THE DEVELOPMENT AND EVALUATION OF A NUTRITION EDUCATION PROGRAM FOR THE THIRD AND FOURTH GRADES

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by

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ABSTRACT

A nutrition education program for the third and fourth grade levels was developed within a sound educational structure, namely a systematic approach involving the five dimensions of motivation, concepts and generalizations, behavioral objectives, learning experiences and evaluation.

To test the effectiveness of the nutrition education program, 117 children in two Vancouver schools participated in an experimental program. Fifty eight of these children were treated as two control groups, one group from each school. The other 59 children were treated as two experimental groups, one group in each school. Both the control and the experimental groups were pre- and post-tested using tests designed to evaluate the competency level of learning (Krathwohl et al., 1964; Bloom, 1965). The control groups did not receive any nutrition education. The experimental groups actively participated in nutrition education learning experiences for forty minutes, twice each week for six weeks. Evaluation proceeded during the week immediately before and immediately after the nutrition education program.

The nutrition education program was found to improve significantly nutrition knowledge and comprehension for both grades. Although results of a parent questionnaire indicated that there had been significant improvement in nutrition attitudes at home, there was no general tendency toward improvement of dietary patterns reflected in the remaining tests.

i

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TABLE OF CONTENTS

ABSTRACT		i
ACKNOWLEDGEMENTS		ii
LIST OF	F TABLES	
LIST OF	FIGURES	vii
Chapter		
I	INTRODUCTION	1
II	REVIEW OF LITERATURE	4
	Early Foundations of Nutrition Education	4
	Development of Teaching Techniques	10
	Nutrition Education Programs	12
	Nutrition Education Since 1950	15
III	METHODS	24
	OBJECTIVE ONE	24
	Motivation	25
	Concept and Generalizations	26
	Behavioral Objectives	26
	Evaluation: Pre- and Post-Testing	30
	Instruction - Course Content	30
	Learning Experiences	35
	OBJECTIVE TWO	40
	Statistical Techniques	43

.

.

Chapte	er	Page
IV	RESULTS AND DISCUSSION	45
	Discussion of Individual Tests	48
	1. Knowledge Test	48
	 Application of Knowledge Tests A. Menu Planning Test B. Analysis of Diet Test 	49 49 52
	 Willingness to Respond Tests A. Vegetable Attitude Test B. Parent Questionnaire C. Free Food Meal Choice Test D. 24-Hour Dietary Recall 	54 54 56 61
	General Discussion	63
v	SUMMARY AND RECOMMENDATIONS	72
	Summary	72
	Recommendations	73
REFER	ENCES CITED	
Pri	mary Sources	75
Sec	ondary Sources	. 82
APPEN	DIXES	
A.	Lewin's Food Attitude Test (1943)	84
В.	Preliminary Tests	87
с.	Pre- and Post-Tests, Teachers Instructions and Scoring Systems	104
D.	Lesson Plans	132
Е.	Student Raw Scores	147
V REFER Pri Sec APPEN A. B. C. D. E.	A. Vegetable Attitude Test B. Parent Questionnaire C. Free Food Meal Choice Test D. 24-Hour Dietary Recall General Discussion SUMMARY AND RECOMMENDATIONS Summary Recommendations ENCES CITED mary Sources condary Sources DIXES Lewin's Food Attitude Test (1943) Preliminary Tests Pre- and Post-Tests, Teachers Instructions and Scoring Systems Lesson Plans Student Raw Scores	54 56 61 63 72 72 73 75 82 84 84 87 10 13 14

•

LIST OF TABLES

ł

Table		Page
1.	Behavioral Objectives Designed to Reflect Internalization of Generalization I	27
2.	Behavioral Objectives Designed to Reflect Internalization of Generalization II	28
3.	Behavioral Objectives Designed to Reflect Internalization of Generalization III	29
4.	Facts Related to the Behavioral Objectives of Generalization I	. 31
5.	Facts Related to the Behavioral Objectives of Generalization II	32
6.	Facts Related to the Behavioral Objectives of Generalization III	34
7.	Learning Experiences Related to the Behavioral Objectives of Generalization I	36
8.	Learning Experiences Related to the Behavioral Objectives of Generalization II	, 37
9.	Learning Experiences Related to the Behavioral Objectives of Generalization III	39
10.	Description of the Four Classes Involved in the Nutrition Education Program	42
11.	Names and Descriptions of the Pre- and Post-Tests	46
12.	Groups Compared to Determine the Effectiveness of the Nutrition Education Program	47
13.	Knowledge Test	48
14.	Menu-Planning Test	50
15.	Analysis of Diet Test	53

LIST OF TABLES (continued)

Table		Page
16.	Vegetable Attitude Test	55
17.	Parent Questionnaire: Attitude of Student at Home	56
18.	Free Food Meal Choice Test	58
19.	24-Hour Dietary Recall	62
20.	Percent Change Observed from Pre-Test to Post-Test	66

LIST OF FIGURES

.

Figure	gure	
1.	Popham's Instructional Model	24
2.	An Expansion of Popham's Instructional Model	25
3.	Behaviors in the Cognitive Domain	64
4.	Behaviors in the Affective Domain	65

CHAPTER I

INTRODUCTION

The call for nutrition education began at the turn of the twentieth century when poverty and ignorance combined to create a problem of malnutrition in many parts of Europe and North America (Rosen, 1958). Today malnutrition is a more complex problem encompassing over-nourishment as well as lack of nourishment. Poverty, ignorance, change in food choices and lack of exercise could be given as reasons for present malnutrition.

Increased concern about the nutrition of the population has given rise to renewed demands for nutrition education. This is witnessed by many recent developments at the national, provincial and local levels. Concerned nutritionists have formed the professional organization, the Society for Nutrition Education and the associated Journal of Nutrition Education. The National Department of Health and Welfare in Canada, has been recently organized to make provision for a Nutrition Programs Division to develop and coordinate nutrition education programs. Dr. J. A. Campbell (1972) recently stated that results of the Nutrition Canada Survey will demonstrate a need for more knowledgeable consumers. The B. C. Nutrition Coordinating Committee has approached the Provincial Government, requesting that nutrition education be instigated in schools. Teachers are asking for assistance in designing nutrition programs for their students.

Although there is an expanded interest in nutrition education, as Dr. Campbell (1972) has pointed out, "a brief review of nutrition information and nutrition education has indicated many deficiencies There is little information available on nutrition education techniques and no experience with the ones available elsewhere". As will be shown in the review of literature, most reports have been outlines of nutrition education techniques and programs, but few have given evidence to support the effectiveness of these approaches.

Those studies that have been concerned with program effectiveness have not been complete in their measurement techniques. As discussed in the review of literature, Lovett (1970) tested the effectiveness of the California Dairy Council program at the knowledge, application and acceptance levels described by Bloom (1965). Baker (1972) also tested the effectiveness of her program at the knowledge, application and acceptance levels. Both authors ignored the possibility that the test they used for acceptance (dietary recall or record) reflects verbal skills and the traditions and attitudes of the family perhaps more than the child's acceptance of the importance of a well-balanced diet. The diet of the primary and elementary school aged child is primarily controlled by the mother (Dairy Council of California, 1973) and her choices are reflected in the dietary recall.

The purpose of the following research project was twofold. The first objective was to develop an interesting nutrition education program relevant for a particular elementary grade level. The program was to be developed within a sound educational structure, namely a systematic approach involving the five dimensions of motivation,

concepts and generalizations, behavioral objectives, learning experiences and evaluation.

The second objective of the research project, but an integral part of the nutrition education program, was to develop a network of tests to determine the effectiveness of the program. This evaluation was designed to show the level(s) at which learning had occurred: an improvement in nutrition knowledge, a change in attitude towards certain foods, a change in dietary behavior.

CHAPTER II

REVIEW OF LITERATURE

Early Foundations of Nutrition Education

Nutrition education had its beginning at the turn of the twentieth century. The economic and social world at this time was in a period of advancing industrialization, accompanied by an expansion of urban communities. In the United States, a flood of immigration had caused a severe congestion of living areas resulting in an acute public health problem. The wealth derived from industrialization was in the hands of a few financial leaders with a large part of the national income devoted to capital expenditure rather than to social reform. Poverty and malnutrition became widespread (Rosen, 1958).

During the last part of the nineteenth century a marked decline in the death rate in North America and Europe had been accomplished through public health programs which included improved sanitation and pasteurization of milk. Some of those engaged in health and social work were not satisfied that maternal and child welfare had been improved to a desirable level and there were obvious ways of improvement. For example, knowledge of nutrition was not common; food habits were based on tradition (Rosen, 1958).

Dissatisfaction with the general welfare of the population started a broad movement concerned with the problems of social welfare. Socially minded citizens, physicians, clergymen, social workers,

educators and government officials found common ground for action in the prevention of tuberculosis, reduction of health hazards in factories, reduction of infant mortality, improvement of the health of school children, and similar concerns (Rosen, 1958).

Increasing awareness of the conditions of all phases of child life was a prominent characteristic of the movement for social amelioration. This movement was directed toward general hygiene for disease prevention, dietary improvement and antipartum care (Rosen, 1958).

The reasons for the above movement are clear. Soon after 1870, a decrease in the number of births was apparent in many countries. Then it became evident that many young men examined for military service were found to be physically unfit. Findings of this sort aroused concern in England at the time of the Boer War and in the United States at the time of World War I. Clearly, here was a national resource that was being wasted.

Whatever its motivation, a community that placed a high value on child life could not overlook the problem of improving the health of the school child. School medical inspection in the United States began sporadically in the 1870's, but not until 1894 was organized medical inspection of schools finally established. This was a crude method of screening out the worst cases of infectious diseases. It was soon realized that a more concerted effort was needed to educate the parent and child about health care and nutrition.

Dr. W.R.P. Emerson has been credited with conducting the first nutrition class in the United States in 1908 (Roberts, 1944). As a physician at the Boston Dispensary, he became aware of the great need his under-privileged patients had for increased knowledge of nutrition. He encouraged the children associated with the dispensary to come in groups for weekly instruction in food selection and in general good health habits. The program was developed specifically to improve their growth profile through competition in weight gain. The children did make remarkable gains in their health status. Whitehead (1957a) claims that the program's success, which created much interest, may be regarded as a "provocative force" which caused educators to examine health education programs in terms of nutrition education for children.

Emerson's clinic approach toward nutrition education served as a basis for early work in the schools (Martin, 1954). Students of participating schools would visit a local health unit where discussions about nutrition were led by the physician. Again, the main technique was to encourage competition in weight gain but since the classes were larger, representing a wider range of health status than those of Emerson's, this technique met with more limited success. The work of Hunt et al. (1921) in nutrition education in a New York Public school in 1918 resulted in the conclusions that children should not compete with each other in weight gains, that cooperation at home was essential, that nutrition education needed to be in a regular classroom and that a nutrition worker rather than a physician should lead the class discussions. When these recommendations were put into effect the following year, the author felt that there was a place for nutrition education for all children, regardless of physical status, in the school. Hunt also recommended that the emphasis in nutrition education be broadened from the importance of calorie intake to the importance of balanced diets and

adequate vitamin intake.

Hunt's last recommendation reflects the advances in nutrition knowledge that had occurred since Emerson's first attempt at nutrition education in 1908. Justus von Liebig (1803 - 1873) classified the nourishment of animals and men into three fundamental categories: protein, carbohydrate and fat. Until as late as 1912, attention concentrated on the fuel values of foods and lacking knowledge of the roles of vitamins and minerals in nutrition, early workers often condemned foods that are today considered nutritious. Green vegetables, tomatoes and oranges were considered to be attractive additions to a meal but not sources of nutrients.

Finally in 1912, Hopkins demonstrated in a series of convincing experiments that an animal diet must contain minute amounts of certain essential substances other than protein, fat and carbohydrate if the organism was to remain in good health. The discovery of several individual vitamins occurred shortly thereafter. Thus the nutrition educators were to change their stress from adequate calorie intake to choice of well-balanced diets (Rosen, 1958). Correspondingly, the measure of nutrition education success was to change from weight gain to improved dietary habits. The latter change was to occur slowly since it is more difficult to measure change in habits than to measure change in weight.

Through the dedicated work of Mary Harper, Dr. Lydia Roberts and Mary Rose, the recognition of the place of nutrition education in schools became a reality and Hunt's recommendations were implemented throughout the United States. Working together and independently, from the 1920's onward, these pioneers sought the improvement of the

nutritional status of all children through education. They felt that the school was the place for nutrition education and based their feelings on the rationale that almost every child can be reached in schools, not just those in need of medical care. They developed nutrition curricula using the classroom teacher as the instructor, since the teacher, not the nutritionist is skilled in pedagogy and since the teacher has greater knowledge of her students. The spectacular weight gains of children in these nutrition classes indicated to these nutritionists the success of, and the need for, such an approach (Roberts, 1944; Martin, 1954; Whitehead, 1957a).

There were other developments which also focused on the school as an important place for learning about nutrition. In the 1920's the U. S. Office of Education, in cooperation with the Child Health Organization, sponsored a nation-wide campaign to promote, through school lunch programs and health education visual aids, the improved weight gain of children (Brown, 1929; Roberts, 1944). Brown concluded from her studies conducted in North Dakota that instruction designed to improve food habits is most effective when given during the child's early years. Thus, it is important to teach the child about nutrition at this time. Eichelberger's (1927) data showed that nutrition instruction resulted in a marked reduction of the number of underweight children among those who were exposed to nutrition instruction for one year. After a three year program of instruction there were even fewer underweight children. The school provides an ideal situation for such continuous education.

At virtually the same time that those in the medical field

were developing their approaches to nutrition education, those in the teaching profession were evolving quite a different concept. The former advocated the creation of another subject, a separate curriculum for nutrition with special equipment and advisory personnel, with accelerated weight gain as a criterion of success. In contrast, accounts written by educators indicated that there were opportunities for nutrition education within current school programs. Educators were advocating the correlation of all subjects, including nutrition, into an integrated program. The criterion of success was not to be weight gain because this singled out the underweight child as being different. Success would be identified in terms of increased interest in food and willingness to eat a balanced diet, but specific tools of measurement were not identified. Leggett (1914) reported the introduction of Home Economics in an ungraded school where the students preparation of hot food for their lunches was correlated with the study of food principles during arithmetic, spelling and science. Langworthy (1913) offered insight as to how school lunch programs should act as a laboratory for the study of nutrition, food costs and the relation of nutrition to working efficiency.

Both the correlated subject matter approach of the physicians and nutritionists during the first three decades of this century formed the foundations of the modern concepts of nutrition education. Modifications of these two approaches have been gradually inter-woven. The result are today's nutrition education programs based on the needs, interests and age levels of all children, integrated into all aspects of school life. Accelerated weight gain has become a minor parameter in determining success of nutrition education. Far more important

than weight gain are improved attitudes toward food and improved nutritional habits.

Development of Teaching Techniques

Both of the above basic approaches were designed to give out nutrition information, in keeping with the educational theory of the times that drill and repetition were the most useful devices for instruction (Beck, 1965). It is now established that mere dissemination of information to students does not necessarily lead to improved dietary patterns, even though results of tests may indicate improved nutrition knowledge. Evidence from studies support this conclusion (Botto, 1932; Segner, 1932; Beeuwkes, 1959; Poolton, 1972). Results of a study by Botto (1932) showed that high school home economics students had similar dietary patterns to non-home economics pupils. Segner (1932) demonstrated that pupils who showed improvement on nutrition knowledge tests failed to show improvement in selection of foods. This same conclusion has been voiced more recently by Beeuwkes (1959) and Poolton (1972).

Since the prime objective of any nutrition education program should be to improve food habits, such a program can only be determined effective when that objective is reached. Thus the first modification of both initial approaches was to develop teaching methods and tools designed to improve dietary habits rather than to promote only improved nutrition knowledge.

One of the first studies to demonstrate the effectiveness of designing teaching methods to promote a change in food habits as recorded in dietary recalls was conducted by Hatcher (1940). She demonstrated that when students were encouraged to evaluate their own

diets, decide on necessary changes and check their own progress, there were far better improvements than when teachers used the traditional lecture method.

A series of studies by Lewin (1943) also showed that student decision, rather than teacher admonition, changed food habits more effectively. Lewin's studies made use of the food attitudes, habits, likes and dislikes questionnaire shown in Appendix A.

There are many accounts in the literature of the forties describing interesting teaching techniques designed to influence dietary patterns. Unfortunately, most of these reports fail to include measurements of success. Whittinghill (1943) describes a course of study for the first grade where different health principles (which included a nutrition topic) were emphasized each month in all aspects of school life. Martin and Reynolds (1943) reported how first graders prepared vegetable soup and how this was incorporated into the rest of the curriculum. McLeod (1943), when working with food choices of children in grades one through three, showed that foods were readily accepted when the initial experience was pleasant and when parents reinforced this pleasant experience at home.

The above work of Hatcher, Lewin and McLeod and that of others (Thomas, 1943; Benson, 1944; Elliott et al., 1944; Cline, 1947; Tinsley, 1947; Radke and Caso, 1948; Moore, 1951) during the forties demonstrated that a nutrition education experience could change student food habits at all grade levels, if the experience involved student evaluation of his own diet and student discovery about the changes that were needed. Most of the authors observed that students were keenly

motivated to change their dietary patterns when they were learning in a real life situation, not just analyzing their own diets, but actually preparing meals. This observation parallelled the functionalist theory of education which proposed that if the needs or motives of the student could be tapped and used in teaching, learning would take place (Beck, 1965).

The work of Sperry (1944) in Washington demonstrated the need for the next step which was to follow in the history of nutrition education. Following the educator's approach, he integrated nutrition with other subjects at the grade three level. However, there was no evidence that integration of nutrition into the curriculum assured improvement in food habits. Sperry observed that few teachers receive training in nutrition. Therefore they see few possibilities for teaching nutrition except in a very traditional manner and so the valuable real life activities were not being used. He concluded that there was need for nutritionists to act as resource personnel with visual aids and background information to help teachers build appropriate nutrition programs for their classes. The merging of the two initial approaches would thus be complete. Nutrition programs taught by classroom teachers would be integrated into the existing school curriculum and would not be a separate subject. However, the nutritionists would be available to act as resource personnel, for basic nutrition information, ideas for teaching methods and sources of visual aids.

Nutrition Education Programs

The results of several studies have given direction to the nutritionists' new role of consultant. Bosley (1947) emphasized that the nutritionist should help the teacher survey the existing dietary

habits to establish what kind of information is lacking. The nutritionist should give the classroom teacher a training in nutrition and develop or use a twelve year graded plan of nutrition education into which each teacher may fit. The guide should encompass the following fundamental principles:

- (a) children learn by doing.
- (b) learning takes place through a repetition of experiences and requires time.
- (c) learning takes place most readily when information is adapted to the interest level and ability of the learner.
- (d) learning is a cumulative process and elementary experiences provide the foundations for a true understanding of more complicated facts.
- (e) tools appropriate to the subject being taught are essential to real learning.

The work of Neel (1946) was designed to discover if elementary school children could assimilate technical nutritional subject matter. From this work it was concluded that elementary grade children could acquire rather advanced information about nutrition and that they evidenced some ability to apply the information to their own eating habits. Seven to nine year old children were capable of learning to distinguish between fruits and vegetables, and how to cook them. Children in this age group were able to learn from rat demonstrations, the importance of a balanced diet. They were also able to learn from experience which foods contain fat, sugar, starch and protein. Ten to eleven year olds were interested in scientific facts and readily learn about digestion, testing foods for protein, carbohydrate and fat content, how much food they need each day and how to plan and prepare a well balanced meal.

One of the first major programs where a nutritionist provided background training and visual aids to teachers, and where Bosley's basic recommendations were followed, was developed by Whitehead (1947, 1952) in the public schools in Ascension Parish, Louisianna. During the period 1944 - 1948, the teachers and the nutritionist made annual appraisals of student food habits. Seven day dietary records were kept by the pupils. Two analyses were applied to the data. In one, the food habits were rated according to the number of points achieved. Each day's record was scored by giving one point for each serving of eggs, whole grain cereals, meat, raw vegetables, cooked vegetables, fruit, milk, butter and/or margarine. The other analysis was made to determine the frequency of intake of the above protective food groups. The teachers then developed teaching units based on the specific needs of the students to coincide with their interests and age levels. Teachers and pupils studied their nutritional problems in informal classroom discussions. They also sat together in the lunchroom. Students participated in many nutrition related activities and teachers often discussed breakfast and supper menus with parents. The program was very effective, inasmuch as it caused a significant improvement in food habits of school age children as judged by changes in the above annual appraisals. The program was also effective in that it continued to operate at the conclusion of the official study in 1948. A further survey in 1951 demonstrated that teachers and the community were able to continue successfully without the resources of the investigator.

Similar results were reported with adolescents in Kansas City, Missouri (Whitehead, 1960) and with residents of Cape Sable Island (Archibald, 1953).

Nutrition Education Since 1950

In the 1920's Roberts recognized the value of nutrition education programs in schools because all children could be reached and teachers could give the nutrition instruction. In 1954, Martin was still trying to persuade educators of the importance of nutrition in schools. He wrote, "... nutrition education of children belongs to the school because the school is responsible for fitting the child for society and helping him be responsible for himself and his health; the child has a right to know what to eat and why and how it affects his health" (Martin, 1954, p. 347). Nutrition education for children had been alive for half a century and yet generally the concept was not applied in schools.

Since 1950 various factors have added impetus to the drive for nutrition education programs in schools. Nutrition Education Conferences have been held every five years since 1957 and have served to unite the efforts of nutrition educators (Proceedings, 1957, 1962, 1967, 1972). The growing evidence that nutrition plays a vital role in the development of the brain and the ability to learn has caused educators to look with increased interest at nutrition education programs (Leverton, 1969; Selph, 1972). The Ten State Nutrition Survey conducted in the United States in 1968 - 1969 (Schaefer, 1969), showed that undernutrition is a problem in the United States, thus reinforcing this interest in nutrition education. Also, the subsequent White House Conference (1970) on Food, Nutrition and Health which recommended the immediate organization of graded nutrition education curriculum in the schools, has strengthened the demand for nutrition education in the schools.

Perhaps more important than conferences and surveys, is the growing recognition by the public that there are many forces, besides family eating habits, which are constantly influencing the food choices of children. At the 1962 Nutrition Education Conference, Margaret Lantis, an anthropologist, discussed some of the cultural factors which influence children's food habits, emphasizing the role that self service (vending machines, cafeterias and candy counters) has played in establishing a snacking population. She concedes that nutrition educators have a slim possibility of promoting control of soft drink, baking, confectionary and advertising industries. She concludes that the child and the family must be educated to become wise consumers (Lantis, 1962).

Advertisements in the media are designed to exert an influence on children's food choices. Gussow (1972) reports that children are bombarded with counter-nutritional messages during children's programs on television. For the week monitored, out of 388 network commercials run during 29 hours of children's television, 82 percent were for indigestible items. Analysis of these food commercials showed the following distribution:

Breakfast cereals	38½%
Cookies, candies, gum, other snacks	17 %
Vitamins	15 %
Canned desserts, frozen dinners, drive-ins, peanut butter, oranges	9 %
Beverages and beverage mixes	8 %
Frozen waffles and pop tarts	7½%
Canned pasta	5 %

These advertisements not only attempt to sell nutritionally unsatisfactory foods, but also 15% promote vitamins - "to keep you growing right even if you don't eat right" (Gussow, 1972, p. 50).

One of the messages delivered by children's television commercials has to do with what is not advertised. The four food groups are very poorly represented. There are no milk products (though there are flavours to make milk taste good), no eggs, no meat, no vegetables and just a single fruit. There is a nutritional message here - a negative one. It tells children that these are food not to be excited about.

As Tyler (1962) points out, the advertisements in the mass media must be effective. The products are sold in quantities to satisfy the sponsor, the advertising agency and the broadcaster. Contracts are renewed and new products are launched with an emphasis on broadcast advertising. Tyler feels it is safe to conclude that advertisements do influence the eating habits of the young through the promotion of specific products.

Children do have some control over what they eat. In a study

by Ward (1971), it was found that mothers of children five to seven years old were usually willing to yield to children's wishes: 88% on breakfast cereals, 52% on snack foods, 40% on candy, 38% on soft drinks. By the time the children were eight to ten, 91% of the mothers were yielding to their children's influence on which cereal to purchase. Children also control their food consumption by their own food purchases with spending money and by the amount of waste they leave on their plates (Gussow, 1972). It is important that children choose their foods wisely for optimum growth.

It has been shown in North America that food preferences in childhood parallel those in adulthood. During childhood, vegetables are the most frequently disliked while milk and cake are the least frequently disliked (Breckenridge, 1959; Harrill et al., 1972). The same is true for adults (Pilgrim, 1961). Since one of the major influences on preference is familiarity (Alford and Tibbets, 1971; Ireton and Guthrie, 1972), it is not surprising that children who do not like and do not taste vegetables, become adults who do not choose them. It seems important for optimum nutrition that children learn to like many foods.

Since recognition of the need for nutrition education in schools has broadened beyond nutritionists and public health officials to teachers and some of the public, there has been greater stimulus for the development of nutrition education programs. Examples are those reported by Sinacore and Harrison, 1970; Whipple et al., 1970; Von Housen, 1971; and Selph, 1972. Their programs were developed with the major goal being attainment of good dietary habits. Their programs

are complex, involving limited behavioral objectives, to be attained over short periods of time, which are in tune with the interests and courses of study of each level from kindergarten to grade twelve. The programs are not prescribed courses for teachers to follow but are helpful guides which list several learning experiences suitable for various situations which would help the students attain the suggested behavioral objective. Some of the programs also include performance tests for teachers and students to rate results.

Concepts to be learned that are common to most programs are: 1. Nutrition is the use of food by the body.

- Adequate nutrition is essential for physical health and for the realization of growth potential.
- The body needs nutrients rather than specific foods; there are many combinations of foods which can provide an adequate diet.

4. Many factors determine what food people eat.

5. Food is the most sensible source of nutrients.

At the primary level (K - 3), the learning experiences work toward helping the child develop positive attitudes toward food and eating, accept a variety of foods, recognize differences in how and what people eat, and begin to understand the relationship of food to health and growth.

At the intermediate levels (4 - 6), the curriculum is geared toward helping the student understand in some detail the relationships among food, health and growth; understand how to select food to meet nutritional needs; develop an appreciation of food as part of man's physical and socio-cultural environment. At the junior high school level (7 - 9), the learning experiences work toward helping the student apply knowledge of nutrition to everyday situations; realize that individual differences exist in requirements and use of food, appreciate the effects of social and environmental factors on nutritional health; and realistically evaluate his own nutritional practices.

The senior high school curriculum seeks to relate the student's understanding of nutrition to broad social concerns and to encourage him to understand that his eating habits affect his own longrange health and the health of the next generation; to explore the problems of malnutrition and hunger in his own country and the world; and to become aware of unanswered questions in the field of nutrition.

Weight control may be used as an example of how one topic may be found at all grade levels, but the learning experiences are spiralled according to abilities and needs at each level to provide a deepened understanding. At the primary level, children learn that it is normal for people to be different from one another - in size and other characteristics. Elementary pupils learn the effects of too much and too little food for the needs of the body. They observe individual variations in the need for calories, and note the phasic nature of growth and development which results in temporary chubby and lean stages for many youngsters. In the junior high school curriculum guide there may be an extensive section on weight control, with information on what factors affect body weight, how to determine whether one has a weight problem, and how to go about setting a sensible course of action to cope with a weight control problem. In senior high school, students

can study obesity as a health problem of the society; learn about current research in the area of obesity and study society's attitudes toward the obese individual (Sinacore and Harrison, 1970).

The development of such all-inclusive programs is quite a recent event, and the collection and evaluation of data on the results of such programs will be a complex process. Very few such data have been reported as yet. There are a limited number of studies, especially at the elementary level, which have been undertaken to determine the effectiveness of nutrition education programs. They fall into two categories: those designed to study attitudes toward specific foods and those designed to test both nutrition knowledge and dietary habits.

The standard procedure for the former type of study is to either observe food preferences and plate waste in cafeterias or to give written food preference tests. The subjects are involved in food preparation and tasting parties, where the least liked foods are prepared in a variety of ways. The subjects are then re-tested. Results of such studies indicate that increased familiarity improves attitudes toward the least liked foods. This is true with pre-school children (Glaser, 1964; Harrill et al., 1972; Ireton and Guthrie, 1972), elementary school children (Carver and Patton, 1958; Hunt et al., 1958; Patton et al., 1958; Breckenridge, 1959; Alford et al., 1971; Baker, 1972), high school students (Botto, 1932; Kunkel and Hall, 1958) and adults (Pilgrim, 1961).

Only two studies have been reported that were designed to test both knowledge and habits. The Dairy Council of California has adopted a nutrition education program where teachers are trained, in nutrition education workshops, for knowledge and teaching techniques. Lovett

evaluated the effectiveness of this program at the second grade level, involving 1,720 students (Lovett et al., 1970). Three groups of students were established: an experimental group whose teachers attended the workshops, were trained and equipped with materials; a semi-control group whose teachers were equipped with the same materials and were given the general objectives but no training; and a control group whose teachers were only supplied with the same general objectives. The three groups were pre-tested and post-tested for knowledge (ability to identify the four food groups), application of knowledge (ability to make a balanced meal selection), and application to child's own life (breakfast recall). There was marked improvement in the three tests for the experimental group with a smaller improvement noted in the other two groups.

Baker (1972) collected dietary recalls and dietary records, scores on a nutrition knowledge test, ratings of vegetable preferences and scores of scholastic achievements from 200 children. Changes in these variables in the experimental groups were compared with changes in the control groups to determine the influence of the program.

The nutrition unit was comprised of many student activities designed to help the children meet four behavioral objectives. The activities included an animal feeding demonstration, various physical and chemical food tests, and class tasting parties. The program continued for thirteen lessons, each thirty minutes in length, plus two follow-up lessons.

Scores on the nutrition tests were significantly higher $(p \leq 0.01)$ for experimental classes than for control classes, when

retesting was done within a week after completion of instruction. No significant changes in diet due to the program were observed.

Although the reports by Lovett (1970) and by Baker (1972) tested for change in dietary behavior, they ignored the fact that a dietary recall does not necessarily demonstrate behavior change. Dietary recall also reflects the traditions and attitudes of the family. A more suitable test for change in dietary behavior would be to observe changes in selection of food when the children in the sample are given a wide choice of food and where parental control is absent. Thus the only two studies which have reported the effectiveness of nutrition education programs in terms of knowledge and behavior are incomplete in their evaluation.

CHAPTER III

METHODS

OBJECTIVE ONE

Objective One: To develop an interesting nutrition education program relevant to third and fourth grade children.

The third and fourth grade level was chosen because several authors (Rose, 1932; Martin, 1963; Sinacore and Harrison, 1970) have found that this is the first level at which some clearly formulated nutrition principles may be most profitably developed.

The nutrition program was developed basically following the instructional paradigm developed by Popham and Baker (1970c) shown in Figure 1 where evaluation is an integral part of the planning process.

Figure 1

Popham's Instructional Model



Since it was thought that the above model was too simple to be complete, an expanded paradigm (Figure 2) was designed following suggestions by Hunter (1971 - 73) and by Vaines (1972).

Figure 2

An Expansion of Popham's Instructional Model



Each of the steps in formulating the program as shown in Figure 2 will be discussed in detail.

Motivation

A strong factor in the success of a learning experience is the degree to which the pupil is motivated to learn. Interests, needs and problems can all serve as motives.

Martin (1963) describes the general interests of children at the intermediate grade level as follows:

Children in the intermediate grades are increasingly interested in people and things outside their immediate environment. They have a desire to discover things for themselves. They want to know why things happen. This scientific attitude can be utilized as a motivation technique. Finding out how people live, how animals eat and grow, how they feed themselves, can develop and become self-sufficient, are typical interests of this age. Children feel the need to prove to themselves that food of suitable kind and amount is a prime factor in nutrition and health (p. 23).

The above description served as a guidepost for developing the motive to learn during the teaching period. Interests, needs and problems specific to the children in the population sample were recognized throughout the program and these elements were utilized as motives.

Concept and Generalizations

The general concept of the program was to cause an improvement in a child's diet if it was low in certain nutrients as assessed by Canada's Food Guide. It was determined that before a child would be willing to alter his food habits, he must be able to accept the following generalizations.

- Generalization I To maintain optimum health one must eat a balanced diet as well as get enough exercise and sleep.
- Generalization II The body uses food for growth, for repair, for energy and for regulation.
- Generalization III A balanced daily diet must include a wide variety of foods selected from each of the four food groups.

Behavioral Objectives

Specific behavioral objectives were designated to identify acceptable terminal behavior, which would demonstrate that the student had comprehended the above generalizations. These objectives were arranged in hierarchies, according to complexity. For each behavior, a level of competence and/or internalization from taxonomies of educational objectives (Bloom, 1965; Krathwohl et al., 1964) were identified to test whether the objectives were arranged within true hierarchies. Tables 1, 2 and 3 list the generalizations with the related behavioral objectives.

Table 1

Behavioral Objectives Designed to Reflect Internalization of Generalization I

Generalization I	To maintain good health one must eat a balanced diet as well as get enough sleep and exercise.
Behavioral Objectives	The student will demonstrate by recognition in writing, his understand- ing of good health by (comprehension)*:
Α.	selecting from a list of phrases a definition of good health that means optimum well being (knowledge).
В.	writing in his own words at least three characteristics of good health (knowledge).
C.	choosing from a list the four ingredients necessary for good health: adequate nutrition, sleep, exercise and clothing (comprehension).
D.	drawing correct conclusions, in writing, about the health of two animals, given details about the diets (comprehension).

* Words in parentheses are levels of competency from Bloom (1965).
Behavioral Objectives Designed to Reflect Internalization of Generalization II

Generalization II	The body uses food for growth, for energy, for repair and for regulation.
Behavioral Objectives	The student will demonstrate his understanding of the functions of food by (comprehension)*:
Α.	listing in writing the four functions of food in the body (comprehen-sion).
В.	matching the word 'digestion' with a simple description meaning the breakdown of food (comprehension).
С.	matching the word 'absorption' with a simple description meaning the passing of food from the intestine into the blood (comprehension).
D.	matching the word 'transport' with a simple description meaning carry- ing of food to different parts of the body (comprehension).
Е.	identifying to which group a food belongs by its nutrient content (comprehension).

* Words in parentheses are levels of competency from Bloom (1965).

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Behavioral Objectives Designed to Reflect Internalization of Generalization III

Generalization III	A balanced daily diet must include a wide variety of foods selected from each of the four food groups.				
Behavioral Objectives	The student will demonstrate his knowledge of Canada's food guide by (application and responding)*:				
· A.	matching the number of servings required by a child of the same age with the appropriate food group (knowledge).				
В.	planning from a wide variety of food pictures a balanced selection of foods for one day for a child of the same age (application).				
с.	choosing a balanced meal from a wide variety of foods offered in picture (application and willingness to respond).				
D.	showing an improvement from pre-test to post-test in his own 24-hour dietary recall (application and willingness to respond).				
Ε.	showing an improved attitude toward vegetables as shown by his score on a hedonic scale vegetable test (willingness to respond).				
F.	showing an improved attitude toward food at home as reflected by parenta contact through a questionnaire or by telephone (application and willing ness to respond).				

Evaluation: Pre- and Post-Testing

An important phase of an education program is the evaluation of the student's learning. In the program which was developed in the present study, the testing techniques were a natural outcome of the behavioral objectives from the knowledge competence level to the comprehension level. The knowledge test followed a similar format to that of Lovett (1970) and Baker (1972). A multiple choice menu planning test was developed to test application of knowledge. This test was a modification of Lovett (1970). A vegetable preference test was used to test willingness to respond (Baker, 1972; Breckenridge, 1959; Ireton, 1972). To test application and willingness to respond, two tests were used : a 24-hour dietary recall (Martin, 1963) and free choice balanced meal selection. A third test of application and willingness to respond which was included was a parent questionnaire to determine if the students had reflected any change in attitude or behavior toward food at home.

Samples of all the tests are included in Appendix C. The scoring system accompanies each of the tests in Appendix C. As shown in the scoring systems for the Balanced Diet, Free Food Meal Choice and 24-Hour Dietary Recall tests, the term "extra foods" was used to describe foods which supplied very few nutrients but many calories. Examples which were included in this category are soda pop, potato chips and candy. Cake and cookies were scored as one-half extra foods and one-half cereal.

Instruction - Course Content

Based on the behavioral objectives, the facts in Tables 4 - 6 were included in the program. The letters of the facts correspond to the appropriate behavioral objective.

Facts Related to the Behavioral Objectives of Generalization I

Related Behavioral Objective(s)	Facts Included in the Course.
А	You are healthy when you are at your best in body, mind and relations with others.
В	Health includes having good posture, bright eyes, sound teeth, shining hair and clear skin.
	Health includes having an alert mind.
	Health includes getting along well with others.
С	Everyone is responsible for his own health. We can all try to control our own diet, amount of exercise, amount of sleep and wear adequate clothing for the environment.
D	Nutrition is the food you eat and how your body uses it.
	By eating properly (as science has shown is the best way), you can realize your optimum health.

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Facts Related to the Behavioral Objectives of Generalization II

Related Behavioral Objective(s)	Facts Included in the Course.					
A	The body needs building blocks to grow, to repair damaged tissue, and to give you energy. The body also needs building blocks to help balance its work. Food supplies these necessary building blocks. They are called nutrients.					
	When your body grows or repairs itself, it needs protein. Muscle, skin, hair and bone all need protein to grow and repair.					
	Bones and teeth need calcium and phosphorus to stay hard.					
	Enzymes are special proteins in the body which help regulate the production of new materials and energy. Enzymes are helped by vitamins and minerals. Vitamins and minerals are necessary for regulation.					
	All foods can be used for energy but since proteins are especially needed for growth and repair, the most economical ways to get energy are from carbo- hydrates and fat.					
B, C, D	Before the nutrients in food can be used by the body, food must be broken down into small pieces (digested), taken from the intestine to the blood (absorbed), and carried in the blood to the parts of the body that need the nutrients (transported).					
E	Foods are a combination of nutrients.					

Table 5 (continued)

Related Behavioral Objective(s)	Facts Included in the Course.	
E (continued)	Foods are grouped into their classes on	the basis of their major nutrients:
	Meat group Milk group Cereal group Fruit and Vegetable group	protein and iron calcium, phosphorus and protein vitamins, iron and calories vitamins and minerals

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Table (5
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Facts Related to the Behavioral Objectives of Generalization III

Related Behavioral Objective(s)	Facts Included in the Course.					
А	The following amounts of food from each food group and reco fourth-grade children:					
	Meat Milk Cereals Fruits and Vegetables	1½ - 2 servings 2 - 3 servings 3 servings 3 servings, one with high Vitamin C				
	This food guide helps you plan	your diet.				
B, C, D	To stay healthy, a body needs nutrients to grow, repair itself, have lots of energy and operate smoothly. Since the nutrients for these functions come from all four food groups, we must select foods from all the groups to make sure we are healthy.					
Ε	A person is more likely to get wide variety of foods, especial	all the nutrients he needs by eating a ly a wide variety of fruits and vegetables.				

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Learning Experiences

The learning experiences shown in Tables 7 - 9 were developed to help the students attain the behavioral objectives. The learning experiences were based on the interests and motivations of students in this grade level. The lesson plans, which reflect how these learning experiences were organized and the extent to which they were emphasized, are included in Appendix D. The letters of the learning experiences correspond to the appropriate behavioral objectives.

Learning Experiences Related to the Behavioral Objectives of Generalization I

Related Behavioral Objective(s)	Learning Experiences
Α, Β	Imagine a healthy boy or girl. Discuss in a group how he/she would look, feel, act. Find pictures that portray characteristics of good health and poor health or draw pictures. Make a bulletin board display of the pictures that the students bring.
C, D	Read a story to the children about two children, one with good habits and one with poor health habits. Ask them in a class discussion to tell what the good habits were and what the poor habits were. Ask them to compare their habits with those of the children in the story.
A, B, C, D	Conduct an animal feeding demonstration with one pair of rats on a good diet and another pair on a poor diet. At the end of three weeks put both pairs on the good diet to show that the difference between them was just the diet.

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Learning Experiences Related to the Behavioral Objectives of Generalization II

Related Behavioral Objective(s)	Learning Experiences.				
Α	<pre>Show pictures of the following: a baby, a child of about 10 years, an adult. a child reading, a child running. a person with a scraped knee, a person with a broken bone. a cartoon of "Johnny" cleaning up his room without Mother's presence ("Johnny" playing with his toys), a cartoon of "Johnny" cleaning up his room with Mother's presence. From comparison of these pictures concluded that the body must grow, repair, give energy and that these functions must be regulated. The building blocks for these functions must come from food.</pre>				
B, C, D	On a model and on student diagrams show where the food goes from the mouth to the intestines.				
В	To demonstrate digestion have the students: mix some of their saliva with cornstarch. simulate the grinding action of their teeth by mashing a potato with a fork. simulate swallowing by squeezing a bead down a straw. mix oil and water, then add detergent, to simulate the action of the bile. mix pepsin, .1N HCl and milk, to demonstrate protein digestion.				
C	To demonstrate absorption have the students sprinkle granulated sugar in the center of a paper draped over a cup. Pour water on the sugar. Taste the liquid in the cup to ascertain if sugar passed through the towel.				

Table 8 (continued)

Related Behavioral Objective(s)	Learning Experiences
D	Show a diagram of the circulatory system. Feel pulse. With each pulse imagine food and water being pushed out from the intestine into all the parts of the body.
Α	Again show the pictures of people illustrating growth, repair, energy and regulation. Discuss: what happens when you grow (re: muscles, bones, skin and hair). what must happen when something is repaired (use examples of gluing broken dish together, sewing a patch on clothes). what is energy (use example of car or train). what happens if we are not regulated (or supervised).
Ε	Building blocks called nutrients are necessary for the body functions. To show that this is true: test muscle, skin, bone and hair for the presence of protein. decalcify bone. burn fat, sugar, protein to give off heat. read and act out stories from the booklet, "The Great Vitamin Mystery".
Ε	Nutrients come from food. Foods are a combination of nutrients. As an example, have the students test meat for protein, fat and water.
Ε	Post a picture of the Four Food Groups. Discuss each of the food groups in terms of the food origin. Divide the class into four groups. Have each group analyze the foods in a particular food group by testing the food for the presence of: protein, sugar, fat, minerals, vitamin C, vitamin A and starch.
E	Have the children bring box tops, labels, pictures and drawings of the food they eat. Play the grocery bag game with these to develop food grouping ability.

Learning Experiences Related to the Behavioral Objectives of Generalization III

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Related Behavioral	Learning Experiences.							
	Review: Know what the body needs and know that food supplies these needs.							
A	How do you know how much individuals need? Discuss the difference between children and adults to show that their requirements are different.							
A	Post a simple version of Canada's Food Guide for children. Have the students write down what they ate in the past 24 hours.							
B, C, D	Using a point system, have each child evaluate his diet, at the same time taking the class scores for each food group. Then have each child decide how he should change his diet to get a top score.							
С	Using food models in a cafeteria style situation, have each child choose a lunch and check to see if it is balanced.							
Ε	Using results of the pre-test vegetable preference question, introduce new and least liked vegetables, discuss their origin, feel smell, taste them raw and have the students prepare, cook and eat them.							
C, D	Plan a well balanced meal with the students and have them prepare it in class.							

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OBJECTIVE TWO

Objective Two: To determine the effectiveness of the nutrition education program which was developed as described in Objective One. Effectiveness was to be determined as a change in test results at the knowledge, application, willingness to respond levels of the cognitive domains (Krathwohl, 1964; Bloom, 1965).

Permission was granted by the Vancouver School Board for the author to conduct the experimental nutrition education program at the third and fourth grade levels. Principals of three socio-economically related schools consented to have the program. The schools were Begbie Elementary (B.), Chief Maquinna Annex (M.A.) and Queen Alexandra Elementary (Q.A.). The socio-economic description of the population which the schools served would be: mixed immigrant, low to low middle class (Armour, 1973).

In December, 1972, one class of thirty-five third and fourth grade pupils at B. was given the preliminary tests shown in Appendix B. The purpose of the preliminary testing was to determine if the evaluation tests were worded correctly for the grade level and if the skills involved in answering the questions were suitable. Several changes in wording were found necessary and one question was eliminated because it was repetitious of another that proved better.

From January 8, 1973 to March 2, 1973, two classes each from M.A. and Q.A. were involved in the experimental program. One class each from M.A. and Q.A. received the nutrition education. These classes formed the experimental groups. The remaining class in each of the two

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schools received no nutrition education during the experimental period. These classes were treated as the control groups. A description of each of the four classes is shown in Table 10.

During the week of January 8 - 12, the tests shown in Appendix C were given to all four classes, one per day, in the following order: knowledge test, analysis of diet test, menu planning test, free food meal choice test, and vegetable attitude and 24-hour dietary recall test combined. The tests were administered by the classroom teachers. At this time a letter to the parents was also sent, informing them of their child's participation in the experimental program.

The learning experiences were conducted by the author twice each week for six weeks, January 15 - February 23. The lessons were approximately forty minutes long. The lesson plans are shown in Appendix D.

The students of all four classes were tested again during the week of February 26 - March 2, immediately following the nutrition education program. The same tests were administered in the same order as the previous tests. An additional test involving parental contact through questionnaire, and if necessary, telephone, was administered following the other tests.

A total of 117 children were pre-tested and post-tested. The tests were administered by the classroom teachers to eliminate any tendency of members of the experimental groups to bias their answers to impress the author, especially their dietary recalls and their free food meal choices. To control the testing situation, the tests were discussed in detail with each teacher with reference to the objectives

Description of the Four Classes Involved in the Nutrition Education Program

	Oueen Alexandra (O.A.)			Maguinna Annex (M.A.)		
	Experimental	Con	trol	Experi	mental	Control
Assigned Group Number	1	2	3	4	5	6
Grade	4	3	4	3	4	4
Number of Students	32	17	17	13	14	24

of each test, how the questions could be answered and unfamiliar terminology. The teachers were asked to follow the instructions which were attached to their own test copies. These instructions preface each of the tests in Appendix C.

Since none of the teachers had any background in nutrition, it was felt that the author should conduct the learning experiences. The teachers of all four groups were informed of the general objectives of the program. They were asked to refrain from having nutrition related projects of their own in their classrooms during the eight week period of this project. The teachers of the experimental classes were encouraged to participate in the learning activities. Their advice was frequently sought concerning individual students, the classes' responses to certain activities and the interests of the classes.

According to the teachers, none of the classes had received any nutrition education instruction during the 1972 school year. The teachers' backgrounds varied from two years to twelve years teaching experience. All of them had a Bachelor of Education degree. They were all interested in learning new approaches to teaching health and nutrition.

Statistical Techniques

Because the sample was fairly small (N = 117), not randomly selected and from two different schools, the classes from each of the two schools were treated separately.

The difference in the mean scores from pre-test to post-test was the statistic used to evaluate the performance of each group. To determine if the means of the experimental and control groups were from the same population, an analysis of the variance of the means was applied to the data. This test was also applied to determine if the program was equally effective for the third and fourth grades. The acceptable level of significance was designated by the statistical advisor to be $p \leq 0.05$.

CHAPTER IV

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RESULTS AND DISCUSSION

As reference for the reader, the names and descriptions of the tests administered to the students are listed in Table 11.

It should be noted that for the tests listed in Table 11, the differences between the mean scores of the post-tests and the pre-tests were compared as shown in Table 12 to determine the significance of the score changes that occurred. Since the grade three experimental group and the grade three control group were in different schools, the results of these two groups could not be compared. The only method used to determine the effectiveness of the nutrition education program at the grade three level was to compare each grade three group with the grade four group which received the same treatment in the same school. This comparison only indicated whether the grade three and grade four groups were from the same population and not the degree of influence the treatment had on the grade three groups.

Names and Descriptions of the Pre- and Post-Tests

Test Name	Level of Learning Tested*	Description of Test
Knowledge	Knowledge	An objective recall test involving multiple choice and short word answers.
Menu Plan- ning	Comprehension	Student required to select a balanced diet for one day for a child, from 49 nutritious and non- nutritious foods shown in illus- tration form.
Analysis of Diet	Comprehension	Student required to classify the foods shown in a fictitious 24- hour diet of a child. Student required to determine how many more servings should be included to make a balanced diet.
Vegetable Attitude	Willingness to respond	Student required to mark attitude toward 19 vegetables on a 5 point hedonic scale.
Parental Contact (post-test)	Willingness to respond	Parents asked in a letter or by telephone if any change had been noticed in their child's attitude toward food and/or nutrition.
Free Food Meal Choice	Willingness to respond and Valuing.	From 23 pictures of foods, the student was asked to select the foods desired for one meal and to indicate which of these foods would not be eaten, if there were too many chosen.
24-Hour Dietary Recall	Willingness to respond and Valuing	After each meal the student was asked to write down everything that had been eaten.
* (Krathwohl et	al., 1964; Bloom, 196	55)

Groups Compared to Determine the Effectiveness of the Nutrition Education Program

Group Number	Description	Group Number	Description
1 .	Q.A. Experimental Grade 4	Compared with 3	Q.A. Control Grade 4
5	M.A. Experimental Grade 4	Compared with 6	M.A. Control Grade 4
2	Q.A. Control Grade 3	Compared with 3	Q.A. Control Grade 4
4	M.A. Experimental Grade 3	Compared with 5	M.A. Experimental Grade 4
1	Q.A. Experimental Grade 4	Compared with 5	M.A. Experimental Grade 4

DISCUSSION OF INDIVIDUAL TESTS

1. Knowledge Test

The results of the knowledge test in Table 13 show that the experimental program was effective in improving nutrition knowledge at the fourth grade level. Both experimental grade four groups showed a significant improvement in test scores ($p \leq 0.05$). Since there was no significant difference between the mean difference scores of M.A. experimental grade three group (group 4) and M.A. experimental grade four group (group 5), there is indication that the nutrition education program was also effective in improving knowledge at the grade three level.

Table 13

Group Number	Group Description	Difference Between Post- and Pre-Test Mean Scores
1	Q.A. Experimental Grade 4	5.7 ± 5.4 $\rightarrow p \ge 0.05$
3	Q.A. Control Grade 4	1.1 ± 3.2
5	M.A. Experimental Grade 4	7.9 ± 2.4 $p \ge 0.05$
6	M.A. Control Grade 4	-2.3 ± 4.9
2	Q.A. Control Grade 3	0.9 ± 3.5
4	M.A. Experimental Grade 3	4.6 ± 3.9

There was no significant difference for comparisons not marked.

As shown in Appendix E, the raw scores of the experimental and control groups were similar in the pre-test. For example, the mean score for group 1 was 14.9 and the mean score for group 3 was 13.4, with a possible total score of 38. All the experimental groups and the control groups scored less than 50 percent on the pre-test. On the post-test, only the experimental groups achieved mean scores of greater than 50 percent.

2. Application of Knowledge Tests

A. Menu Planning Test. The results of this test (Table 14) show that there was no significant improvement at the fourth or third grade level in the ability of the students to plan a diet for one day, based on Canada's Food Guide. Group 1 did show a significant decrease in the number of high calorie or extra foods chosen as compared with group 3 (p=0.05).

Pre- and post-test raw scores for all groups were high. The maximum total score was 25. The mean pre-test scores ranged from 21 to 23. The chance for improvement was little. The mean post-test scores ranged from 22 to 24. For the children tested, the Menu Planning test was a poor measure of ability to apply knowledge. There are two possible reasons for the high pre-test mean scores: either the students were at a more advanced level of learning than either the author or the teachers had realized, or the balanced diet test did not measure student comprehension. Since the related Knowledge pre-test scores were less than 50 percent, it would seem that comprehension of that knowledge would also be low. Therefore the Menu Planning test scores must reflect an

		Difference Betwe	en Post- and Pre-Test Means
			Number of
Group	Group Description	Test Scores	Extra Foods Chosen
1	Q.A. Experimental Grade 4	1.3 ± 4.0	-0.7 ± 2.3 $p \leq 0.05$
3	Q.A. Control Grade 4	1.8 ± 3.1	0.3 ± 2.3
5	M.A. Experimental Grade 4	0.9 ± 3.0	-0.5 ± 1.5
6	M.A. Control Grade 4	-0.3 ± 2.3	-0.4 ± 1.1
2	Q.A. Control Grade 3	1.6 ± 3.1	0.9 ± 1.2
4	M.A. Experimental Grade 3	0.9 ± 3.5	-0.6 ± 2.2

Menu Planning Test

There was no significant difference for comparisons not marked.

Especially in the pre-test for the experimental groups, and in both tests for the control groups, where the student would not know the meaning of a "Balanced diet", he/she would choose foods on the basis of family eating patterns, and preferences, rather than for the nutritional value. To eliminate the tendency of the students to choose on the basis of tradition rather than nutrition, the Menu Planning test could be administered only to those who correctly identified the recommended numbers of servings for each food group in the Knowledge test. However, the high scores cannot be entirely explained by good family eating habits because the 24-Hour Dietary Recall mean scores were not equally high. Investigation of the individual student Menu Planning tests reveals that students in all the groups were unable to limit the number of their food choices to the number that a child would eat in one day. Since no restrictions were imposed on the number of foods that could be chosen, it was possible to obtain a high score by choosing many foods. Thus the Menu Planning test as it was administered cannot be interpreted as a valid measure of the application of knowledge level of learning.

There were no restrictions limiting the number of foods which could be chosen because it was thought that such restrictions would make the question too difficult for the grade level being tested (Armour, 1973). However, during the test the teachers did stress that only enough food for one day should be chosen. The teachers also directed the students to think of each of the meals and snacks in a day and to choose foods accordingly. It was hoped that this instruction would help the students limit quantities. Since children of the third and fourth grade levels appear to have difficulty grasping the concept of quantity, a more appropriate test would be to offer fewer foods and to divide the test into meals: breakfast, lunch, supper and snacks. A test such as this would help the student focus his/her attention on one meal at a time, and the task of selecting food would be easier. Using food models instead of pictures could also improve the children's ability to choose from the selection of food offered.

<u>B. Analysis of Diet Test</u>. Both experimental grade four groups showed a significant improvement in ability to analyze a diet, as compared to their controls (p=0.05). Only Q.A. experimental grade four group (group 1) showed a corresponding significant decrease in the number of incorrect answers, as compared to its control group (group 3). The comparison of M.A. experimental grade three group (group 4) with M.A. experimental grade four group (group 5) demonstrated that the two groups were from the same population. Therefore group 4 also showed an improvement in the ability to analyze a diet. These results are shown in Table 15.

Both grade four experimental groups showed a significant improvement (p=0.05) over their control groups in the second part of the Analysis of Diet Test in which the students were asked to write the number of each of the food groups required to make the diet balanced according to Canada's Food Guide. Results from comparison of scores of M.A. experimental grade three group (group 4) with M.A. experimental grade four group (group 5) do not indicate an improvement in ability of the grade three group to balance a diet. Comparison of group 4 with group 5 showed that there was a significant difference between the groups. By deduction, since group 5 had shown improvement, group 4 had not shown improvement. One of the teachers involved in the testing suggested that the question involved solving a word problem, a skill which grade three students do not normally have (Armour, 1973).

The pre-test means for all the groups except group 5 were approximately 50 percent (range 5-6, possible total 11; group 5 mean, 8 out of possible total of 11). The pre-test mean scores indicated that

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		Difference Between Post- and Pre-Test Means			
		Quest	ion l	Question 2	
		Number of	Number of	Number of	
Group	Group Description	Correct Answers	Incorrect Answers	Correct Answers	
1	Q.A. Experimental Grade 4	^{2.0±2.3} } p≤0.05	-0.1±1.5 } p≤0.05	0.9±1.4 } p≤0.05	
3	Q.A. Control Grade 4	ر 0.1±2.2	0.4±1.5	-0.2±1.7	
5	M.A. Experimental Grade 4	0.9±0.9 } p≤0.05	-0.5±0.9	$\left. \begin{array}{c}1.5 \pm 1.5 \\ p \leq 0.05 \end{array} \right\}$	
6	M.A. Control Grade 4	0.4±1.8 J	0.3±1.0	-0.1±0.7 J	
2	Q.A. Control Grade 3	0.1±1.2	0.7±1.5	-0.1±1.1	
4	M.A. Experimental Grade 3	0.8±2.5	-0.4±1.3	-0.2±1.0	

There was no significant difference for comparisons not marked.

the students had not yet attained the level of learning being tested. The experimental nutrition education program was effective in improving comprehension as reflected by all the experimental groups' post-test correct scores for question one. The significant decrease in number of incorrect answers by group 1 and the similar trend for group 5 further supports the conclusion that the program was successful in helping the students reach the comprehension level of learning.

3. Willingness to Respond Tests

<u>A. Vegetable Attitude Test</u>. Part number six of the vegetable attitude test was eliminated from the statistical analysis because it was a function of parts one through five: either the students could show how they liked a vegetable or they had never tasted that vegetable.

None of the mean scores of the experimental groups varied significantly from their controls in this test. The teachers involved suggested that at the third and fourth grade level, the average student was only able to distinguish between like and hate. They felt that there was probably a lot of guessing involved in the answers between the like and hate attitudes.

<u>B. Parent Questionnaire</u>. The scoring system for this test is included in Appendix C. Results from parent responses to the written or telephone questionnaire show that all three experimental groups of children had demonstrated significantly (p=0.05) improved attitudes toward food and interest in nutrition at home. A subjective evaluation of the experimental program through parental contact indicated that the tests also had considerable influence on the control students; several mothers

		D:	Difference Between Post- and Pre-Test Means			
		Like	<u>, </u>	Neither		Dislike
		very		like nor		very
Group	Group Description	much	Like	dislike	Dislike	much
1	Q.A. Experimental Grade 4	0.4±2.9	0.1±1.7	0.8±1.4	-0.3±1.3	0.8±2.3
3	Q.A. Control Grade 4	-1.1±2.1	-0.4±1.4	0.6±2.2	0.1±1.4	1.1±2.0
5	M.A. Experimental Grade 4	0.9±2.4	0.3±1.2	0.0±1.3	0.8±1.5	-0.6±2.0
6	M.A. Control Grade 4	-0.5±2.1	0.5±2.0	0.1±1.2	0.1±1.0	-0.1 ±2.2
2	Q.A. Control Grade 3	-0.2±2.0	0.5±1.8	0.4±1.1	0.1±1.0	-0.8±1.6
´4	M.A. Experimental Grade 3	0.6±3.6	1.4±2.1	0.3±1.2	-0.2±1.5	0.2±1.6

Vegetable Attitude Test

All comparisons were not significant

wrote long comments about their children's increased interest in food and nutrition. Some of these children had only been exposed to nutrition education through the pre- and post-tests.

Table 17

Group	Group Description	Difference Between Post- and Pre-Test Means
1	Q.A. Experimental Grade 4	0.4 ± 0.5 $p \leq 0.05$
3	Q.A. Control Grade 4	0.2 ± 0.4
5	M.A. Experimental Grade 4	0.6 ± 0.5 p ≤ 0.05
6	M.A. Control Grade 4	0.3 ± 0.4
2	Q.A. Control Grade 3	0.2 ± 0.4
4	M.A. Experimental Grade 3	0.5 ± 0.5

Parent Questionnaire: Attitudes of Student at Home

There is no significant difference for comparisons not marked.

<u>C. Free Food Meal Choice Test</u>. The first question of this test, "Do you like the foods you have chosen?", was answered by all the students for both pre-test and post-test with the word "yes". The second question, "Why did you choose the foods that you ordered?", was answered in one or both of two ways: liking reasons and/or health reasons. On the post-test, all three experimental groups plus the M.A. control group (group 6) showed trends toward including health as a reason for choosing foods. As shown in Table 18, only Q.A. experimental group (group 1) demonstrated a significant improvement ($p \le 0.05$) on this question.

The answers to the fourth and fifth questions were recorded as indicating the foods which the student had chosen but which would not be eaten, usually because too many foods had been chosen for one meal. The term, "rejected foods" was given to these foods.

As shown in the scoring system for this test (Appendix C), four scores were given for the choice of foods: a score for all the nutritious foods chosen (those which could be classified in Canada's Food Guide, including the rejected foods; a score for all the extra foods chosen (those which contributed mainly calories), including the rejected foods; a score for only the nutritious foods which would be eaten; a score for only the extra foods which would be eaten.

There was no significant difference for any of the nutritious food choice scores, with or without the rejected foods. Although the high mean pre-test scores could indicate that the students were competent at this level of learning, since the scores for the Knowledge and Analysis of Diet were low, a better explanation is necessary. As with the Menu Planning test, no restrictions were imposed on the allowable number of foods to be chosen. The teachers stressed that the students should only choose what could be eaten but many pupils chose more than enough and then failed to list what they would leave if they were too full to eat all. The large numbers of foods chosen resulted in high scores, thus invalidating the test results.

Pictures of foods were used in the Free Food Meal Choice test because neither of the schools had a lunch program where student food

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Free Foo	d Meal	Choice	Test
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<u></u>		Difference Between Post- and Pre-Test Means					
Group	Group Description	Like Reasons	Health Reasons	Score with Rejects	Score without Rejects	Number of Extra Foods with Rejects	Number of Extra Foods without Rejects
1	Q.A. Experimental Grade 4	-0.2±0.5	0.2±0.5	0.5±1.5 ≤ 0.05	0.5±1.6	-0.9±1.6	∫ ^{-0.8±1.5} ≤0.05
3	Q.A. Control Grade 4	0.1±0.2	-0.1±0.2	-0.2±1.7	-0.2±1.9	0.4±1.4	L _{0.4±1.3}
5	M.A. Experimental Grade 4	-0.2±0.6	0.4±0.5	0.3±1.5	0.1±1.4	-0.4±1.2	-9(2±1.1
6	M.A. Control Grade 4	-0.1±0.4	0.2±0.5	0,1±1,5	0.0±1.6	0.0±1.3	-0.2±1.2
2	Q.A. Control Grade 3	0.0±0.0	0.0±0.0	0.6±1.2	0.8±1.4	0.1±1.2	0.1±1.3

Table 18 (continued)

		Difference Between Post- and Pre-Test Means						
Group	Group Description	Like Reasons	Health Reasons	Score with Rejects	Score without Rejects	Number of Extra Foods with Rejects	Number of Extra Foods without Rejects	
4	M.A. Experimental Grade 3	-0.2±0.4	0.2±0.4	0.8±2.2	1.1±2.1	-0.4±1.5	-0.4±1.3	

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There was no significant difference for comparisons not marked.

choices could be observed. The pictures introduced another variable as reflected by a remark by one of the children. "Of course I can eat all that I've chosen. Those pictures are really small." The pictures were not full-size and the child thought she was choosing exactly what she saw. Even after the teacher explained that the pictures represented normal servings, the child could not imagine the amount of food she had actually chosen.

The grade 4 experimental groups did show a significant decrease in number of extra foods chosen in the post-test ($p \le 0.05$). Since there was no significant difference between M.A. experimental grade three group (group 4) and M.A. experimental grade four group (group 5), it can be assumed that the nutrition education program also influenced the number of extra foods chosen by the grade 3 experimental group.

The Free Food Meal Choice test could be redesigned in one of several ways to make it a more valid measure of willingness to respond. The ideal test would be to give each student money and send them to a cafeteria to select their own meal from the variety of foods offered. The choices would be recorded by an observer. However, since few elementary schools in British Columbia have a lunch program, such a test would be very impractical.

A second, less elaborate test could be one where full-size pictures or plastic food models were used in the same manner as used in the present study. To ensure student indication of foods which would not be eaten, the teacher could discuss quantities with each student. This would only be a practical solution where the teacher would be willing to spend the time required.

Other solutions to the Free Food Meal Choice test would be to place restrictions on the numbers of foods to be chosen, or to limit the amount of money to be spent. Although the students would then have to decide which foods he/she would really order from the menu, it might be very hard for a nine - ten year old child to make this decision (Armour, 1973) when offered the same wide variety (23 foods). It would also be necessary to limit the number of foods offered. Since the students involved in the present study were from many ethnic backgrounds, it would then become desirable to design several equal sets of food choices, each set designed for specific ethnic backgrounds.

D. 24-Hour Dietary Recall. The scoring system for this test is shown in Appendix C. The scores did not vary significantly for the grade four experimental groups. However, the grade three experimental group did improve by 4.0 points out of 25. When compared with the matched experimental grade four group, the two groups were shown to be from different populations, so it is possible that the program did have a positive influence on the grade three experimental group.

The number of extra foods chosen did not vary for any of the groups.

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Group	Group Description	Nutritious Foods Score	Number of Extra Foods
1	Q.A. Experimental Grade 4	-0.7±5.0	-0.2±1.6
3	Q.A. Control Grade 4	-0.4±3.2	0.0±1.8
5	M.A. Experimental Grade 4	1.6±2.5 —	0.7±1.7
6	M.A. Control Grade 4	-0.5±2.2	-0.4±1.6
2	Q.A. Control Grade 3	1.1±5.1	-0.8±2.0
4	M.A. Experimental Grade 3	4.0±4.0	-0.2±1.5

24-Hour Dietary Recall

There was no significant difference for comparisons not marked.

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GENERAL DISCUSSION

The foregoing discussion of results treated each of the tests and the results individually without reference to the interdependency that existed amongst them. As demonstrated by Figures 3 and 4, the learning levels tested in the present study are a hierarchy where competence or behavior at each level is determined by competence or behavior at the preceding levels.

In the present study the Knowledge test was administered to determine student competency at the knowledge level of learning in the Cognitive domain. The Analysis of Diet and Menu Planning tests were developed to evaluate comprehension in the Cognitive domain. The Analysis of Diet test evaluated the lower translation and interpretation subdivisions; the Menu Planning test measured a higher extrapolation subdivision of the comprehension level. The Menu Planning test also was designed to measure receiving behavior in the Affective domain. The second Affective domain behavior, responding, was tested by the Vegetable Attitude test, Parent Questionnaire, Free Food Meal Choice test and 24-Hour Dietary Recall. The latter two tests also measured the valuing behavior of the Affective domain.

The results of the tests generally reflect the hierarchy of learning. Except for part two of the Analysis of Diet tests, the greatest improvement was shown in the Knowledge test, and less change noted in tests for comprehension. It is also interesting to note that although more than 50 percent of the parents for groups 4 and 5 had noted a positive attitude change (willingness to respond), the students
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Behaviors in the Cognitive Domain

		APPLICATION	ANALYSIS (ability to break down a communica- tion into con-	SYNTHESIS (ability to put together parts and elements into a unified organization or whole)	EVALUATION (ability to judge the value of ideas, procedures methods, etc., using appro- priate criteria) Requires synthesis
	COMPREHENSION (ability to ap-	ideas, princi- ples, theories in particular and concrete	to make organi- zation of ideas clear)	Requires analysis	Requires analysis
	prehend what is being communi- cated and make use of the idea	situations)	Requires application	Requires application	Requires application
KNOWLEDGE (ability to recall, to bring to mind the	without relat- ing it to other ideas or material or seeing ful- lest meaning)	Requires comprehension	Requires comprehension	Requires comprehension	Requires comprehension
appropriate material)	Requires knowledge	Requires knowledge	Requires knowledge	Requires knowledge	Requires knowledge

Levels of thinking as applied to learning, using the major objectives of the cognitive domain. From Brown (1963) as adapted from Bloom (1965).

Figure 4

Behaviors in the Affective Domain

RECEIVING (Attending) (Become aware; be willing to learn and try a particular response	RESPONDING (Initially may react out of compliance, later out of willingness and satisfaction)	VALUING (The process of accepting the worth of an object, idea, or a behavior; attempting to promote it as a value; and developing commitment)	ORGANIZATION (Determining inter- relationships of values; establishing a hierarchy)	CHARACTERIZATION BY <u>A VALUE COMPLEX</u> (Generalization of selected values into controlling tenden- cies with subsequent integration into a total philosophy
-	Initially involves attending.	Initially involves attend- ing; requires a response.	Initially involves attending; requires a response and development of values.	Initially involves attending; requires a response and develop- ment and organization of values.

Modified from unpublished materials developed by Brown (19...), as adapted from Krathwohl et al. (1964).

had not accepted the worth of good nutrition sufficiently to show a significant change in their Free Food Meal Choice post-test or their 24-Hour Dietary Recall.

Table 20

Percent Change Observed from Pre-Test to Post-Test

	Group 1	Group 5	Group 4
Knowledge Test	15.0	20.8	12.4
Analysis of Diet			
Score Food Rules	18.1 22.5	7.3 37.5	7.3 -7.5
Menu Planning	5.6	3.2	3.6
Free Food Meal Choice	6.3	2.5	12.5
24-Hour Dietary Recall	-2.8	6.8	16.0
		• • • • • • • • •	
Positive Attitude Change Noted Through Parental Contact	43	57	54

Although the percent improvement results show general agreement with the levels of learning of Bloom (1965) and Krathwohl (1964), the pre- and post-test scores for the Menu-Planning, Free Food Meal Choice, Vegetable Attitude and 24-Hour Dietary Recall tests reflect more than what was being tested. As discussed earlier, the Menu-Planning and Free Food Meal Choice tests required student comprehension of the possible quantity of foods which could be consumed by a child. The Menu Planning and 24-Hour Dietary Recall tests reflected family eating patterns. The Vegetable Attitude test could not show attitude changes to any significant amount because during the experimental program only two vegetables were introduced to the children.

Despite the difficulties encountered in the evaluation, it can be concluded that the nutrition education program was effective in improving nutrition knowledge and comprehension. Behavior was also recorded through the parent questionnaire indicating that the students were willing to respond to the nutrition education program but there was no evidence indicating that the students valued a balanced diet to the extent that their real or imaginary meals were changed. These conclusions are true for both levels: grade three and grade four.

The major difference between this study and other similar programs was the inclusion of the Free Food Meal Choice test which was developed to minimize the recorded influence of family choice on student food choices. It was hoped that the results of this test might be interpreted to discover whether or not the nutrition education program had been effective in altering the student's valuing system sufficiently to modify dietary behavior. Unfortunately, the students were unable to limit the quantities of food chosen and no such interpretation can be made.

The results obtained in this study are in agreement with those of other evaluations of similar nutrition education programs. Baker (1972) taught third and fourth grade students thirty minutes each day

for thirteen consecutive days. She measured significant changes in knowledge but none in quality of diet. Lovett et al. (1970) tested second grade pupils who were taught one hour per day for three weeks. They found marked improvement in nutrition knowledge scores and ability to apply nutrition knowledge in selecting balanced meals; some improvement in breakfast habits was also noted. Bell and Lamb (1973) observed that fifth grade children who were involved in a six week nutrition education module increased their knowledge of nutrition but did not modify their behavior. Boysen and Ahrens (1972) studied second grade children whom they taught thirty minutes per day for four weeks. They noted improvements in nutrition knowledge, ability to apply knowledge and breakfast behavior. Lunch habits did not alter significantly although parents reported improvements in food attitudes at home. George (1971) reported an improvement in both nutrition knowledge and habits of sixth grade students during a nutrition education unit.

Students in all the studies cited as well as in the present study improved their nutrition knowledge scores (and in some, application of knowledge scores) significantly more than control students who did not participate in the nutrition education programs. Yet the dietary patterns of the experimental students generally did not improve significantly. Analysis of the behavioral objectives of all the studies reveals that the students were not intended to reach the highest levels of Cognitive learning (application, analysis, synthesis and evaluation) at which point there might be a direct effect on Affective behavior. Further analysis of all the programs shows that only at the knowledge and comprehension levels was the principle of appropriate repetition

(Hunter, 1972b, 1973b) followed in the learning experiences. Without repetition of application of knowledge learning experiences, elementary school age children cannot be expected to reflect modified dietary patterns. Thus even trends showing willingness to respond, as shown in this study, as well as others (Lovett et al., 1970); George, 1971; Boysen and Ahrens, 1972) demonstrate the effectiveness of the nutrition education programs and support the thesis (Travers, 1963) that a relationship exists between information acquired and Affective behavior.

The results of this study appear to have been influenced by a phenomenon similar to that reported by Emmons and Hayes (1973). They observed that the nutrition practices of mothers and their children were better than would have been suggested by their knowledge of nutrition. The subjects could name foods important to their health but few could give nutritional reasons for their importance. Food choices by mothers were based on attitudes and customs rather than knowledge. In turn, their children's food habits were being instilled without nutritional reasoning.

The students in the present study may also have made choices in the Menu Planning, Free Food Meal Choice and 24-Hour Dietary Recall tests based on tradition rather than knowledge. Such a conclusion would explain the discrepancy between the low Knowledge pre-test scores and the high pre-test scores for the above three tests.

At the outset of the project it was stated that the general objective of any nutrition education program should be the improvement of student dietary patterns where necessary. Upon review of this state-

ment and study of the results, it becomes evident that the general objective should be modified. Several reports have shown that although nutrition knowledge is valuable only to the extent that it is practiced, those with nutrition knowledge do choose more adequate diets than those without nutrition knowledge (Young et al., 1956 a-b; Jalso et al., 1965). If the general objective of a nutrition education program was only to improve dietary behavior where necessary, the results of the Menu Planning, Free Food Meal Choice and 24-Hour Dietary Recall pre-tests would have suggested that such a program would be of little benefit to the students since these scores were high. The low Knowledge pre-test scores indicated that the behavior was not based on knowledge and that a program was necessary. Therefore the general objective should be reworded to be that the students will consciously choose to consume a well balanced diet of nutritious foods according to Canada's Food Guide.

Modification of the general objective would also help direct suitable changes in the program and the evaluation measures. The major change which should be made in the program should be to include more practice in choosing and eating balanced meals. Even though purchasing foods for use in the classroom is expensive, good food habits result from repeated experience with practice of good habits. Practice with food pictures is an alternative, but practice with real food promotes lasting changes in habit (Hill, 1972).

Such a program as outlined above where practice in making food choices would be a major activity would require a much longer period of time than the six weeks allotted for the present study. The reinforcement of learning which would take place in these activities over

the entire school year would ensure the effectiveness of the program.

CHAPTER V

SUMMARY AND RECOMMENDATIONS

Summary

The effectiveness of a nutrition education program, which was developed specifically for third and fourth grade children, was tested in two Vancouver schools. The experimental program involved 117 children: 58 children were included in three control groups and received no nutrition education; 59 children were included in three experimental groups and participated in the nutrition education program for forty minutes twice each week for six weeks. Both control and experimental groups were pre- and post-tested to evaluate individual student competency at the knowledge, comprehension and willingness to respond levels of learning.

For the twenty-one variables of each group, differences between the mean post-test and the mean pre-test scores were statistically treated by analysis of variance to determine the significance of the differences.

The nutrition education program was found to improve significantly student competency for all experimental groups at the knowledge level. The one application of knowledge test, which was believed to be valid, also showed significant improvement for all experimental groups.

Comments by parents demonstrated that the students were responding at home to the nutrition education program. However there was no general indication from the results of the rest of the tests that dietary patterns had changed.

Recommendations

Following interpretation of the results, several recommendations can be made.

- The general objective of the program should be to promote student conscious choice to consume a well balanced diet of nutritious foods according to Canada's Food Guide.
- 2. Three tests should be altered to obtain more valid results.
 - (a) The Menu Planning test should be divided into a series of four smaller tests according to meals: breakfast, lunch, supper and snacks.
 - (b) The Free Food Meal Choice test should be redesigned to eliminate choice of excessive numbers of foods either through restriction or teacher guidance.
 - (c) The Menu Planning, Free Food Choice and 24-Hour Dietary Recall tests should all include questions to determine reasons for food choices.
- 3. More repetition of application of knowledge and desirable dietary patterns should be included in the program. Wherever possible, real foods should be used.
- 4. The program should be integrated into other subjects as well as treated as a separate subject, for reinforcement of learning from

one subject to another.

- 5. An animal feeding demonstration should be conducted by the students in the classroom to reinforce learning and stimulate interest.
- Teacher-parent interaction should be promoted to achieve desirable changes in food habits.
- The program is suitable for third and fourth grade students in closed or open area classrooms.
- 8. To increase the effectiveness of this program, the time period should be extended from six weeks to the entire school year.

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APPENDIX A

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LEWIN'S ATTITUDE TEST

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SAMPLE QUESTIONNAIRE

Type of questionnaire for investigating food habits suggested by Dr. Kurt Lewin of the State University of Iowa, U.S.A., with suggestions for using the answers.

1. Write down the different foods a person in a family like yours eats almost every day.

Foods	Liby-2
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the second s	

2. Both Jim and Bob stayed at friends' houses over the weekend. Monday morning they were talking about it on the way to school.

Bob said: "I had a great time because the food was just swell; each meal was wonderful?"

Jim said: "Oh, I had awful meals; the food was terrible. It was no fun at all!"

Name the foods served at the house Bob visited	Name the foods served at the house Jim visited		
Breakfast	Breakfast		
Lunch	Lunch		
Dinner	Dinner		

3. Name a food which someone in a family like yours would eat and would be praised for eating.

Food	Who would praise them?	Why would they praise?

4. Name a food which someone in a family like yours would eat and would be scolded for eating.

Food	Who would scold?	Why would they scold?

5. This question asks for the name of the respondent and data on sex, grade at school, nationality of parents, and any other relevant information by which natural groupings can be made.

The answers to Question 1 should indicate the foods which form the basic part of the diet and which arouse no conflict in the home or the community - foods that are accepted by everyone automatically. In designing an educational program, the consumption of these foods can be assumed and no teaching is needed to encourage their use. This makes it possible to simplify the program. The educator can then concentrate on teaching the use of foods which will supplement these in order to provide a wellrounded diet. The answers to Question 2 tell the educator what foods are especially esteemed; therefore, the consumption of these would be easily increased if supplies were assured. They also show which foods are despised or disliked and would therefore be difficult to popularize. Answers to Questions 3 and 4, if given by children, indicate the attitudes and reasons why certain foods are liked or disliked, or at least the reasons given by their parents. If the same questionnaire is answered by the parents, a comparison of replies may reveal interesting sidelights on the parents' attitude toward food and toward training children in eating habits. Questions 3 and 4 also indicate the person with the most authority in the household with regard to food, and hence the most important person to reach in an educational program. Question 5 gives data which enables those answering the questionnaire to be put into suitable classifications for the particular community.

Habits, likes and dislikes, and attitudes common to the group should be evident from examination of the answers. Such a questionnaire may give useful guidance on how and where to start a program of education.

(Lewin, 1943)

APPENDIX B

PRELIMINARY TESTS

Page

Knowledge Test	88
Teacher's Instructions	91
Menu Planning Test	92
Teacher's Instructions	93
Analysis of Diet Test	94
Teacher's Instructions	96
Vegetable Attitude Test	97
Teacher's Instructions	98
Free Food Meal Choice Test	99
List of Foods Offered	100
Teacher's Instructions	101
24-Hour Dietary Recall	102
Teacher's Instructions	103

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Answer all the questions as well as you can. Ask your teacher to tell you the meaning of any words that you do not know.

GROUP I

You may see more than one correct answer to these questions. Put a

check () beside each of the correct answers that you see.

1. What does the meaning of health include?

being at one's best in body

being at one's best in mind

getting along well with others

2. What are the things you need to be healthy?

adequate sleep

adequate exercise

adequate clothes

_____ adequate nutrition

friends

3. What parts of food does your body need to be healthy?

____ protein

____ fat

carbohydrate

_____ vitamins

minerals

4. Which nutrients can be used to provide energy?

____ protein

_____ carbohydrate

____fat

vitamins

minerals

GROUP II

There is only one correct answer to these questions.

Pur a check () beside the correct answer

1. What is the job of vitamins in the body?

Vitamins provide building blocks for the body to grow.

Vitamins can be used for energy.

_____ Vitamins help enzymes.

2. Which nutrients make teeth and bones hard?

calcium and iron

_____ calcium and phosphorus

_____ phosphorus and iron

GROUP III

2.

Match the correct word in the right column with the words in the left column.

1. What are the functions of the food groups? (There may be more than one correct answer)

Meat Group	1.	Build
Milk Group	2.	Repair
Vegetable Group	3.	Energy
Fruit Group	4.	Regulate
Regulate		
How does food get to be used by the body?	۲	
The food is broken into small pieces.	1.	Absorbed
The food goes from the intestine to the blood.	2.	Transported

The food goes to different 3. Digested parts of the body.

- 3. In which food groups do these foods belong? (They may belong in more than one group.)
 - Ice Cream1. Meat GroupSpinach2. Cereal GroupCornflakes3. Milk Group
 - ____ Apple
 - ____ Chicken
 - Cheese
 - Hamburger

GROUP IV

Answer these questions in your own words.

 Write the three things that help you know that someone is healthy just by looking at that person.

2. Box and Cox are two white rats. Box is fed meat, milk, bread, a fruit and a vegetable every day. Cox is fed jelly sandwiches, cake or cookies and coffee or pop every day.

Is Box healthy?

How can you tell?

Is Cox healthy?

How can you tell?

If you wanted to be healthy would you eat Box's food or Cox's food?

4. Vegetable Group

5. Fruit Group

TEACHER'S INSTRUCTIONS

Go through each question with the students to ensure that they understand what they are to do.

Give students definitions of any words they do not understand, as long as your definition does not answer that or any other question.

You may help the students with question number one in Group IV by suggesting to them that when they look at a person they see his or her hair, face, posture and how that person moves. How would these aspects of a person appear if he or she were healthy?

NAME

Put an X beside the foods that you could choose for your friend that would give him a balanced diet for one day. You may choose a food more than once by putting more than one X by that food.

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	Condu			salad		Carrots
DreaO	canay	THINK	soup	20100	JEny	
cheese	J uice	grapes	е еаs	cake	coffee	apple
E tra	eotate	bacon		Lereal	potato chios	meat
		·····			1	
	Craw and	3			- And	C) douchaut
homburger	chicken	eggs	Cocod	KOOTOID	BEEIS	uougnnui
taneaq butter sanelwich	green beins	banana	ccookies	cheese sandwich	orange	peanuts.
nch Fried tatoes	bologna	moast beef	hot dog	baked beans	fish	Fr pop
	Î	Ð			Ø	Land Ke
rice	pear	iver	hot cereal	snaghetti	tomato	celery

TEACHER'S INSTRUCTIONS

The best way to conduct this exercise will be to have the students mark what they would give their friend for breakfast, then for recess, then for lunch, then for snacks, then for supper.

They should only mark the number of foods that a ten year old could eat.

Emphasize that they should choose foods for a balanced diet, but do <u>not</u> tell them what a balanced diet is. The purpose of the question is to determine whether or not they know what a balanced diet is. 1. This is what Jan and Jill each had for breakfast.

Jan	Jill
$1^{l_2}_2$ cup tomatoe juice	¹ ₂ grapefruit
1 slice of ham	peanut butter sandwich (2 slices of bread)
2 pancakes with syrup	
1 cup of milk	i cup of mirk

Which sentence is more correct?

Jan's breakfast is more nutritious than Jill's

_____ Both breakfasts contain foods from four food groups and are adequate.

2. This is what Paul had to eat one day.

Breakfast	Lunch	Snack	Supper
Toast	Cheese Sandwich Grape Pop		Pork Chop
Butter	Apple	Mashed Potatoes	
Milk	Chocolate Cake	Bread and Butter	
	Milk		Peach Ice Cream

How many servings did Paul have from the Vegetable Group?

servings.

How many servings are recommended for children for the Vegetable Group?

two servings

_____ three servings

_____ four servings

How many more servings of vegetables does Paul need to have a balanced diet?

_____ He would not need any more servings.

_____ He would need two more servings.

He would need three more servings.

.

He would need four servings.

TEACHER'S INSTRUCTIONS

Mention that to get the answer to the last question, all the students have to do is subtract the number of vegetable servings that Paul ate from the number recommended on the Canada's Food Guide. Do not, however, tell them how many are recommended. Put an X under the face which tells how you feel when you taste these vegetables. If you have never tasted a vegetable, put an X in the Never Tasted column.

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	$\left(\begin{array}{c} \bullet \\ \bullet \end{array}\right)$	$\left(\begin{array}{c} \cdot \\ \cdot $	(••)			Novor
	\bigcirc	\bigcirc			$' \bigvee$	Tasted
Carrots					· ·	
Peas						
Beans						
Squash						
Cabbage						
Bean Sprouts						
Potatoes						
Yams						
Celery						
Lettuce						
Eggplant						
Beets						
Mushrooms						
Turnip			-			
Green Pepper						
Spinach			- ,			
Corn						
Onions						
Zucchini						
;						

You may add other vegetables to the list.

Each child must put one X for every vegetable listed. If a child thinks of another vegetable he/she may add it to the list.

You are out for dinner with a friend.

You may order whatever you wish from the menu.

Your menu is the foods in the pictures.*

On this paper, write the numbers of the foods you will choose for your dinner.

Do you like the foods that you will order?

Will you eat all that you have ordered?

* Food Models available from: Milk Foundation of British Columbia,

. . ·
List of Foods Offered for Free Meal Choice

apple	ice cream
bread	jello
broccoli	macaroni and cheese
cake	milk
candy	peanut butter sandwich
carrots	peas
chicken	pie
coffee	potato
cookies	salad
french fried potatoes	soft drink
hamburger	stew
hot dog	

TEACHER'S INSTRUCTIONS

Tell the students to take the pictures out of the envelopes.

Tell the students to look at the pictures carefully. Then read the question with them, again giving definitions where necessary.

Tell the students to pick out the foods they would like to order for one meal. Then have them put the other foods back in the envelope.

Have them answer the questions.

The foods that I have eaten since I woke up this morning are:

The foods that I have eaten for lunch and for snacks since the morning record are:

The foods that I ate between the noon record and bedtime are:

TEACHER'S INSTRUCTIONS

MORNING RECORD

When the students are ready to begin their school day, have the students write down in the space provided everything they have eaten since they woke up. Emphasize that they should write down e.g. <u>3</u> cookies, not just cookies, and if they had cereal with milk and sugar that the milk and sugar should be included.

LUNCH RECORD

This should include any food <u>eaten</u> at recess and during the lunch break. If a sandwich was eaten, the student should record how many slices of bread it included and the type of filling. Mention that they should think about what they are eating so that they will be able to record accurately all the food they eat from lunch to bedtime.

EVENING RECORD

At the beginning of the second morning, the students should record all food eaten during the afternoon, at supper and between supper and bedtime of the previous day. To help them remember go step by step from after the lunch break to bedtime.

APPENDIX C

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PRE- AND POST-TESTS

Page

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Knowledge Test	105
Teacher's Instructions	109
Scoring System	110
Menu Planning Test	111
Teacher's Instructions	112
Scoring System	113
Analysis of Diet Test	116
Teacher's Instructions	117
Scoring System	118
Vegetable Attitude Test	119
Teacher's Instructions	120
Scoring System	121
Free Food Meal Choice Test	122
List of Foods Offered	123
Teacher's Instructions	124
Scoring System	125
24-Hour Dietary Recall	127
Teacher's Instructions	128
Scoring System	129
Parent Questionnaire	130
Scoring System	131

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NAME

Answer all the questions as well as you can. Ask your teacher to tell you the meaning of any words that you do not know.

GROUP I

You may see more than one correct answer to these questions. Put a check mark () beside each of the correct answers that you see.

- 1. What does "good health" mean?
 - --- being at one's best in body
 - being at one's best in mind
 - getting along well with others
- 2. What do you need to be healthy?
 - adequate sleep
 - adequate toys
 - _____ adequate nutrition
 - adequate clothes
 - adequate books
 - adequate exercise
- 3. What parts of food does your body need to be healthy?
 - ____ protein

carbohydrate

fat

_____ vitamins

- minerals
- 4. Which nutrients can be used to provide energy?
 - ____ protein

_____ carbohydrate

____ fat

_____ vitamins

minerals

GROUP II

There is only one correct answer to these questions.

Put a checkmark () beside the correct answer.

1. What is the job of vitamins in the body?

Vitamins provide building blocks for the body to grow.

_____ Vitamins can be used for energy.

Vitamins help enzymes.

2. Which nutrients make teeth and bones hard?

calcium and iron

calcium and phosphorus

iron and phosphorus

Group III

Match the correct word in the right column with the words in the left column.

1. What Food Group is the main source of each of these nutrients?

	protein	1.	Milk Group
	calcium	2.	Fruit and Vegetable Group
	vitamins	3.	Meat Group
<u></u>	carbohydrates	4.	Cereal Group
	iron		

3. Digested

2. How does the food get to be used by the body?

- _____ The food is broken into 1. Absorbed small pieces.
- The food goes from the 2. Transported intestine to the blood.
- The food goes to different parts of the body.

3. How many servings of each of the Four Food Groups does a ten year old boy or girl need?

_____ Fruit and Vegetable Group 1.

_____ Milk Group

_____ Meat Group

____ Cereal Group

- one
- 2. one and one-half
- 3. two
- 4. three
- 5. four
- 6. five

GROUP IV

Answer these questions in your own words.

 Write the three things that tell you someone is healthy when you look at that person.

 Box and Cox are two white rats. Box is fed meat, milk, bread, a fruit or vegetable every day. Cox is fed jelly sandwiches, cake or cookies and coffee or pop every day.

Is Box healthy?

Is Cox healthy?

3. Write down the four ways your body uses food.

TEACHER'S INSTRUCTIONS

Go through each question with the students to ensure that they understand what they are to do.

Give the students definitions of any words they do not understand, as long as your definition does not answer that or any other question.

You may help the students with question number one in Group IV by suggesting to them that when they look at a person they see his or her hair, face, posture and how that person moves. How would these aspects of a person appear if he or she were healthy? .

1 point given for each correct answer. Total Points Possible: 38 points.

NAME

Put an X beside the foods that you could choose for your friend that would give him a balanced diet for one day. You may choose a food more than once by putting more than one X by that food.

				-	100	e e
bread	candy	milk	soup	salad	jelly	carrots
cheese	juice	grapes	еаs	cake	coffee	apple
E tea	رجری potato	bacon	ice. Cream	Lereal	potato chips	meat
homburger	chicken	CC CD eqqs	Loca	koolaid	beets	doughnut
peanut butter Sandwich	green beins	Denena	cookies	cheese sandwich	orange	peanuts.
nch Fried tatoes	bologna	ioast beef	hot dog	baked beans	fish	Рор
rice	Dear	(P) Liver	hot receil		Ø	A low

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TEACHER⁽⁾S INSTRUCTIONS

The best way to conduct this exercise will be to have the students mark what they would give their friend for breakfast, then for recess, then for lunch, then for snacks, then for supper.

They should only mark the number of foods that a ten year old could eat.

Emphasize that they should choose foods for a balanced diet, but do <u>not</u> tell them what a balanced diet is. The purpose of the question is to determine whether or not they know what a balanced diet is.

SCORING SYSTEM FOR THE MENU PLANNING TEST

Cereal Group: 1 point each.

bread

prepared cereal rice hot cereal hot dog bun

spaghetti

Cereal Group: 2 points each sandwiches hamburger bun

Fruit and Vegetable Group: 1 point each

soup	juice	orange
salad	potato	pear
carrots	hamburger	tomato
apple	green beans	celery
peas	banana	beets
grapes		

Meat: 1 point each

meat sandwich	peanuts	hot dog
bacon	peanut butter sandwich	fish
hamburger	bologna	baked beans
chicken	roast beef	liver
eggs		

Milk: 1 point each milk cheese ice cream cereal cocoa cheese sandwich hot cereal Extra Foods: 1 point each candy jelly coffee tea potato chips kool-aid рор Foods: two ½ points cake: cereal, extra food doughnut: cereal, extra food cookies: cereal, extra food french-fried potatoes: fruit and vegetable, extra food The total points for each food group was recorded. The diet was scored in the following way, based on the requirements of 9 - 10 year old children as described by the Daily Food Guide Score Sheet.* * Available from the Milk Foundation of British Columbia,

Cereals - 2 points each serving, maximum 6 points.

Fruits and Vegetables - 2 points each serving, plus 1 point for a

Vitamin C source, maximum 7 points.

Meat - 2 points each $\frac{1}{2}$ serving, maximum 6 points

Milk - 2 points each serving, maximum 6 points.

Total points for extra foods was recorded as scored.

This is what Paul had to eat one day:

Breakfast	Lunch	Snack	Supper
Toast Butter Milk	Cheese Sandwich Apple Chocolate Cake Milk	Grape Pop	Pork Chop Mashed Potatoes Bread and Butter Ice Cream

Name the foods that Paul ate from the:

Fruit and Vegetable Group

Milk Group

Meat Group

Cereal Group

If Paul wanted to eat a balanced diet, how many more servings does he need to eat from the:

Fruit and Vegetable Group

Milk Group

Meat Group

Cereal Group

TEACHER'S INSTRUCTIONS

Mention that to get the answer to the last question, all the students have to do is subtract the number of servings of each Food Group that Paul ate from the number recommended on Canada's Food Guide. Do not, however, tell them how many are recommended.

SCORING SYSTEM FOR THE ANALYSIS OF DIET TEST

Classification of Foods:

1 point for each correct answer.

Total possible, 11 points.

Incorrect score also totalled.

1 point for each incorrect answer.
Food Rules.

1 point for each correct answer.

Total possible, 4 points.

Put an X under the face which tells how you feel when you taste these vegetables. If you have never tasted a vegetable, put an X in the Never Tasted column.

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)(••`)(X	χ)
	\cup			\sim	$\land \bigcirc$	Never Tasted
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				··		
Peas						
Beans						
Squash						
Cabbage						
Bean Sprouts						
Potatoes						
Yams						
Celery						
Lettuce						
Eggplant						
Beets						
Mushrooms						
Turnip						
Green Pepper						
Spinach						
Corn						
Onions						
Zucchini						

You may add other vegetables to the list.

Each child must put one X for every vegetable listed. If a child thinks of another vegetable, he or she may add it to the list.

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Total number of points were recorded for each column of attitudes.

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You are out for dinner with a friend. You may order any of the foods that you see in the pictures. Put the pictures of the foods that you WILL NOT ORDER back in the envelope. Now put your dinner on your desk so that you can see all the foods that you ordered.

Do you like the foods that you ordered?

Why did you choose the foods that you ordered?

Will you be able to eat all the food that you ordered?

If you cannot eat all the food that you ordered, what will you leave?

On the pictures of the food, you can see black numbers. Write the numbers of the food that you ordered in the space below.

Put the pictures back in the envelope.

*Food Models available from: Milk -Foundation of British Columbia,

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List of Foods Offered for Free Meal Choice

apple	ice cream
bread	jello
broccoli	macaroni and cheese
cake	milk
candy	peanut butter sandwich
carrots	peas
chicken	pie
coffee	potato
cookies	salad
french fried potatoes	soft drink
hamburger	stew
hot dog	

TEACHER'S INSTRUCTIONS

Tell the students to take the pictures out of the envelopes.

Tell the students to look at the pictures carefully. Then read the questions with them, again giving definitions where necessary.

Tell the students to pick out the foods they would like to order for one meal. Then have them put the other foods back in the envelope.

Have them proceed to answer the questions.

SCORING SYSTEM FOR THE FREE FOOD MEAL CHOICE TEST

First Question

1 point for positive response.

0 points for negative response.

Second Question

1 point for "Liking" reasons.

1 point for "Health" reasons.

Third Question

No score given since the question was related to the fourth question. Fourth Question

Foods listed were scored as "Rejected Foods".

Total numbers of Rejected Foods were recorded for each food group. Fifth Question

 All foods chosen were classified into the four food groups or as an extra food.

Extra foods were classified as foods providing few nutrients for the number of calories present. Extra foods were candy, coffee, jello, lemon-meringue pie, soft drinks.

Foods which were scored as $\frac{1}{2}$ cereal and $\frac{1}{2}$ extra foods were cake and cookies. French-fried potatoes were scored as $\frac{1}{2}$ fruit and vegetable, $\frac{1}{2}$ extra food.

The food choices were scored in the following way. Cereal - 2 points for each serving, maximum 2 points. Fruits and Vegetables - 2 points each serving, maximum 2 points. Meat - 2 points each ¹/₂ serving, maximum 2 points. Milk - 2 points each serving, maximum 2 points.

Total possible score, 8 points.

The number of extra foods chosen was recorded.

 The number of rejected foods in each food group was then subtracted from the food group total.

The remaining total for each food group was scored as above to determine whether there was a difference in the scores of foods chosen and the scores of foods which would be eaten.

NAME_____

The foods that I have eaten since I woke up this morning are:

The foods that I have eaten since the Morning Record, for lunch and for snacks are:

The foods that I ate between the Noon Record and bedtime were:

TEACHER'S INSTRUCTIONS

MORNING RECORD

When the students are ready to begin their school day, have them write down in the space provided everything they have eaten since they woke up. Emphasize that they should write down quantities, e.g. $\underline{3}$ cookies, and if they had cereal with milk and sugar that the milk and sugar should be included.

LUNCH RECORD

This should include food eaten at recess and during the lunch break. If a sandwich was eaten, the student should record how many slices of bread it included and the type of filling. Mention that they should think about what they are eating after school so that they will be able to record all the food they eat from lunch to bedtime.

EVENING RECORD

At the beginning of the second morning, the students should record all food eaten during the afternoon, at supper and between supper and bedtime of the previous day. To help them remember go step by step from after the lunch break to bedtime. SCORING SYSTEM FOR THE 24-HOUR DIETARY RECALL

Each food eaten was classified into the four food groups and/or the extra food group. The total number for each of the groups was recorded. The diet was scored in the following way, based on the requirements for 9 - 10 year old children as described by the Daily Food Guide Score Sheet*. Cereals - 2 points each serving, maximum 6 points.

Fruits and Vegetables - 2 points each serving plus 1 point for a source of vitamin C, maximum 7 points.

Meat - 2 points each $\frac{1}{2}$ serving, maximum 6 points.

Milk - 2 points each serving, maximum 6 points.

*Available from the Milk -Foundation of British Columbia,

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129

VANCOUVER 8, CANADA

SCHOOL OF HOME ECONOMICS

February 28, 1973

Dear Parent:

As you know, for the past six weeks your child has been participating in a nutrition education pilot study. It would be very helpful to those conducting the study to have your answers to the following questions. Please have your child return this letter with your answers in the spaces provided, as soon as possible.

Thank you for your co-operation.

Sincerely,

(Mrs.) Joyce Mackay School of Home Economics, U. B. C.

In the past six weeks have you noticed any change in your child's attitudes or ideas about foods, or any change in your child's eating habits?

If you have noticed any change at all please describe the change.

130

SCORING SYSTEM FOR THE PARENT QUESTIONNAIRE

l point for positive attitude change; O points for negative or no change.

APPENDIX D

LESSON PLANS

LESSON PLAN 1

Generalization I To maintain optimum health one must eat a balanced diet, have adequate clothing, get enough sleep and enough exercise.

Behavioral Objectives The student will demonstrate his understanding of term 'optimum health' by drawing a picture of someone who is healthy. The picture will illustrate the following characteristics of health: shiny hair, good posture, strong teeth, clear skin, bright eyes, able to get along well with others, trying to do as well as possible and lots of energy.

Learning Activities

Time (min)	Activity	Equipment
5	Introduce the class to the purpose of the pro- gram. Ask the students what they think such a program will do for them.	
	When you think of someone really being healthy, what do you think this person looks, feels and acts like? When you think of someone being un- healthy, what do you think this person looks, feels and acts like? Write the students' answers on the board under the two headings - Health and Unhealthy.	Blackboard, Chalk
ž 2	Show pictures of people from posters and maga- zines and ask the students which ones look like healthy and unhealthy people. Ask how they can tell.	Pictures
5 10	Read pages 2-6 from Annie Apple's Gift. Ask the students to draw Annie and Prince Michael and to write which one they think is healthy and which one is unhealthy.	"Annie Apple's Gift" story*
15	Ask the students to act out these situations: You are on the playground of the school. You are just like Annie Apple and are very healthy. It is lunch time and you are playing with your other very healthy friends.	
	You are on the playground of the school. You do not have good health habits and are not as healthy as you could be. You are playing with your friends.	

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* Available from the Milk Foundation of British Columbia,

You are very healthy but you are playing with your friends who are very unhealthy.

Have the rest of the class guess who is healthy.

<u>Generalization I</u> To maintain optimum health one must eat a balanced diet, have adequate clothing, get enough sleep and enough exercise.

Behavioral Objectives The student will write the important ingredients of good health. The student will demonstrate his understanding that good health requires good health habits by comparing in class Annie Apple's health and habits with Prince Michael's health and habits. The student will demonstrate his acceptance of the importance of good health habits by comparing his or her health habits with Annie Apple and stating in class what needs, to be improved.

Learning Activities

Time (min)	Activity	Equipment
5	Read the remainder of the story Annie Apple's Gift.	"Annie Apple's Gift" story
5	Discussion of the story. Why was Annie so healthy and strong? What are some other good health habits we all should have? Did Prince Michael have any good health habits?	-
3	Read the health poem. Have the children say what the blanks should be.	Poem from the story with health habits left blank.
10	Have each student look very carefully in the mirror to decide if he or she looks healthy.	Mirrors
5	What are your health habits? Do you get enough sleep? Do you wash every day? Do you play every day? Do you wear warm clothes when you should? Do you eat fruit, vegetables, milk, meat, fish, eggs and cereal? Tell the class whether you are healthy and what you can do to improve your health habits	
12	Do you try foods that you have never tasted or do not like? Introduce zucchini using the vegetable Mystery Box.	Mystery Box
Generalization II	The body uses food for growth, for repair and for regulation.	
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Behavioral Objectives	The student will list for four functions of food in the body: growth, energy, repair and regula- tion.	

Learning Activities

Time

15

(min) Activity

Equipment

metal cup match

10 Show pictures which describe the functions of food. Have the student interpret the pictures so that they identify the functions during the discussion.

Students will: Use blocks to show how growth occurs. Use broken china and glue to demonstrate repair. Burn a peanut to learn about food and energy. Play a game without instructions, then with instructions to demonstrate regulation.

10 Discussion of food and its role in the above activities. Ask how they think these functions take place. mother's presence regulates activity. blocks broken saucer glue peanut

Pictures: baby, child,

child sitting; accident

victim; cartoon of how

adult; child running,

Generalization II The body uses food for growth, for repair, for energy and for regulation.

Behavioral Objectives The student will demonstrate attending (Krathwohl, 1964) by evaluating his/her own diet and concluding that it is important to see consequences of eliminating good foods from the diet.

Learning Activities

Time Activity (min)

Equipment

30 Students will list all foods eaten in the past 24 hours. They will then evaluate the diet as described on Guide to Good Eating Every Day*.

10 Through class discussion, discover what the students believe will happen if they don't eat properly.

*Available from the Milk Foundation of British Columbia,

Generalization II	The body uses food for growth, for repair, for energy and for regulation.	
Behavioral Objective	The student will demonstrate his understanding of	

the importance of good nutrition for optimum growth, energy, repair and health by comparing the effects of a good diet and a poor diet on two groups of white rats.

Learning Activities

Time (min)	Activity	Equipment
5	Explain the outline of the animal feeding demon- stration*	
5	Discuss the two diets to be given to the rats.	Food Models*
5	Children will name the rats.	
10	Children will weigh the rats and record the weight.	Weighing can Scale Rats Cages
10	Children will observe appearance and behavior	

10 Children will observe appearance and behavior of the rats.

* Available from the Milk Foundation of British Columbia,

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See also Harden and Lamb (1970).

<u>Ceneralization II</u>The body uses food for growth, for energy, for repair
and for regulation.Behavioral ObjectiveThe student will select simple definitions of diges-
tion, absorption and transport.

Learning Activities

Time (min) Activity Equipment 5 Discussion - when we eat a potato can we see that potato later on our body? - No! That means something must happen to the potato before our body uses it. We actually eat food to get nutrients - protein, vitamins, minerals, carbohydrate and fat, 35 Where does a potato start changing. DIGESTION plate, knife, Cut it with a knife on the plate. fork, Benedict's chew (mash with a fork). saliva - sugar test before and after. swallow - push pea down straw. stomach - acid rennet, milk - rennet, .1NHC1, milk .1NHC1, oil bile action - fat, water, detergent water, detergent, 2 jars

<u>Generalization II</u> The body uses food for growth, for energy, for repair and for regulation.

Behavioral Objective The student will select simple definitions of digestion, absorption and transport.

Learning Activities

Time

- (min) Activity
- 10 ABSORPTION -Place paper napkin over a cup, sugar on napkin, sugar, warm pour warm water over sugar. Taste sugar water water, paper in cup. napkin
- 10 TRANSPORT -Have each student feel pulse, imagine nutrients circulation being pushed through the body with each pulse. chart
- 10 Student Discussion of: digestion, absorption, transport, to reinforce simple meanings of these terms.
- 10 The five nutrients needed are: carbohydrate protein fat vitamins minerals Describe the functions of each in their bodies.

Equipment

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General	ization II	The body uses food for growth, for repair and for regulation.	, for energy
Behavic	oral Objective	The student will demonstrate his knowledg are grouped by their nutrient content by major nutrient found in each of the four	e that foods stating the food groups.
Learnin	g Activities		
Time (min)	Activity		Equipment
40	Have each stu ing tests.	dent perform at least two of the follow-	
	STARCH cookie potato orange bread macaroni milk meat cornstarch		foods, test tubes iodine
	PROTEIN		

feather	foods
hair	hot plate
meat	aluminum foil
eggs	
orange	
bread	

VITAMIN C orange apple juice (vitaminized) apple bread cheese

CALCIUM decalcify chicken bone in vinegar

chicken bone vinegar jar

foods

Generalize from the tests about how the food groups were formed:

cereal - starch or carbohydrate (plus vitamins)
fruit and vegetables - vitamins and minerals.
meat - protein and iron
milk - calcium and phosphorus

Generalization II	The body uses food for growth, for repair, for energy and for regulation.
Behavioral Objectives	The student will demonstrate his understanding of the importance of nutrients by identifying the dif- ferences between the two sets of rate on the differ- ent diets.
	The student will identify the groups to which various foods belong.
Learning Activities	

Time

(min)	Activity	Equipment
20	<pre>Students will weigh rats and record weights. Students will compare the two sets of rats: - weights - appearance - temperament - activity</pre>	rats, scale, weighing can
15	Grocery bag game to identify food groups.	coloured flash cards empty food cartons, cans, etc.
5	Mystery box - yams	hot yams cold yams

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Generalization III	A balanced daily diet must include a wide variety of foods from each of the four food groups.	
Behavioral Objectives	The student will be able to list the recommended number of servings for each food group for his/her age. The student will evaluate his/her own diet and sug- gest changes to improve it.	

Learning Activities

Time (min)	Activity	Equipment
20	Each student will list foods eaten for past 24 hours. Then score diets as shown on pamphlet - based on number of recommended servings. Change to make perfect score.	Guide to Good Eating*
20	Divide class into 5 groups. Give each group a diet. Have them make the diet a balanced one. Show and tell at the end of the period.	5 poor diets on large flashcards

* Available from the Milk Foundation of British Columbia,

Generalization IIIA balanced daily diet must include a wide variety
of foods from each of the four food groups.Behavioral ObjectiveGiven a wide variety of foods, a student will select
a balanced diet for one day.

Learning Activities

Time (min) Activity Equipment 20 Divide class into 5 groups. Food Models* Set up 5 restaurants. Choose balanced meals for whole day. Discuss choices with each group. 20 Same groups. Plan a balanced breakfast they will prepare next day. Plan who will do the work.

* Available from the Milk Foundation of British Columbia,

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Generalization III	A balanced daily diet must include a wide variety of foods from each of the four food groups.
Behavioral Objective	The student will prepare a balanced breakfast that is fun to eat and nutritious.
Learning Activities	

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Learning Activities

Time (min)	Activity	Equipment
25 25	Prepare and eat breakfast.	as listed by students

- Analyze the breakfasts 8
 - food groups
 - nutrients
 - taste good?
 - good for you?
- 7 Observe changes in rats, especially since change from poor to good diet.

Legend to Test Names

Page

LEGEND TO TEST NAMES

KNO	Knowledge Test
BDS	Menu Planning - Score
BDE	Menu Planning - Number of Extra Foods Chosen
ADC	Analysis of Diet - Number of Correct Answers
ADI	Analysis of Diet - Number of Incorrect Answers
FRS	Analysis of Diet - Food Rules Score

Free Food Meal Choice Test:

LIK	Like Reasons
HEA	Health Reasons
SWR	Score with Rejected Foods
SNR	Score without Rejected Foods
EWR	Extra Foods Chosen Including Rejected Foods
ENR	Extra Foods Chosen Without Rejected Foods
RES	24-Hour Dietary Recall Score
REE	24-Hour Dietary Recall Extra Foods

Vegetable Attitude Test:

AT1	Like Very Much
AT2	Like
AT3	Neither Like Nor Dislike
AT4	Dislike
AT5	Hate
AT6	Never Tasted
PAR	Parent Questionnaire

RAW SCORES FOR PRETESTS

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RAW SCORES FOR PRETESTS.

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65		-15	<u>5</u>		ž	0		0			2.U 	2.V	1/	5,0	2	- 5	0	1	1	9
66	15	23	20	7	Ö	4	1	Ŏ	8.0	8.0	25	25	14	10	10	1	<u>2</u>	}	ÿ //	
MEAN	13.4	21.9	2.3	6.1	a.1	0.6	0.9	õ	6.7	6.5	1.7	1.7	17.9	1.8	6.6	* 9/L	45	6 1.7	. wi 9 i	V 47 0
GROUP 4																۲ יא				5.5
67	7	14	2.0	6	1	0	1	0	8.0	8.0	3.0	3.0	15	1.0	6	1	1	2	3	6
68			0			0		0			0	0		-2.5		<u> </u>	ō		<u>3</u>	
87 7 A	14	24	1.5	4	1	0	1	0	8.0	6.0	2.0	2.0	14	2.0	6	Q	Ó	-3	4	6
	<u> </u>	21 	20	1	<u>.</u>	1	1	0	8.0	6.0	4.0	2.5	21	0	5	2	3	2	3	4
72	10	24	0	9	1	0		0	-0.0			<u>-</u>		-1.5				2	<u> </u>	
73	17	21	2.0	5	2	ĭ	1	õ	8.0	80	,9 ,6	;7 2	23 13	¢.>	¥ م	V 72	0	0	3	7
74		-23		6				0	6.0	6-0			20		Q	د ،	چ 00	4	4	1
75	16	25	.5	8	2	2	ĩ	0	8.0	8.0	25	2.5	23	2.0	13	0	0	0	0	
76	15	25	6.5	6	4	0	1	0	2.0	20	35	35	-23	.5	10	ž	ĭ	2	2	2
77	- 16	-55	-20	_7		-3	-	0	<u> 4.0 </u>		1.0	<u> 1.0 </u>	17		9				<u> </u>	-5
70	10	21	1.5	6	0	4	1	1	6-0	6.0	1.0	1.0	21	.5	13	0	0	1	1	4
(7 	TV	د ۵	2.0	4	4	Q	1	0	8.0	80	1.5	1.5	23	3.0	7	1	1	0	3	7
GROUP 5	12,4	47.A	1.8	6.0	2.0	1.0	1.0	0	6.8	6.5	1.6	1.5			8.2	0.8	0,8	1.2	2.8	5.3
80	-14	-25	3.0	-9				0		8.0			23	25	1.0		2	0	z	4
81	23	24	.5	9	2	ĩ	ī	Ō	6.0	6.0	.5	5	25	0	5	2	<u> </u>	1	2	4
82	19	20	1.0	10	0	1	1	0	6.0	6.0	Ō	Ō	17	3.0	:4	5	2	·2	4	2
83	-12	-23	1.0	9	0			Q	6.0	6.0	0	0		0	5		0	4		
84	10	25	2.5	9	1	2	1	0	8.0	8.0	0	0	21	. 3.0	5	1	3	1	4	5

RAW SCORES FOR PRETESTS

.

STUDENT NUMBER	KNO	BDS	BDE	ADC	ADI	FRS	<u>LIK</u>	HEA	9WR	SNR	EWR	ENR	RES	REE	AT1	AT2	<u>A73</u>	<u>AT4</u>	ATS	
GROUP 5	, ,									******							******			
85	16	25	.5	9	1	1	1	0	8.0	8.0	1.5	0	21	<u>.5</u>	.9	1	:0	o	- 2	7
87	14	-24	4.0	· 9	0	- 1	1	0	8.0	8.0 8.0	15	-15-		1.5	- 5		<u>1</u> z		7	
88	19	23	1.0	7	2	ō	ī	ō	8.0	8.0	5.0	45	19	-5 -5	5	1	-3	Õ	-8	5. . 2
89		25	10	10	1		0		6.0	6.0	0	0		5	8	3	4			<u>-</u> 2
91	16	·20	<i>2</i> .0 0	7	·2	1	1	0	e.u 8.0	0.0 8.0	1.0	1.0	22	20	7	2	3	0	2	7 • © :
		19	.5	10	<u> </u>			- Õ	-60-	- 6.0	0			15-	17-					
93	15	25	3.0	6	:2	1	1	0	8.0	8.0	0	0	23	5.0	11	2	0	0	5	· İ ·
GROUP 6	1 [.5	a 3. J	1.4	ی ، و	1.0	1.1	0.9	0.0	7.1	<i>η</i> ,ι	1.0	0.8	21.2	1.5	7.1	2.1	2.0	0.9	3.2	3.7
0 "				•	-						_			•						
95	15	25 	45	9		· 0	1	0	6.0	6.0	·5	رچ: <u>۱۵</u> -	18	4.0	9	2	0	1	.2	·51
96	13	23	2.5	4.	ĩ	ò	1	ò	4.0	4.0	25	25	23	6.0	9	ö	1	2	2	5
97	12	23	1.0	6	1	2	1	0	8.0	8.0	5	5	23	1.0	10	-4	4	Ū.	1	3
99	15	25	1.5		0		0	1		- 6.0		-10	23	0	Q	4 1	<u>2</u>		<u> </u>	
100	21	25	1.5	9 .	1	i	1	õ	8,0	-6.0	1.0	0	20	1.0	10	2	e 0	0	3	4
101	13	-25	1.0	7	0	- 0	1	0	8.0	8.0	1.5	1.5	23	- 5				ź		2
102	15	25	0 6.0	6 0	0 2	0	1	-0	8.0 8.0	8.0	1.0	1.0	25	.5	6	- 4 -	.4	5	2	1
104	-21	-25	6.5	9		i	0			6.0	- <u>1.5</u>		<u>18</u>			2	1	; Ç ; 0:		- 4
105	20	-25	1.5	9	0	2	1	0	8.0	8.0	1.5	1.5	18	0	.9	1	2	õ	2	5
106	10 	23	.5 	6 	0	0	1	0	80 	8.0	0	0	18	20	10	3	0	0	- Q	- 6 :
108	22	25	2.0	. 9	ž	ŏ	i	ŏ	6.0	6.0	0	0	20	0	2		2	- 2		
109	12	18	3.0	4	0	1	1	0	8.0	8.0	4.5	45	10	0	2	4	5	Ŝ	ō	3
110	20	18	20	9				0		<u>8:0</u>	<u>1</u> .5			1.5				0	3	
112	13	18	2.0	6	ŏ	ō	1	ŏ	4.0	4.0	1.0	1.0	20	1.0	9.	i i	2	. 1	1	۲ <u>۲</u>
113	13	24	5	8	- 0		1	0	4.0	4.0	- 30	-30	-20	-0	-10			0		
114	20	23	2.0	: 6 -	1	0	1	0	6.0	6.0	5	.5	19	1.0	8.	1	0-	0	5	. <u>5</u>
		18	4.0					Ö		6.0 6-0	10 	1.0 <u>1.5</u>				0	0		<u> </u>	2
117	19	25	1.5	8	1	1	Ó	1	8.0	8.0	0	Ō	24	1-0	8	1.	0	- Q -	7	3
MEAN 	16,5	23.0	2.3	7.0	0.7	0.7	0.8	0.2	6.8	6.8	1.3	1.2	20.5	1.4	8.0	2.6	1.5	1.0	J. J	3.7
EXECUTION	N ŤERMI	NATED																	·	
\$SIGNOFF																				
												-								

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RAWSCORES FOR POST TESTS

energiana POST T.ESS.TS energiana

STUDENT	KND	BDS	BDE	ADC	ADI	FRS	LIK	HEA	SWR	SNR	EWR	ENR	RES	REE	AT 1	AT2	AT3	AT4	AT5	AT6	PAR
GROUP 1						-															
	-28	25	0	9	0	1	1	0	8.0				55		5			0			-0
S.	22	25	2.5	6	1	0	- 1	0	6,0	6.0	2.5	2.5	4	1.0	14	۰ 5 -	Ō	0	0	0	0
	24	.24	.5	8	0	1	1	0	60	6.0	1.0	1.0	22	0	5	7	2	• 3	1 -	1	0
4	30	25	0	10	0		0		8.0	80	0	0		5	10		0			3	
5	21	22	1.0	8	1	1	0	1 -	4.0	40	.5	-5	55	0	.9	1	1	0	6	:2	1
· · · · ·		<u> </u>	 	4 ·		1	1	0	8.0	8.0	0	0	16	2.0	: b	4	-3	1	2	3	0
8	22	10	1.0	7	Ň	ie O	1 4	0	80	80	25	25	14	30	0	<u> </u>	c				0
ő	15	21	1.0	7	Ň	. V A	*	Ő	80	80	20	20	25	C.V 1 S	i) Eta	2	· ⊃ '	1	0	4	
10					0	t		0	70					1.9 0	·) 3			` ?	9 	0	
11	15	25	75	5	5	í	i	1	8.0	8.0	35	35	16	.30	5	5	3	2	2	2	0
12	18	24	1.5	8	õ	ĩ	ō	ī	8,0	8.0	3.0	3.0	19	0	.6.	. 3	- 4	0	3	3	0
	-26	-23	1.0	10				0	6.0	4.0	5		17	-25	<u>-12</u>	- 2/				<u>i</u>	o
14	32	-24	0	8	0	3	1	0	6.0	6.0	,5	5	25	1.0	10	· 4.	2	1	1	ĩ	0
15	14	-24	.5	4	0	2	1	0	8.0	8.0	2.0	:5	20	0	4	:2	2	1	.3	7	0
16			<u>.</u> 5	10		1	0					5			9			0	3		
···· 17	23	23	.5	10	0	- 3	0	1	6.0	6.0	1.0	0	25	0	12	0	0	0	5	:2:	0
18	15	22	1.0	7	0	5	1	- 0	8.0	8.0	1.0	.5	25	20	19	0	0	0	-0	0	1
19	23	23	1.0	<u>نې</u>		0	1	0	- 8.0	8.0	1.0							0			0
20	20	24	1.0	1	2	0	1	Q.	8.0	8,0	25	1.5	19	20	8	4 -	. 4	-1	1	1	0
<u>د ا</u> 	 ₹			1 U		4	0	1	6.0	60	1.0	1.0	41	1.0	3	4	- 4	:3	3	5	1
23 (23	15	シス	1.0	7	1	0	1	0	80	80	10	10	- 27	1.0	10	i	Q	0	1		
24	13	21	1.5	4	+ 1	õ	1	0	80 80	80	140	1.0	22	1.0	10	•	v o	v o	0	· 2	1
		-21	30	 	i				<u> </u>		Ò	Ŏ	+2	4.0 	<u>1</u>	5	()	7	2		
26	12	24	0	-6	ō	õ	ō	. 1	60	6.0	õ	õ	14	0	14	0	. 0	0	.1 .1	ц Ц	1
27	20	22	1.5	7	.2	Ŏ.	1	ō	80	80	0	ŏ	4	ŏ	-5	i	-4	1	2	6:	i
		-24	5	6	0		<u>1</u>	0			0	Ò	-16		6	<u> </u>	5	.	<u> </u>	2	Ò
29	29	23	0	9	0	4	1	0	8.0	8.0	0	Ó	18	.5	14	ž	1	- Õ	ī	. 1	1
-30	19	12	1.5	6	2	2	1	Q	80	8.0	.5	·,S	20	30	2	1	3	1	.8.	4	0
	18	25	.5			0	1	0	8.0	80	0	0	16	-20		<u>3</u> :		0	7	<u> 5 </u>	
32	20	25	-5	7	0	4	1	0	8.0	8-0	1.0	1.0	23	1,0	6	4	2	3	2	2	1
MEAN	20.7	a a.7	1.2	1.3	0.8	6.4	0.8	0.3	7.3	7.2	1.0	0.8	17.6	1.2	7.7	2.6	2.1	0.9	3.0	2.5	0.4
GRUUP 2					*****			*****											·····		
. 3.3	13	25	50	5	1	1	4	â	60	60	- 9 E -	24	14.	Δ		Δ	72	· 9	^		<u>^</u>
	-+2			7		0	+		80			2.5	18		Ś	U 4	2 2	2 C	0		0
35	:21	24	.5	ú.	õ	1	1	0	80	80	20	10	18	45	- <u>-</u>	<u> </u>	<u>ر الم</u>	0		<u> </u>	0
36	14	25	35	4	ō	ō	1	Ő	80	8.0	30	30	18	10	Ц.	5		ő	.و. ۱	8	
		-25				0	<u> </u>	Ō		60			-19	0	Q		2			<u>4</u>	O
38	14	20	5.0	6	4	1	Ō	1	8.0	6.0	1.0	1.0	18:	20	4	4	4	2	1	4	ī
39	9	23	3.5	.3	1	0	1	Ō	8.0	8.0	30	20	8	0	.3	1	2	1	-8	4	0
40	11	25	-3.0			0	1	0	8.0		-1.0	0	-22		7	<u> </u>	_2	ō			Ō
41	14	25	4.5	5	0	0	1 1 -	0	8.0	8,0	50	5.0	13	0	7	2	0	0	1	9	0
42	13	23	3.0	8	2	2	1	0	8.0	80	0	0	21	0	8	1	1	1	1	7	٥
43	10		-1.0					0			-25	25	12	1.0	77		0	1	3	4	0
44	7	23	50	6	1	0	1	0	60	6.0	25	25	19	.5	-3	1	0	0	• 6	9	
43	17	67	3.0	ø	1	U	1	Q	8,0	8.0	1.5	15	18	0	10	1	1	0	.3	4	Ö

RAWSCORES FOR POST TESTS

STUDENT

NUMBER

KNO BDS: BDE SNR ADC ADI FRS LIK HEA SWR EWR ENR REE AT1 AT2 AT3 RES: AT4 AT5 AT6

GROUP	2																					
	20			<u> </u>			<u> </u>		- 60-												t	
47	-12	25	55	- 3	2	Õ	1	ŏ	8.0	8.0	3.0	3.0	24	1.0	7	6	4	.1	ŏ	1	0	
-48	9	25	45	6	5	0	1	0	8.0	8.0	4.5	4.5	22	0	8	Ō	2	Ś	1	6	i i	
MEAN	9 13.1	20 23.8	1.0 3.2	5.4	1.9	0 	0.9	0.0				.5 2.0	18	0	8		0				 	
GROUP	3 <u>(</u>												• • • •	0.0	0.0	<i>w.</i>	140	0.7	<i>a</i> .0	0.2	0.2	
50	12	24	. 3.0	6	5	- 0	1	0	40	40	-25	25	16	15	4	2	:3	. 3	2	S		1
51	13	25	3.0	- 5	Ô,	1	ĩ	Ő	6.0	6.0	3.5	35	20	35	8	2	Ō	ō	7	ź	Ð	
52	17-		5.5	4		0					0	0			7	<u> </u>	7	0	3	0		
- 53	16 16	25	<i>6</i> .9	7	4	1	1	0 0/	8.0 6.0	8,0	.5	20 20	19	1.0	-3	2	. 4	:2	5	-3	0	
	16	- 24	Ś	6			i		- 8.0			3.5	-23	<u></u>				3				_ '
56	- 13	25	25	6	0	2	1	0	8,0	6.0	.5	.5	16	1.0	2	3	3	1	1	9	Ô,	
57	17	23	35	. 7	2	0	1	0	4.0	2.0	30	-30	21	1.0	5	3	4	1	.5	4.	1	
.90	14	25	- 1.5 -	- Q	C	1	1	0	2.0	80	35	10	1.8		14			2		<u>9</u>	0	
60	17	25	3.5	7	2	õ	i	÷Ö	8.0	8.0	3.0	3.0	20	60	6	2	- 4	1	3	3		1
61	17	25		6	6	0		0	8.0	8.0	15		16	1.0			- 1	2		<u> </u>		- '
62	16	-25	5.0	5	4	0	1	0	6.0	6.0	25	:2.5	20	1.0	5	.2.	S	3	5	5	Ó	
					<u>1</u> ————————————————————————————————————	0	1	U 0					18		8	1	0.	0	.4.	6		
65	14	21	1-0	-8	2	1	i	ŏ	20	2.0	3.0	3.0	18	2.0	5	i	2	2	5	4	0	
66	15	21	2.0	8	1	0	1	Ó	8.0	8.0	30	3.0	1.4	2.0	9	ō	0	0	2	8	õ	
MEAN	14.5	23.6	2.6	6.2	2.5	0.4	1.0	0.0	6.5	6.2	2.0	2.0	17.5	1.8	5.5	2.0	2.1	1.2	3.1	5.0	0.2	- '
GRUUP	· •										-										1	
67	19-		3.0	3		0		0	- 0.8	8.0				1.0			2	3		2	Ó	_ 1
68	21	25	0	8	1	0	1	0	8.0	8.0	0	0	25	Q .	6	1	0	5	4	-3	0	
	19		2.0	· 8.		0	1	0	80	8.0	1.0	1.0	25	1.0	7	0	0	×0	3	9	0	
70	14	16	4.5	1	2	õ	1	ò	60	6.0	0	. 0 .	15	10	A A	2	0	0	<u>_</u>	5		
72	16	25	Ō	11	. 1	.2	ō	1	8.0	8.0	1.0	1.0	19	15	13	Ö	Ö	ŏ	2	. 4	0	
73-				5		0		0			0		23	0			2		1	<u> </u>		_ (
74	19	25 23	0	7	1	2	1	0	8,0	8.0	5	.5	25	25	12	0	i i ĝi	0	-4	3	1	
		21	ŏ	7		<u>1</u>	<u>i</u>	0	- 8.0	80			2 <u>5</u>	- <u></u>			• 2). 	<u> </u>	<u> </u>	~64 ± 1		
77	20	23	2.0	9	Ż	2	ī	Ō	8.0	8.0	35	35	25	Ō	13	0	0	- 1	3	2	1	
78	16	25	2.5	9	1	2	1	1	6.0	6.0	2.0	1.0	23	2.0	11	2	2	2	Ó	2	i	
24	10	25	1.0	4	2	0	1	0	8.0	8.0	0.5			5	9			0	4		<u>0</u>	-
GROUP	5	4 .۵.۱	1.2	8.9	[].(s	0,8	0.8	0:2	7.5	7.5	1.2.	1.1	22.7	1.0	8.8	2.1	1./	1.1	2.9	3.0	0.5	
80	22	20	0	-9	2	2	1	0	8.0	8.0	1.5	15	21	3.0	12	2.	0	0	·2.	.3	1	1
81	29	25	1.0	10	Ō	.3	ī	Ô	80	8.0	0	0	25	15	-4	3		1	4	1	0	
82	24	25	2,0		0	<u>3</u>		0	-80	8.0	1.0				<u> </u>	<u>5</u>			<u>3</u>			-
0.) 8.4	17	27	1.0	10	1 ·	~1 - 4	1	0 1	-60	6.0	0	0	25	1.0	· 7 · 2	3		× 3 //	:2,	2	0 2	
	~ 1	. 5.	لية. 	÷ V	v	म्म	+	•	9.7	- cr.A	v	- V	4 7	: > >	6	-	6 4 (· **	E	2 2 1	0)

153

PAR

RAW SCORES FOR POST TESTS

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STUDENT NUMBER	KNO	BDS	BDE	ADC	ADI	FRS	L1K	HEA	SWR	SNR	EWR	ENR	RES.	REE	AT1	AT2	AT3	AT4	AT5	AT6	PAR
GROUP 5:						-															
85	-21	25	1.0	10	0	-2	0		8.0	8.0	0		-25	-30	14	0		<u>0</u>	<u>1</u>		
86	:25	25	10	7	0	2	0	1	80	8.0	1.0	10	20	3.0	8	ĩ	.1	0	5	4	1
87	27	24	15	-9	0	: 4	1	0	8.0	8.0	.5	.5	24	0	. 4	7	5	-3	0	3	t
66	30	25	0	8			0		8.0	8.0	-1.0		-53		8	0	0		6	·····	
07	-24	25	<u>ح</u> مد	10	0	\$	1	1	8.0	8,0	0	0	24	1.0	9	3	4	-3	0	0	1
		 2		Q	0	4 	1	0	8.0	6.0	1,5	1.0	25	45	8	1	4	1	3	2	1
92	29	25	1.0	11	1	ц. Ц		0	80	QV 80	<u>2</u> .0	2.0	25	1.9	10	2	. 2:			<u>5</u>	-0
93	23	22	1.0	8	1	0	0	1	6.0	60	1.0	1.0	25	30	17	۷ چ	0	0	•	. Q	
MEAN	25.1	84.1	0.9	9.4	0.5	2.6	0.7				67				45	· 6; ·	V.	· V	•	· • • • •	<u> </u>
GROUP 6		•••	•	•••		w.w	0.7	0.4	7.4	.1.3	0.7	و).ت	22.9	a.a	ð.0	a.4	a.O	1.6	a.(,	ą .4	0.6
94	18	25	2.0	10	1	0	-1:	0	6.0	6,0	1.5	15	- 20	1.0		- 2		0			
95	17	25	2.0	6	0	0	0	1	60	60	2.0	1.0	24	1.0	5	2	. 1	.4	5	2	0
96	14	25	1.0	9	2	0	1	0	6.0	6.0	0	0	21	1.0	8	1	2	2	2.	4	0
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99	12	25	55	9 8.	1	•	U .	1	80	6,U 8,0	ູງຊະ	16	50	0	- 9 -	- 4	2	2	1	1	0
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107	10	25	1.5	7	1	0	1	0	7.0	7.0	.5	.5	18	1.0	6	4	- 1	1	2	5	Ô
100 			2,V 	0 3	<u>د</u> مسلم ک	1 ·	1	0	6.0	6.0	20	2.0	17	20	3	. 4	2	2	-4	4.	0
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114	21	23	3.0	- 7	2	0	1	0	7.0	6.0	20	20	20	2.0	10	7	1	ō	ō	1	0
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116	12	19	3.5	6	. 0	1	0	1	8.0	8.0	5	.5	23	1.0	10	0	Ó	- 0	7	2	0
117	19	25	1.0	8	3	0	0	1 :	8-0	8.0	5	.5	22	5	14	0	0	- 0	1	×4	1
STOP	14.2	22:7	1.9	7.4	1.0	0.5	0.8	0.4	6.9	6.8	1.3	1.0	20.0	1.0	7.4	3.1	1.6		2.1	3.6	0.3
EXECUTION	TERMI	NATED	·												- •		-		-	-,-	
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