and nutrition education need not be "dull, ineffective or unimpressive" (14).

iii Additional techniques for teaching nutrition.

The techniques described below are some which the teacher of nutrition in both elementary school and high school might find useful and interesting. Documented results of testing these programs are not available but they are sufficiently well-described to be able to be used in the classroom.

A four weeks' workshop at the University of Illinois developed techniques for teaching nutrition which worked well when put into practice with students (66).

As a point of departure in the workshop, the "Basic Conceptual Framework of Nutrition", developed by the Interagency Committee on Nutrition and accepted by the White House Conference on Food, Nutrition and Health as an adequate base for nutrition education (66), was used.

Teaching techniques were classified according to the principle of reality, as: 1) real life situations, 2) simulations of reality, and 3) abstractions from reality (67). Accepting the theory that the effectiveness of a technique increases as it approaches a real life situation, techniques were developed which utilized reality or simulated reality as closely as possible.

The simplest, most basic concept in nutrition (66), i.e. diet affects health, is probably the most difficult to teach. Slides of animal and human deficiency diseases and pantomimes of deficiencies were used; the latter adding a touch of humour. The very best technique for teaching that diet affects various aspects of appearance and health is to work on the real problems of the students (66). If some of them change their eating habits, e.g., decide to start eating breakfast or stop consuming quantities of candy and pop and then experience a desired change in the way they feel or look, their testimonials will carry more weight than all the slides and simulations (66).

Two participants in the workshop created bulletin boards and displays which called attention to this most basic concept. A junior high school teacher used cartoon figures to point out that food affects one's appearance, personality, growth, health and vigor. A high school teacher showed high- and low-calorie snacks beneath a poster titled "What does your shape-measure show?" with tape measures around the middle of a plumpish and a lithe coquettish figure. The message that snacks made the difference was loud and clear (66).

The second basic idea, that foods vary in nutrient value, is much easier to teach and can be approached through an amazing variety of games and simulations (66).

One example is a game called "Food Power". A "cafeteria" was set up, using the cardboard food models of the National Dairy Council. Each student selected a breakfast on a tray and then, using the information on the back of the models, plotted the nutrient values in terms of per cent of Recommended Dietary Allowance (RDA) on a chart containing columns for each of the eight most common nutrients. The process was repeated for lunch and dinner, and the total values for the day were noted and compared with the required 100 per cent. Snacks could be included if desired (66). When all calculations were finished, scores were allowed for each nutrient.

If teams were formed, all members' scores were totalled to ascertain team winner. During the course of the game, the teacher circulated, commented, asked questions, and did some one-to-one teaching. A summary discussion after the game stressed the content to be learned (66).

A set of "nutrition dominoes" was made by a junior high school teacher (66). Instead of dots, the dominoes had names of foods, and in order to match one domino to the next, a player had to attach foods that were rich (i.e., had at least 10% of the RDA) in the same nutrient. A player who made an error missed his next turn, and the winner for that round was the player who first used all his dominoes. He scored one point for each domino still held by the other players (66).

Another project was an adaptation of a television program and was called "Will the Real Vitamin A Please Stand Up?" In addition to guessing which panel member was the real vitamin A, the players determined which nutrient the other panelists represented. Some members of the class served as advisers to the panelists when they needed help in answering players' questions since all questions had to be answered correctly. Others served as judges (66).

Simulations also add variety to classroom activity. A junior high school teacher sponsored a press conference held by the United Nutrients (66). Members of the press corps

queried the representatives of the various nutrients and wrote a "news story" for their own publication, stressing the information which would be of most interest to their readers.

In another simulation, a corporation called Body, Inc., was created and had three students represent the personnel board to hire employees to fit its various needs. Job applicants represented individual foods, and in the job interview they explained what they could do for Body, Inc., and offered to work for a salary commensurate with the caloric value of one serving of that food. The total budget for Body, Inc., was a day's allotment of calories for one person (66).

Along the line of civic affairs an "election" was conducted (66), in which candidates represented nutrients running for the Board of Health. In the campaign speeches, each candidate stressed what he could do to improve or maintain health. The rest of the students listened and cast their ballots for the most convincing speaker. A group of "election advisers", including the teacher, made sure that all candidates gave accurate information (66).

"Building blocks of food" (66) were made from reclosable boxes, covered with self-adhesive plastic and letters spelling out a nutrient, which can be used in a variety of ways. "Inside information" about each nutrient may be placed in the

boxes to serve as a reference in the classroom. The information may be typed on sheets of paper in four different colours, each representing different levels of difficulty and technicality, so that students of different ability levels can be referred to the appropriate information.

A guessing game was created by a teaching assistant (66). Players received scores according to the number of clues they required to guess a food or nutrient.

Nutrition education towards young people has been tried in the form of a monthly teenage nutrition newsletter (26). It was sent to 1,000 teenagers ranging in age from ten to sixteen. The first newsletter contained an introduction to the program as well as a nutrition quiz on basic nutrition. Sixty per cent returned this quiz, many with additional comments. The quiz revealed that the majority of these teenagers were unfamiliar with the importance and function of food nutrients. From this, it was decided to present, monthly, a more in-depth discussion of these nutrients in an attempt to stress their importance in the diet.

The problem was to present the nutrition information in an easily understood manner which would hold attention. Interest-holding devices such as cartoons, crossword puzzles, review quizzes, nutritious snack recipes were a logical solution (26) (Appendices j and k).

"Puzzle Poems" are presented (68) as yet another innovative technique for teaching nutrition (Appendix 1). Students could write similar rhymes, either individually or in small groups. The teacher can make the one illustrated in Appendix 1 a valuable learning experience by asking students to do the following:

a) Name other sources of protein besides meat.

b) Identify foods high in vitamin A, iron, calcium, etc.

c) Compare and contrast the nutritive values of foods in relation to the number of calories provided (68).

The "teaching power" of these poems is limited only by the instructor's imagination and her ability to ask meaningful follow-up questions. These poems can help students find pleasure in learning and, therefore, serve as a means of motivation (68).

Spitze (66) believes that teaching and learning the science of nutrition can be the most exciting subject in the curriculum if the techniques lead students to discover the important intellectual relationships, or principles, involved. The content is certainly relevant, by anyone's definition. Improved teaching of nutrition could make a significant contribution to improved health and even to solving some of our more serious social problems. Well-nourished, healthy people learn faster, get along better with their fellows, and are more employable. The possible benefits seem worth more than the effort required.

CONCLUSION

Nutrition educators, along with doctors, nurses, dentists and the food industry, have somehow failed to get the message of good nutrition across to the public. A strong attempt should be made to place the improvement of the public's eating habits and a better understanding of nutrition in a place of prime importance. A program which will motivate people to adopt good eating habits and to eradicate ignorance is urgently needed. Innovative programs on nutrition through the various media and other channels of reaching the public could be effective in educating all segments of the public in the essentials of nutrition. Nutrition education programs aimed at the school years children could contribute tremendously to the health and welfare of mankind. The development of continuing, effective programs of nutrition education requires the whole-hearted support of individuals from all disciplines interested and involved in nutrition and nutrition research.

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A P P E N D I C E S

(a - 1)

Appendix a

Table 1.

Birthweight versus length of service with or without Montreal Diet Dispensary Service 1963-1967

Length of service by trimester	Royal Victoria Hospital public clinic patients			
	With DD service		Without DD service *	
	Number	Bwt. gm.	Number	Bwt. gm.
1st trimester	177	3313	1121	3037
2nd trimester	530	3285	2108	3239
3rd trimester	301	3268	1216	3017
	1008	3284	4445	3127

* Patients delivered at RVH Hospital not receiving Montreal Diet Dispensary Service.

Statistics for the years available show that in the Diet Dispensary Study there is a relationship between birthweight and length of service. The birthweight of the infants whose mothers came for their first visit in the first trimester was greater than for those whose mothers started in the second trimester, and was the least for the infants whose mothers started during the third trimester. This birthweight to service correlation did not hold for the other public clinic patients in the same hospital who did not receive this service. In the latter group the birthweight for the infants was approximately the same whether the mother came for her first clinic visit in the first or third trimester.

Mean birthweight for infants of mothers who attended clinics without Montreal Diet Dispensary service 1963-1967 was 3127 grams, 167 grams or 6 oz. less than the mean birthweight of the mothers in the study. During the same period the mean birthweight for private patients at the hospital was 3276 grams, approximately the same as the mean birthweight of the infants in this study, erasing the traditional class difference between birthweight of public and private patients.

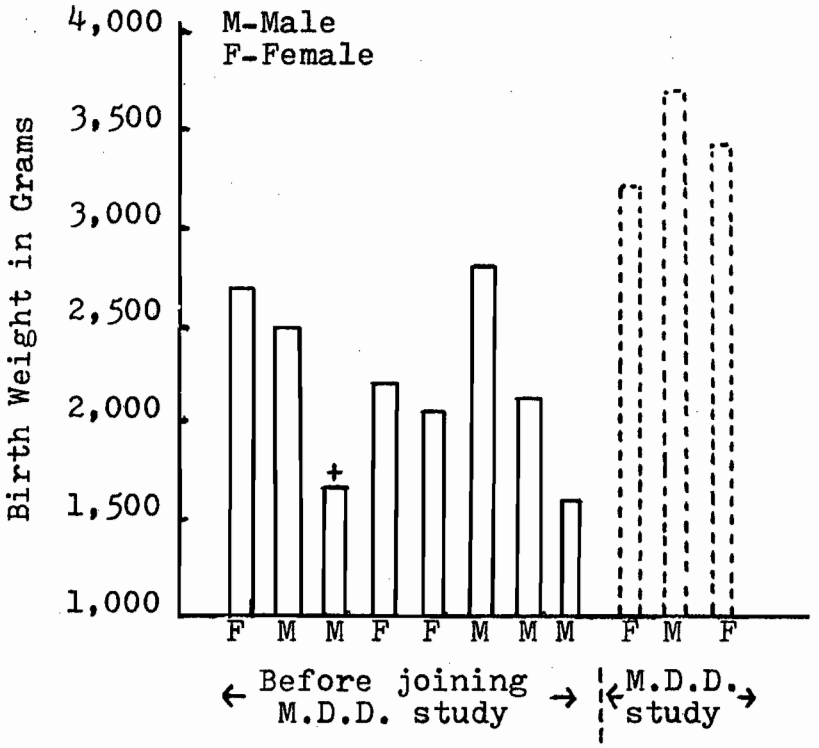
(continued)

Appendix a (continued)

Figure 1.

Case history of 29 year old mother before and after the diet supplementation program of the Montreal Diet Dispensary

BIRTH WEIGHT RECORD



MONTREAL DIET DISPENSARY 1972

Indicated is the birth weight record of 11 children of a 29-year-old mother who delivered at the Royal Victoria Hospital. The third child died at the age of one month. The mother received nutrition service from the Diet Dispensary only during the last three pregnancies. The birth weights of these children were greater than that of the others. A physical and mental assessment of all the children was done at the Montreal Children's Hospital and indicated that the last three children are normal whereas the others were found to be disadvantaged and there was considerable doubt as to their ability to succeed. The cost of the Diet Dispensary's service for each case - including the food supplementation - is $125.00 whereas the estimated cost to the state of maintaining a deficient child is more than a thousand times greater.

Higgins, A.C., Crampton, E.W., Moxley, J.E. 1972. Nutrition and the Outcome of Pregnancy. (Abstract) Address Given at the IV International Congress of Endocrinology Symposium - Protein Malnutrition and Endocrine System. June 23rd, 1972, Washington, D.C.

Appendix b

Foods apparently consumed by Canadians in 1966 per person per day

FOOD GROUP	DESCRIPTION	CONSUMPTION	CANADA'S FOOD GUIDE RECOMMENDATIONS
Milk		2.5 C	Children 2½ C
	Fluid whole	1.6 C	Adolescents 4 C
	Processed (reconstituted)	.9 C	Adult 1½ C
Fruit			
	Citrus-fresh equivalent	4.4 oz.	1 serving daily
	Other-fresh equivalent	6.2 oz.	1 serving daily
Vegetables			
	Potatoes-fresh equivalent	7.8 oz.	1 serving daily
	Other-fresh equivalent	5.1 oz.	2 servings daily
	Dried legumes and nuts	.5 oz.	
Cereals		6.6 oz.	Bread (with butter or margarine)
	Whole grain (rolled oats)	.2 oz.	One serving of whole grain cereal
	Breakfast cereals	.2 oz.	
	Flour	5.9 oz.	
	Other (corn, rice, barley, buckwheat)	.3 oz.	
Protein Foods			
	Meats-boneless weight	4.8 oz.	1 serving of meat, fish or poultry, liver occasionally. Eggs, cheese, dried beans or peas may be used in place of meat. In addition eggs and cheese at least 3 times a wk.
	Poultry and fish-boneless	1.8 oz.	
	Eggs-grade A large	.7 eggs	
	Cheese	.5 oz.	
Fats and Oils			
	Fat content	2.1 oz.	
Sugar and Sweets			
	Sugar content	4.9 oz.	

Sinclair, D., 1969. Canadian Food and Nutrition Statistics 1935 - 1965. Canad. Nutr. Notes. 25: 109 - 116.

Appendix c

Examples of Food Fads

a. Health Foods

This is probably the most popular food fad in North America today. These "health" foods are nutritious and useful but not unusually so. To describe a food as a "health" food is to imply some unusual health-giving property. No single food is essential to health. Good nutritional status requires the ingestion of proper amounts of many nutrients that are available from a mixed diet afforded by many food combinations - follow "Canada's Food Guide".

The "health" food followers believe strongly in the value of fruits, nuts and salads, but also rebel against modern methods of growing and processing foods. One theory promoted is that chemical fertilizers poison the land and the crops grown on it; therefore people are warned that the only way to avoid such evil is by "organic" farming - only humus and vegetables are used for fertilizer and pesticides and commercial fertilizers are not used. No scientific basis exists for this theory. Some soils have been depleted and produce poor yields of crops but most of our soils are capable of providing abundant food supplies. Without chemical fertilizers to supply the deficiencies in the soil, the nations of North America would be unable to produce so bountiful a supply of food that there are surpluses for the

(continued)

hunger-stricken nations of the world. Many nations desperately need more chemical fertilizers to make their lands more productive in order to support their populations. Without insecticides and pesticides a large proportion of fruit, vegetables and grains would be lost to the very great insect population in every country in the world. Food losses would lead to untold loss of life because of the great increase in food shortages. The dangers of pesticides, when improperly used, are recognized by health authorities who are concerned with the testing of new products and with the development of safe conditions and controls for use. The nutritive value of foods produced on different soils does not vary greatly, except in the case of iodine. In fact, the only disease in man which is known to be linked to a soil deficiency is simple goiter due to lack of iodine in certain areas (16). This deficiency can be corrected by using iodized salt.

Faddists also contend that white flour, refined cereals and canned food lose their nutritive value when milled, processed, kept in storage, exposed to daylight and cooked. Some recommend that raw sugar be used in place of refined sugar, lemon juice substituted for vinegar and sea salt used to replace common table salt. However, modern food processing methods have been devised to preserve or restore nutritional value to foods. For example, fruit and vegetables are canned and frozen at the peak of nutritional perfection and flour,

(continued)

bread, milk and margarine are fortified with minerals and vitamins. These additions to certain foods have been carefully calculated by scientific authorities so that the amounts added supply known dietary requirements. The success of this is demonstrated by the fact that once prevalent diseases such as rickets and pellagra are now rare in North America.

Some faddists deplore pasteurized milk claiming that the milk loses its nutritive value during the process. There is a slight loss of ascorbic acid but a person has no difficulty in receiving this from other foods. When the protection that pasteurization gives to milk from bacterial growth is considered, this process should be considered essential and indispensable.

Some food quacks maintain that cooking, as practised in the home, also destroys nutrients, especially minerals and vitamins. This is true, however, with a little care it can be minimized - preferable to the recommendation of use of special equipment which happens to be sold by the said food quacks.

Most large cities today have stores and restaurants specializing in "health foods". Packages of sunflower seeds, avocado honey, pumpkin seeds, rice polish, wheat germ etc. are available. In a restaurant, the menu might offer (34) for an appetizer - "mixed green" vegetable cocktail - a blend of

(continued)

parsley, celery and watercress juices. The main dish might be a salad of soybeans and to wash it down, a favourite drink is "Tiger's Milk". This is a mixture of whole milk, skimmed milk, brewer's yeast and fruit juices. The meal might be finished with the faddists' favourite dessert - yogurt seasoned with wheat germ and honey. Health foods themselves are not harmful but they are expensive.

b. Miracle Foods

Still another belief of some people is the existence of miracle foods. Some claim that blackstrap molasses, yeast and wheat germ are miracle foods which can correct various difficulties including insomnia, undesirable hair and skin colourings, digestion problems and ageing. Blackstrap molasses is also falsely thought to be a cure for anemia and rheumatism. Crude molasses does contain more vitamin B and iron along with impurities, than refined molasses but in the normal diet it is not eaten in sufficient quantities to add appreciably to the iron and B vitamins.

Yogurt is another food which is thought by some to contain special qualities not found in other foods. It is supposed to be blessed with life-prolonging powers, mainly because it is a staple in rural Bulgaria where, it is said, many peasants have lived to be more than one hundred years old. However, yogurt has the same food value as any sour milk of the same butterfat content. Unfortunately, many are willing

(continued)

to pay up to four times (16) the price of ordinary buttermilk for the same amount of yogurt.

Comparative Food Values (16)

	Buttermilk (1 cup)		Yogurt (1 cup)
Calories	110	Calories	120
Protein	9 g	Protein	8 g
Calcium	285 mg	Calcium	295 mg
Iron	0.1 mg	Iron	0.1 mg
Vitamin A	1721 I.U.	Vitamin A	1701 I.U.
Thiamine	0.10 mg	Thiamine	0.09 mg
Riboflavin	0.44 mg	Riboflavin	0.43 mg
Ascorbic Acid	.2 mg	Ascorbic Acid	.2 mg

"Royal Jelly", a special food substance prepared by worker bees for the queen bee, is another food which has received attention during the last few years. Manufacturers have obtained this jelly and sold it, claiming that it will restore beauty, youth and vitality. Science has investigated this and found it to be helpful for bees but not for people (16).

Below is a list of foods recommended for specific health purposes by faddists (56):

Black strap molasses	-	anemia, rheumatism
Raw potatoes	-	pinworms
Raw eggs	-	sexual potency
Garlic	-	high blood pressure
Alfalfa powder	-	diabetes
Fish, celery	-	brain foods
Beets	-	red blood
Gelatin	-	strong finger nails
Cod liver oil	-	arthritis
Honey and vinegar	-	arthritis
Grape juice diet	-	cancer

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c. Vegetarianism

One of the oldest and most widespread fashions in eating is the vegetarian diet which excludes meat and in some cases, all animal products including milk, butter, cheese and eggs. Long established in India as a part of Hindu belief, it has won many adherents elsewhere - among them British dramatist George Bernard Shaw. He gave up eating meat at the age of twenty-five and never resumed for the rest of his ninety-five years. Vegetarians often point to Shaw's long life as evidence that their custom is conducive to good health, strength and longevity. By foregoing meat, the vegetarian deprives himself of the main source of high quality protein but by careful selection of his vegetable foods he can get all the essential nutrients. The most elusive nutrient for the strict vegetarian is vitamin B12. This recently caused serious health problems among "vegans" - a British vegetarian sect. This deficiency had stunted the growth of the children and caused adults to suffer sore tongues, stiff backs and nervous disorders (34).

d. Weight Reduction Diets

In our overfed and underexercized society, food faddists capitalize on the desire of many to lose weight quickly and without any effort. Lacking the will-power to adhere to a carefully planned low-calorie diet, these overweight people listen to charlatans and buy their pills and devices.

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Following abnormal diets publicized in mass media can be unwise since the creator of the diet cannot possibly know the individual's weight problem, allergies, etc. These diets include the all-fruit diet, the grapefruit diet, the hard-cooked egg diet, the bananas and skim milk diet, the low-carbohydrate diet. This last one is sometimes known as the "Mayo Clinic" or "Air Force" (54) diet though it has been disclaimed by both these institutions. These reducing diets can often take off weight but they are rarely a lasting solution to obesity. The popular meal-in-a-can provides a nutritious, though lacking in roughage low-calorie diet, but it is so monotonous that it usually defeats its own purpose.

Reducing pills do not have much more lasting effect. The filler (34), a chemically inactive substance like methyl cellulose, which is not absorbed by the body gives a sensation of fullness and temporarily lessens hunger pangs.

A purpose similar to that of the filler is served by a depressant (34) - usually amphetamine - which interferes with the appetite controlling centre of the brain to reduce the desire to eat.

The stimulator (34) does melt fat - usually a thyroid extract which speeds up the body's reaction so that calories are consumed faster than usual.

The diuretic (34) stimulates the kidneys to drain water from the body tissues but this weight loss is only water and not fat.

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These drugs may be prescribed by a physician as a morale booster but many of them cause undesirable side effects such as insomnia and nervousness and they do nothing towards the development of sensible eating and exercise habits which are essential in maintaining desired weight.

e. Supplementary Nutritional Products

Peddlers of food supplements have seized on the idea that many people have sub-clinical nutritional deficiencies and they promise renewed vigour within days to those who use the vitamin supplement, iron tonic, sea salt, etc. The faddist with no clinical or laboratory experience is not able to make a specific diagnosis and nutritional supplements for those who do not need them are an economic waste. In addition, excess water-soluble vitamins are excreted in the urine and fat-soluble vitamins are stored in the body, which could develop signs of toxicity after several months (16).

f. Oriental Cults

Necessity deems that the majority of the world population subsists on a diet - vegetarian in type. This nutrient crisis has propagated a concern for increased technology creating the "green revolution". For others, concern about vegetarianism originates with the emergence of a counter culture (19). Diet is an integral part of the philosophies of this counter culture. Most of the beliefs are based on eastern religions.

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Zen Macrobiotics is a fundamental way of eating for Zen Buddhists, utilizing a balance between yin and yang (19). Yin is the passive, female element in Chinese philosophy; yang is the active, masculine element. Yin is believed to produce silence, calmness, cold and darkness; yang is constrictive, sound, action, heat and light. Yin foods are supposed to cause one to relax and open up while yang foods cause one to contract and be more active. Subscribers to the philosophy believe one's health and happiness depend on a proper balance between the two. No food should be eaten after 10:00 p.m. or before 6:00 a.m. During pregnancy, the macrobiotic woman can eat any food she desires, including meat. This is allowed because it is believed that her cravings are caused by the yang of the infant and efforts to make him more yin are not attempted until after birth.

"The Messiah's World Crusade" or "One World Family Commune" (19) has a more restrictive dietary pattern. The ultimate diet is consumed twice a day and is composed of 50% plate volume as raw grain (rolled oats) and 50% raw vegetables. An "acid fast" is observed one day a week to clear out one's system.

The Krishna group (19) consumes only "Prasadam" (spiritual food) which has been blessed in the temple. Their diet usually consists of a large variety of fruits, vegetables and milk.

(continued)

Those following the above types of diets contend that they drastically reduce weight, expand thought and depth of concentration and may even stimulate religious hallucinations. It has been suggested (49) that the use of health foods is but one manifestation of a feeling of unrest and dissatisfaction. The nutritional value of health foods is not really the big issue - it is a continuing search for peace of mind. It may also be a rejection of their parents' eating habits by anti-establishment adolescents.

Appendix d

Results of a nutrition education program for children and their parents.

Table 1

Percentage of Homemakers Naming the Four Basics* as Being Necessary for a Minimum Adequate Diet Before EFNEP Compared to Immediately After and Four Months Later

	PERCENT		
Basic Named	Before N=129	Immediately After N=129	4 Months Later N=240
Milk			
Yes	90	98	96
No	10	2	4
TOTALS	100	100	100
Meat			
Yes	87	95	94
No	13	5	6
TOTALS	100	100	100
Vegetables and Fruits			
Yes	97	100	99
No	3	0	1
TOTALS	100	100	100
Breads and Cereals			
Yes	57	84	88
No	43	16	12
TOTALS	100	100	100

* For purposes of calculating Chi Square all four groups were combined.

X^2 (before and immediately after) = 8.741 with 1 d.f.- Sig.at .01.

X^2 (immediately after and four months later) = 0 with 1 d.f.- N.S.

Table 2

Percentage of Homemakers Naming at Least One Food or Drink from each of the Four Major Food Groups as Being Necessary for a Minimum Adequate Diet Before the EFNEP Compared to Immediately After and Four Months Later

	PERCENT		
Named at Least One Food from Each of Four Major Food Groups as Necessary for Good Health	Before N=129	Immediately After N=129	4 Months Later N=240
Yes	47	83	82
No	53	17	18
TOTALS	100	100	100

X^2 (before and immediately after = 36.106 at 1 d.f. Sig. at .01

X^2 (immediately after and four months later) = .027 at 1 d.f.- N.S.

Gassie, E.W., and Jones, J.H. Jr. 1972. Sustained Behavioural Change. J. Nutr. Educ. 4: 19 - 22.

Appendix e

Objectives of a kindergarten cooking program

OBJECTIVE	EXAMPLE OF LEARNING EXPERIENCE
1. To develop an understanding of where basic food commodities of everyday life come from and the habit of inquiring about them	Recall, pictures, trip to farm, direct instruction.
2. To encourage children to try new foods	Eating cheese; it was observed to be rejected by many in the school cafeteria prior to this.
3. To encourage children to eat foods which their parents and teachers know to be good for them; to be realistic about individual preferences so that children learn to make selections from basic food groups	Children report repeating cooking cheese sandwiches at home.
4. To encourage parents to be part of the program so they will extend and reinforce attitudes and skills	Invite parent participation; ditto attractive recipe for the children to take home.
5. To develop understanding of cause and effect	Children observe that heat causes melting; cooling causes solidification.
6. To help children reap the rewards of planning.	Shop for ingredients the previous day with children.
7. To develop new vocabulary	LEARNING EXPERIENCE Cheese; protein food; basic food groups; etc.

(continued)

Appendix e (continued)

8. To develop mathematics concepts and problem-solving experience	Whole slice (of bread); halves; quarters; how many needed for one each; money counting during shopping.
9. To teach early reading skills e.g. matching, coding, sequencing	Pictorial recipe followed in proper sequence.

How cooking grilled cheese sandwiches achieves several objectives.

Cohn, J.M., Johnson, M.M., and Randolph, M.A., 1972. Cooking in the Kindergarten. J. Nutr. Educ. 4: 26 - 27.

Appendix f

A nutrition education program for fourth and fifth grade children

Table 1

Objectives

After a child has completed this unit, he should be more likely to consume a balanced* diet because he should be better able to (application and acceptance of a value**):

1. Formulate a concept of health involving optimum well-being (comprehension-translation).
This could be demonstrated by his ability to:
Define health in his own words in terms of optimum well-being (comprehension-translation).
Identify characteristics of health (knowledge).

2. Comprehend the dependence of health on food (comprehension-extrapolation).
This will involve his being able to:
Relate health and growth of the body to that of the cells (comprehension-extrapolation).
To do this, a child must be able to:
Formulate an elementary, workable definition of a cell in its relationship to the body (comprehension-translation).
Describe, in elementary terms, cell division and growth (comprehension-translation).
Recognize the basic dependence of the body cells on food (comprehension-extrapolation).
Outline the process of digestion, absorption, and transport of nutrients to the cells (knowledge).
Recall some of the functions of nutrients in the body (knowledge).
Recognize selected components in food (knowledge).
Relate caloric value of foods to certain characteristics of taste and feel (comprehension-interpretation).

3. Improve his own food habits if his intake of some nutrients is low (application and willingness to respond).
A typical child could improve his diet if he would:
Recognize that food is the major source of nutrients (knowledge).
Judge his own diet using the Basic Four Food Groups Guide (application).

(continued)

Appendix f (continued)

To do this, he must be able to:
Recall the number of servings from each group and subgroup recommended for intermediate children (knowledge).
Place foods in their respective groups and subgroups (knowledge).
Accept a wide variety of foods from all four groups (willingness to respond).
This may be facilitated if the child can:
Realize that food serves social and psychological functions (knowledge).
Recognize some factors which may affect food acceptance (knowledge).
Realize that food preferences can change (knowledge).
Be willing to taste new or disliked foods (willingness to receive).
Select snacks which contribute to overall nutrition (application and willingness to respond).
Eat a nutritious breakfast before school (application and willingness to respond).
A child will be more likely to do this if he can:
Recognize that a nutritious breakfast can consist of a variety of inexpensive and easy-to-prepare foods (knowledge).

4. Recognize that diet interacts with many factors to affect health (knowledge).
Within Objective 4, a child should be able to:
Realize that there exists a range of acceptable sizes and growth rates (knowledge).
Recognize the relationships between energy intake and expenditure (knowledge).

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* The diets were judged by sex within the classroom using the 1968 Recommended Dietary Allowances of the National Research Council.
** Words in parentheses are levels of competency and/or internalization from taxonomies of educational objectives (8, 41).

(continued)

Appendix f (continued)

Table 2

Generalization and Facts Corresponding to Objective 1
You are healthy when you are at your best in body, mind, and relations with others.
Health includes having good posture, bright eyes, sound teeth, shining hair, and clear skin.
Health includes keeping well and having strength and endurance suitable for a boy or girl of your age and size.
Health includes having an alert mind.
Health includes getting along well with others.

Table 3

Examples of Test Items
From Part 1 (one correct response)
7. Here are some definitions of cells written by fourth graders. Which one is correct?
Cells are little holes in the body that let out sweat.
✓ Cells are the smallest living parts of plants and animals.
Cells are tiny tubes that run throughout the body.
Cells are tiny blocks that make up the skin.
Cells are the molecules of which everything is made.
13. Think about how each of the following foods tastes and feels. If you had equal amounts of each of these foods, which would be lowest in energy value (calories)?
1. cooked corn
2. canned peaches
✓ 3. carrot sticks
4. applesauce
From Part 2 (one or more correct responses)
B. Which of the following do cells need to live and grow?
✓ 20. protein
✓ 21. carbohydrate
✓ 22. fat
✓ 23. vitamins
✓ 24. minerals

(continued)

Appendix f (continued)

Table 4

Most Effective Experiences According to Test Results

(Arranged in order of presentation)

Experiences	Concepts or Ideas
Cartoons and discussion of social health	Definition of health
Graphs of average growth of Monroe County boys and girls	Difference between average growth of boys and girls
Observation of cells through microscope	Definition of cells
Simulation of cell division and growth using clay	Cell growth
Simulation of digestion and study of anatomical model	Process of digestion
Decalcified bone (and perhaps milk ash)	Role of calcium and phosphorus in bone
Basic Four Food Groups bulletin board and discussion of protein sources	Sources of protein

(continued)

Appendix f (continued)

Results

Table 5

Mean Scores of Nutrition Test Periods 1 and 2			
	Period 1 Pretest	Period 2 Posttest	Change
Experimental	29.7[1]	36.3	+6.6**
Control	30.2[2]	30.9	+0.7

1. Average of means of six classes (127 children)
2. Average of means of six classes (140 children)
** Statistically significant at 0.01 level

Table 6

Mean Scores of Nutrition Test Periods 1 and 3			
	Period 1 Pretest	Period 3 5-6months after Period 2	Change
Experimental	29.1[1]	33.3	+4.2
Control	30.6[2]	32.9	+2.3

Note: Means for Period 1 vary slightly from those given in Table 5 because, if a child were absent during Period 2 or 3, his score for Period 1 would be omitted from the calculation of the respective table.

1. Average means of six classes (127 children)
2. Average means of six classes (134 children)

Baker, M.J., 1972. Influence of Nutrition Education on Fourth and Fifth Graders. J. Nutr. Educ. 4: 55 - 58.

Appendix g

Responses from groups of high school students from middle to lower socio-economic groups when asked about their interests, from a nutrition standpoint.

1. We hate proteins and vitamins - couldn't the teacher talk about bread and beef?
2. We hate to be told what to eat; give us the facts and let us decide to do it our way. We hate to be nagged.
3. The athletes wanted to know what they could eat to keep from becoming nauseated with afternoon exercise (they were eating three and four school lunches at a time).
4. The overweight people were interested in dieting and losing.
5. All were interested in their own health.
6. Most wanted to know what to do if they felt that their mother didn't cook balanced meals but felt they couldn't change her habits.
7. Several wanted to know if poor people eat well.
8. Many spent 15 to 35 cents per day before school on food (pop, candy, donuts, and coffee) and said that if the school had a breakfast program, they would eat at school; time was a large factor in skipping breakfast.
9. There were several questions concerning TV advertisements on foods and drugs.

MacReynolds, J.P., 1970. Can Teaching Good Nutrition Be Bad? J. Nutr. Educ. 2: 13 - 15.

Appendix h

A program to determine the Nutritional Literacy of High School Students.

Table 1

Percent by Sex of the Total Number of Students within each Grade and School Who Completed the Nutrition Knowledge and Interest Questionnaires

Grade and School	MALE N	MALE % Tested of Total in Class	FEMALE N	FEMALE % Tested of Total in Class	TOTAL N	TOTAL % Tested of Total in Class
9th, A	293	65.9	266	56.7	559	61.5
9th, B	408	37.0	331	48.0	739	41.9
Total 9th Grade	701	49.1	654	51.9	1298	50.3
10th, C*, D**	313	32.0	194	67.5	507	45.5
10th, E	185	21.1	327	33.6	512	29.1
Total 10th Grade	498	24.1	521	46.2	1019	37.2
12th, C, D	276	34.8	189	64.0	465	46.6
12th, E	116	31.8	301	16.6	417	20.8
Total 12th Grade	392	33.9	490	34.8	882	34.4
Total all Grades	1591	38.7	1608	44.9	3199	41.8

* Girls' School ** Boys' School

(continued)

Appendix h (continued)

Table 2

NUTRITION QUESTIONNAIRE

Please circle the number which is the correct answer for each question:

1. What is a Calorie?

   1. a unit which measures the heat energy of fuel value of foods to the body
   2. a fatty substance found in foods which causes weight gain
   3. a way of measuring body fatness by use of skinfold calipers

2. What is basal metabolism?

   1. the amount of energy used up by a person who is lying quietly at rest
   2. the amount of energy used up by a person who is walking slowly
   3. the basal number of Calories needed to feed an active man

3. About how many Calories do you think you need each day to maintain your present weight?

   0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 Calories _____(6)

4. If you stayed in bed all day, about how many Calories do you think you would need to keep your weight the same and just cover your energy needs?

   0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 Calories _____(7)

5. How many Calories do you think a pound of fat has in it?

   0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 Calories _____(8)

6. If you wanted to lose a pound a week, how many Calories would you have to subtract from what you usually ate each week?

   0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 Calories _____(9)

7. How many Calories would you use up in one-half hour by these activities?

   a. Sleeping: 1-100 101-200 201-300 301-400 401-500 Calories _____(10)

   b. Walking briskly: 1-100 101-200 201-300 301-400 401-500 Calories _____(11)

   c. Swimming: 1-100 101-200 201-300 301-400 401-500 Calories _____(12)

(continued)

8. What do we need energy for in the body?

   1. to supply needed vitamins and minerals to the body
   2. to supply water to the body
   3. to stay alive, for activity, and for growth _____(13)

9. Which three of these substances in foods gives Calories to the body?

   1. carbohydrate, protein, and fat
   2. fat, vitamins, and minerals
   3. carbohydrate, vitamins, and minerals _____(14)

A page from the 100-item questionnaire.

(continued)

Appendix h (continued)

Results

Table 3

Attitudes toward Nutrition Section of Health Education Course by Sex, Grade, and School

Grade and School	Males N	Males Percentage Finding Nutrition More interesting than other parts of health education	Males Same	Males Less interesting	Males ?	Females N	Females Percentage Finding Nutrition More interesting than other parts of health education	Females Same	Females Less interesting	Females ?
9th B	151	18%	55%	24%	3%	159	20%	50%	27%	3%
10th C*, D**	100	10%	23%	34%	32%	131	13%	55%	32%	0
10th E	110	12%	63%	24%	1%	39	23%	47%	18%	10%
12th C, D	96	6%	51%	33%	10%	121	16%	50%	34%	-
12th E	37	14%	54%	27%	5%	50	17%	54%	20%	-
Total	493	12%	50%	28%	10%	500	17%	52%	30%	1%

* Girls' School ** Boys' School

(continued)

Appendix h (continued)

Table 4

Mean Scores on Nutrition Knowledge Test by Sex, Grade, and School

Grade and School	Males $x \pm$ S.D.	Females $x \pm$ S.D.
9th B	53.3 ± 0.91; N = 151	55.5 ± 0.89; N = 159
9th A	52.8 ± 0.67; N = 193	53.9 ± 0.77; N = 151
10th C*, D**	55.7 ± 1.35; N = 100	64.4 ± 0.71; N = 131
10th E	45.8 ± 1.63; N = 39	53.7 ± 0.96; N = 110
12th C, D	55.8 ± 1.66; N = 96	65.4 ± 0.73; N = 121
12th E	51.6 ± 1.98; N = 37	52.9 ± 1.23; N = 50
Total all grades	53.4 ± 0.49; N = 616	58.0 ± 0.40; N = 722
Total both sexes, all grades	55.9 ± 0.317 N = 1338	

* Girls' School ** Boys' School

(continued)

Appendix h (continued)

Table 5

Analysis of Variance for Nutrition Knowledge Scores of 460 High School Girls and Boys Enrolled in Different Types of Programs

Source of Variation	Sum of Squares	d.f.	Mean Square	F	P
Between groups	10655.3	3	3551.7	35.0	.001
Within groups	54859.6	541	101.4		
Total	65514.9	544			

Results of Duncan's Multiple Range Test for the Differences Between Treatment Means for Boys and Girls Enrolled in Different Programs

Girls		Boys	
College Program	Commercial Program	College Program	Commercial Program
58.2	49.9	54.3	43.8

Any two means not underscored by the same line are significantly different.

(continued)

Appendix h (continued)

Table 6

Mean Percent of Male and Female Students Giving Correct Responses to Questions on Different Topics on the Nutrition Knowledge Test

Topic	Number of Items Related to Topic upon which Mean Percent was calculated	Males N = 616	Females N = 722	Total N = 1338
Energy Metabolism	5	66%	69%	69%
Sources, Functions and Requirements for Vitamins and Minerals	18	61%	68%	65%
Energy Output	12	59%*	58%	60%
Lipids and Carbohydrates	13	56%	61%	57%
Protein	11	55%	61%	57%
Energy Intake	16	48%	56%	52%
Vitamins and Minerals	11	47%	51%	49%
Weight Loss and Gain	14	41%*	40%	40%

* Males exceeded females in percent of correct responses.

Dwyer, J.T., Feldman, J.J., and Mayer, J., 1970. Nutritional Literacy of High School Students. J. Nutr. Educ. 2: 59 - 66.

Appendix i

Results of the nutrition education study - "Cartoon Approach to Nutrition Education".

Table 1

Test Score Means and Number of Students Grouped According to Type of Media Studied

GROUPS	Pre-test Mean*	Post-test Mean	Retention test Mean	Number of Subjects (N-105)
Group I (Packet)	68.57	81.90	80.47	21
Group II (Prog. Inst.)	67.62	80.76	80.19	21
Group III (Control)	60.48	74.28	71.61	21
Group IV (Packet)	69.52	81.33	76.66	21
Group V (Prog. Inst.)	77.14	87.33	81.80	21

* Groups were found to be homogeneous with regard to pre-test scores.

Table 2

Significant Differences Between Group Means for the Pre-, Post-, and Retention Tests

TEST	Group II and V Test Score Means (PI)	Group I and IV Test Score Means (Learning Packet)	Level of Signif.
Pre-Test	72.38	69.04	N.S.
Post-Test	84.05*	81.61	1%
Retention-Test	80.99	78.56	N.S.

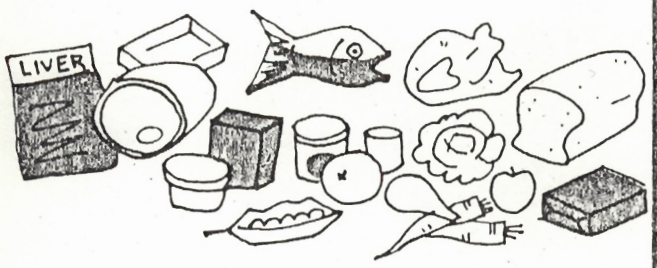
* Computed F values for programmed instruction groups were greater on post-test than other media tested.

Carruth, B.R., and Foree, S.B., 1971. Cartoon Approach to Nutrition Education. J. Nutr. Educ. 3: 57 - 59.

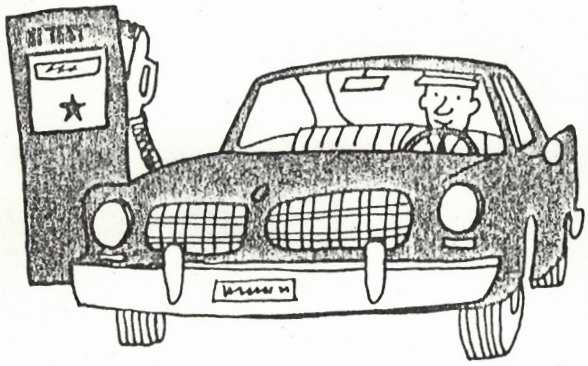
Appendix j

A newsletter to present nutrition information to teenagers in an easily understood manner.

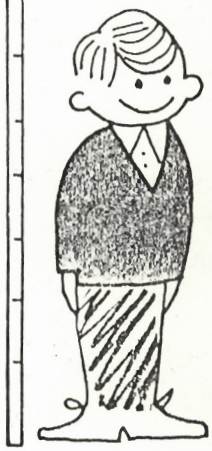
Gasoline can only give a car energy. The food you eat not only gives you energy, but it furnishes materials we need for mending parts of our bodies that are injured or worn out.



When we fill our car with gas it gives it the energy to make the auto go. When we fill our bodies with food, this gives us the energy to work and play.



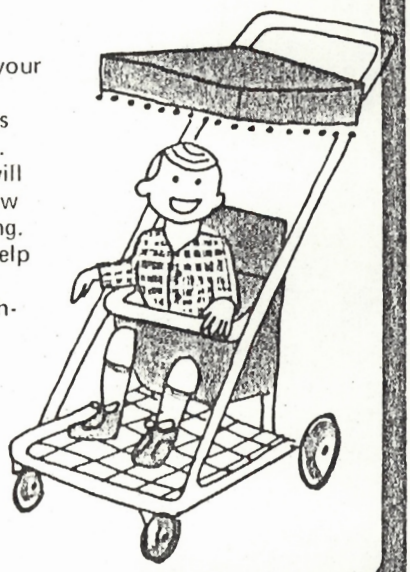
But food also has materials to make us grow. The body of every person is built from food. Are you taller and heavier now than a year ago? That "extra you" comes from the food you eat. Your body uses food to grow.

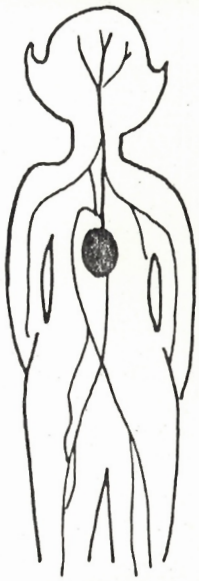


(continued)

Appendix j (continued)

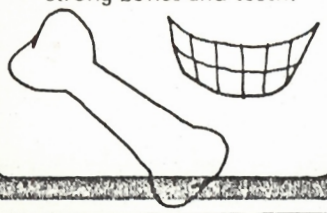
Food affects your muscles. A baby's muscles are very small. Some foods will help them grow firm and strong. Some foods help keep muscles strong throughout life.





Food affects your nerves. Some foods are needed to develop nerves and help to keep them steady. Also, food keeps your blood in good condition so that it must carry materials from your food and oxygen to all parts of your body.

Food affects bones and teeth, As a person grows, his body needs the kinds of foods that help build strong bones and teeth.

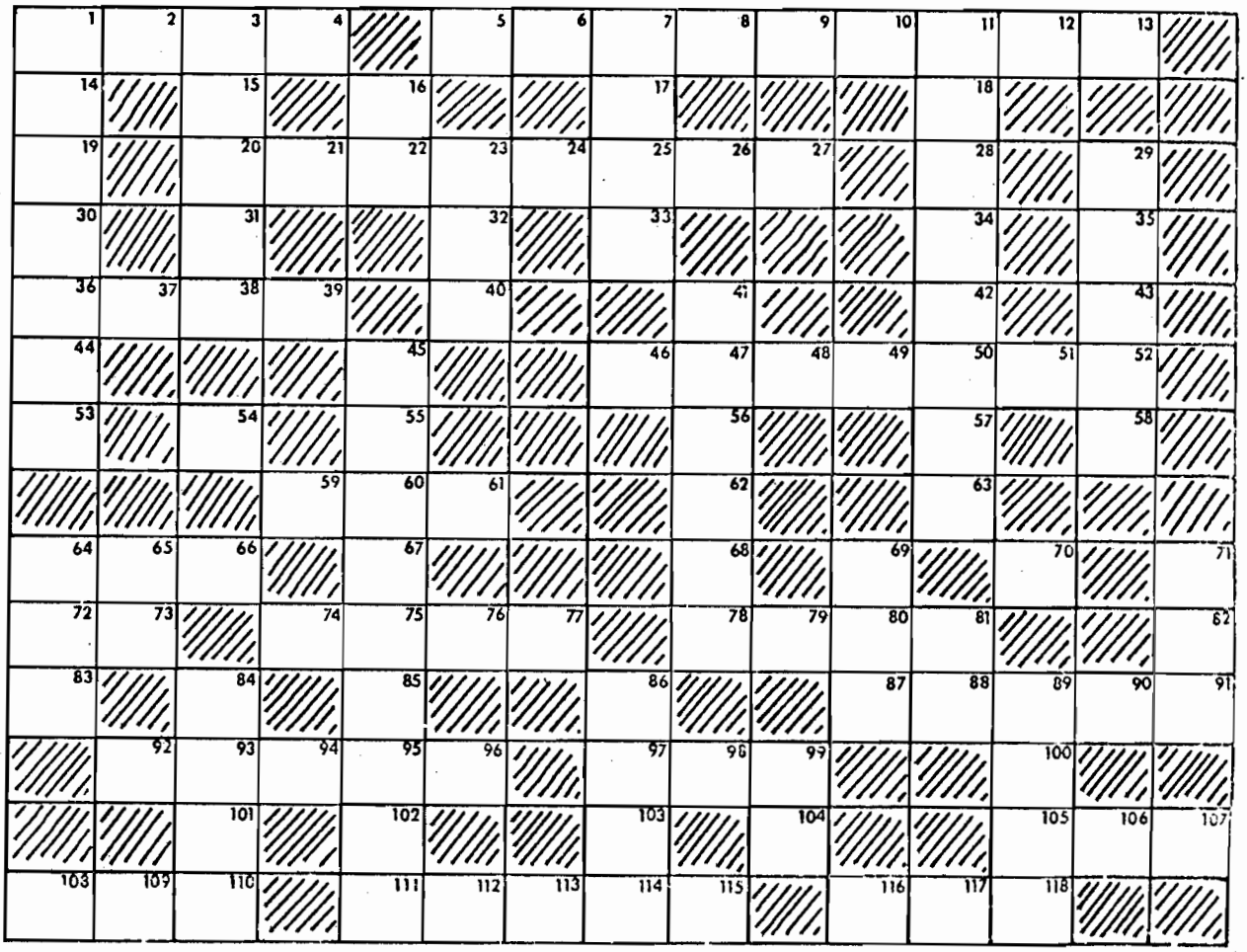


Food affects your skin and eyes. Some foods put a glow in your cheeks and help keep your skin healthy. Some foods are good for your eyes, too.

Graham, D.L., 1971. A Newsletter Teaches Nutrition to Young People. What's New in Home Economics. 35(6): 56 - 58.

Appendix k

A Nutrition Crossword Puzzle.



ACROSS

1. Foods from this group help bones.
5. General term for food and how the body uses it.
20. These nutrients are found mostly in vegetables.
36. An animal fat.
46. Major nutrient found in meat.
54. Vitamin helps gums and cuts.
59. The fruit-_____ group (abbreviation).
64. Measure for energy value (abbrev.).
70. Vitamin in deep green vegetables.
72. You and me.
74. Vitamin C affects the health of your _____.
78. Opposite of sweet.
87. Vitamin A helps us see at _____.
92. The _____-Cereal group.
97. An inexpensive food containing high quality protein belongs to the meat group.
105. Your Mother.
108. Eating _____ fruits and vegetables saves nutrients lost in cooking.
111. Meals are usually eaten at the _____.
116. Opposite of No.

DOWN

1. Protein helps build _____.
3. An organ meat _____.
7. A vacation.
11. A favorite treat from the milk group.
16. V_amins.
23. Teen-
29. Dry _____ are in the meat group.
41. These belong with the vegetables in a group.
45. First meal of the day.
64. Broken place in our skin.
65. Yellow vegetable - S Q U _ _ H.
69. We receive our light from the _____.
71. Eating sweet snacks and between meals may cause one to become _____.
84. To increase in size.
86. A tiny unit of the body.
89. Vitamin C affects the condition of the _____ in our mouth.
99. Foods give us "_____" power.

Crossword Puzzle Answer

Across
1. Milk
5. Nutrition
20. Vitamins
36. Lard
46. Protein
54. C
59. Veg. (Vegetable)
64. Cal. (Calorie)
70. A
72. Us
74. Skin
78. Sour
87. Night
92. Bread
97. Egg
105. Mom
108. Raw
111. Table
116. Yes

Down
1. Muscles
3. Liver
7. Trip
11. Ice Cream
16. It
23. Age
29. Beans
41. Fruits
45. Breakfast
64. Cut
65. As
69. Sun
71. Fat
84. Grow
86. Cell
89. Gums
99. Go

Graham, D.L., 1971. A Newsletter Teaches Nutrition to Young People. What's New in Home Economics. 35(6): 56 - 58.

Appendix 1

Puzzle Poem

Complete the following poem by filling in the blanks in every line. Choose a word that rhymes with the last word of the previous line.

Nutrition Notes

Fill in the blank at the end of each_____.
In order to make a sensible_____.
This poem gives advice we all should_____.
Because it's about nutrients our bodies_____.
What you do and where you've_____.
May reflect what you eat and the shape you're_____.
It has been said, "You are what you_____.
That includes the food groups, one of which is_____.
Meat varies greatly from fat to_____.
And provides our bodies with essential_____.
Citrus fruits are rich in vitamin_____.
But it's the sunshine that gives us_____.
If night blindness bothers your_____.
Carrots might be one of your best_____.
Most people enjoy ice cream_____.
Which provide calcium for healthy_____.
In order to clot, your blood needs vitamin_____.
But for pretty skin you need plenty of_____.
Iron is used to make thick, rich_____.
Which may keep you from becoming a _____.
In all, the complex vitamins number_____.
They're often grouped together and labeled_____.
There are nutrients your body can't_____.
But you get them daily through the Basic_____.
A calorie measures the amount of_____.
Provided by the food you_____.
Too many calories and you may get_____.
And nobody likes to look like_____.
Unless you want to be an awful_____.
It's very important to be eating_____.
In order to stay on the right_____.
You'll have to choose wisely every_____.
Every gal wants to look her_____.
So she gets good food, exercise, and_____.
Count your calories by the friends they_____.
And there will be no need to_____.

(continued)

Appendix 1 (continued)

Nutrition Notes

line - rhyme	blood - dud
heed - need	three - B
been - in	store - 4
eat - meat	heat - eat
lean - protein	fat - that
C - D	sight - right
eyes - buys	track - snack
cones - bones	best - rest
K - A	keep - weep

Teaching Ideas and Materials. 1972. Puzzle Poems. What's New in Home Economics. 36(6): 28 and 126.