ROE, Donna V. The effect of an educational unit on the knowledge and breakfast eating behavior of college students. M.S. in Health Education, 1979. 49 p. (Dr. John Leary)

This study used 45 University of Wisconsin - Stout students, ages 18 to 25, enrolled in two Health Survey 366-101 classes. The design used was the pretest, posttest control design. One class, the treatment group, received a 3-day educational unit in nutrition. Each class completed a pretest and a posttest knowledge questionnaire and at the same time recorded their food intake for the previous 24-hour periods. The results were used to assess breakfast eating behavior. Knowledge increase was significant ($p < .05$). Adequate breakfast eating behavior, defined as meeting one-fourth of the Recommended Daily Dietary Allowances of the National Academy of Sciences, did not show any improvement. There was no correlation between the level of knowledge and breakfast eating behavior following this educational unit.

THE EFFECT OF AN EDUCATIONAL UNIT ON THE KNOWLEDGE AND BREAKFAST EATING BEHAVIOR OF COLLEGE STUDENTS

A Seminar Presented

to

The Graduate Faculty

In Partial Fulfillment

of the Requirements for the

Master of Science Degree

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by

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TABLE OF CONTENTS

LIST OF TABLES

TABLE

CHAPTER I

INTRODUCTION

Health Survey, course number 366-101, at the University of Wisconsin - Stout, is a one-credit course required for most major areas of study at the University. It meets for two hours each week for one quarter of a semester, or a total of sixteen to eighteen sessions. According to the University catalog, an objective for the course is its concern for "The relationship of personal health to the whole person." Within that framework an attempt is made to cover such units of study as Mental and Emotional Health, Drugs and Alcohol, Nutrition, Physical Fitness, Heart Disease, and Human Sexuality. Its goal is to improve the health knowledge, health attitudes, and health behavior of the students enrolled at the University.

The Need for the Study

There is a constant need to evaluate and assess courses of study in any educational setting. This may help to determine the needs of students and may also lead to discoveries of how the teaching may be more effective in terms of material and/or methods to best meet these needs. This is especially true of those courses that are regarded as being of such importance that they are required to be taken even by those majoring outside its particular discipline. This is the case with Health Survey, 366-101.

The question arises as to the effectiveness of a course which attempts to cover such an extensive area of study in such limited class time. Being an introduction or overview of the material it might be expected that the "health knowledge" of the students would be improved, But, should the more difficult change in "attitude" or personal "health behavior" be expected in the light of the cursory nature with which the subject material must be handled?

Purpose of the Study

The purpose of this study was to determine whether or not a teaching unit of limited duration (three to four sessions) in a Health Survey Course at the University of Wisconsin - Stout would result in desirable change in behavior. The specific unit to be measured was a Nutrition Unit and the specific behavior change desired was that of breakfast eating.

The Nutrition Unit studied was a part of the curriculum of the Health Survey Course 366-101. Each unit in the Health Survey Course was of similar duration in length, i.e., three to four class sessions. Each unit was taught by the same instructor and was structured in essentially the same way using reading assignments, lecture and small group decision-making activities. The intent of the entire course and subsequently of each unit was to improve knowledge of health and also emphasized improvement of health practices in daily living. It does not purport to determine whether such a course should be retained or not in its present format or whether the basic purpose of the course should be altered. This study, then, was an attempt to provide helpful data that pertains to only one of

the facets of concern that are necessary to adequately evaluate a course of study.

The unit on nutrition was selected since it is an area in which all people are daily involved and is measurable. Breakfast eating was selected because it is important nutritionally and yet is often neglected or misused. Change in behavior was to be assessed, because it is an indicator of effective teaching-learning, moving beyond the accumulation of head knowledge to that of attitude and action.

The desired behavior in breakfast eating for this educational unit was the provision of one-fourth of the Recommended Dietary Allowances set forth by the Food and Nutrition Board, National Research Council, The National Academy of Sciences.

The specific purposes were to:

1. Measure the nutrition knowledge level of college students before and after a course in Health Survey, 366-101.
2. To determine whether or not the breakfast meal was eaten before and after a course in Health Survey, 366-101.
3. To determine whether or not the breakfast meal eaten was adequate before and after a course in Health Survey, 366-101.

Hypotheses

The following were the null hypotheses of this study and were tested at the .05 level of significance.

1. There will be no significant change at the .05 level of probability in nutrition knowledge among college students as a result of a nutrition education unit in Health Survey, 366-101.
2. There will be no significant change at the .05 level of probability in breakfast eating behavior among college students as a

result of a nutrition education unit in Health Survey, 366-101.

Delimitation

The study uses only a unique population of University of Wisconsin - Stout students enrolled in Health Survey, 366-101, and cannot be generalized to a different group or setting.

Limitations

1. The knowledge test for this study was written by the instructor since no test with established validity was found that would be applicable. Content validity was established by comparing the test questions with the course objectives. It was not possible to test the concurrent or predictive validity.
2. The students in Health Survey, 366-101, sections were not randomly selected. The study used existing populations.

Definitions of Terms

Health Survey Course, 366-101: A one-credit personal health course offered at the University of Wisconsin - Stout and required for graduation in the majority of major areas of study. The class meets for one hour two days per week for eight or nine weeks.

Nutrition Unit: A teaching unit within the Health Survey, 366-101, Course. The unit is conducted three to four class sessions. Behavioral objectives for the unit are found in Appendix A.

Twenty-four Hour Recall Method: A measurement tool designed to estimate the quality and quantity of the past day's food intake.

Desired Breakfast Eating Behavior: Provision for one-fourth of the Recommended Dietary Allowances for the individual.

Recommended Dietary Allowances: Recommendations for daily consumption of various nutrients established by the National Research Council, Food and Nutrition Board of the National Academy of Science.

CHAPTER II

REVIEW OF RELATED LITERATURE

As students enter the college environment life changes abruptly. Independence and freedom of choice are thrust upon students in many areas of life. Of particular interest is that of food consumption as the student is no longer in a home situation where the majority had meals selected, prepared, and provided for them.

Incidence of Poor Nutrition

In the book, Nutrition, Behavior and Change, the author (Gifft, et al., 1971) indicated that eating habits develop through many inter-related factors. Some of these factors involve sound nutritional basis such as nutrition education and parental guidance. However, many factors may offer less than adequate nutrition such as commercials, traditional or cultural aspects of food choices or popular fads (Leverton, 1965).

Poor nutrition occurs in all age groups and at all socio-economic levels of the American population (Leverton, 1965; Cooksey, 1963). Studies involving teen-age populations have indicated that the nutritional intake of an increasingly larger proportion of teenagers has been less than optimal (Eppright, 1959; Brown, 1967; Shoor, 1972; Harris, 1970). This evidence is significatnt in that these are the years during which the individual begins to take primary responsibility for his choices (Kilcoyne, 1975).

This evidence also indicates that lack of nutrition education may be one of the major causative factors in the development of poor eating habits. At the 1971 National Nutrition Education Conference it was agreed that lack of motivation and nutrition knowledge were largely responsible for the poor food habits of teenagers (Breakfasts are Basic, 1954; Bowes, 1959).

This study focuses on the young adult since in recent years the impact of the need for nutritional education has grown (Iowa Breakfast Studies, 1967; Mayer, 1978) and emphasis on nutrition as a behavioral science may provide impetus in motivating people to apply sound nutritional information to eating habits.

There are several factors affecting the food intake of college students. One is a concern for weight gain. This is perhaps more true of women than it is of men as was shown in a study of teenage girls who stated that the main reason for omitting one or more food groups was a fear of gaining weight (Hampton, 1967). The meal most often missed was the breakfast meal (70 percent of those considered overweight) (Wakefield, 1971).

In a recent survey taken during the Spring semester, 1978 Health Survey Course at the University of Wisconsin - Stout, reasons given for not eating breakfast included, fear of weight gain, not enough time, not hungry, not liking the food service breakfast, and financial reasons. It was observed, however, that several of these same students were finishing a can of pop as they entered the classroom at 9:00 a.m.

Importance of the Breakfast Meal

Breakfast then warrants special emphasis since it is the meal most often skipped by children and adults alike (Wen, 1975; Woody, 1973).

By eating a good breakfast the long fast is ended and the nutrients provided to meet the demands of a new day are supplied. The importance of eating a good breakfast has been established by scientific studies which have determined the effects of different breakfast habits on one's nutritional status, physiological responses, attitudes, scholastic achievements and efficiency of work (Iowa Breakfast Studies, 1976; Tuttle, Daum, Myers, Martin, 1950; Tuttle, Wilson, Daum, 1949).

Studies also show that without an adequate breakfast one-fourth to one-third of the nutrients needed for the day are not consumed, and these nutrients are not made up for the other two meals (Kilcoyne, 1975; Woody, 1973).

Men react to the omission of breakfast in a more pronounced fashion than women (tuttle, et al., 1950). They not only complained of being hungry but also showed rather violent fatigue ractions following strenuous work.

A cup of black coffee alone proved to be more detrimental to physical and mental efficiency than no breakfast at all. A group of women ages 18 to 25 given black coffee without sugar showed an increase in tremor magnitude, decrease in maximum work output, and in 45 percent of the cases the reaction time increased over the responses of those who had taken no food or drink (Tuttle, Daum, Imig, Martin, and Kisgen, 1951).

Since coffee is a frequent breakfast substitute for busy college students these findings are emphasized.

Frequently when breakfast is omitted individuals consume quick snacks to satisfy hunger pangs. These snacks may furnish as much as 15 percent of total calories for the day with a marked absence of some essential nutrients (Hinton, Eppright, Chadderdon, and Wolins, 1963).

Good Breakfast

There are two different standards used in determining a good breakfast. One is the basic breakfast pattern, which depends on the nutritive quality of the food eaten for breakfast. The other is the recommended dietary allowances, which depends on the quantity of food eaten for breakfast.

A basic breakfast will include servings from the four food groups in the Daily Good Guide (Leverton, 1965; Harris, 1970). It includes (1) fruit or fruit juice, (2) egg, or cereal with milk, or meat, (3) milk, (4) whole-grained or enriched bread with butter.

Of the four food groups, fruits are important carriers of minerals, vitamins and fibers. Citrus fruits and juices are good sources of Vitamin C, while dried fruits are good sources of iron.

Eggs and meats are valuable sources of protein, iron, and certain other minerals and vitamins. Eggs also are a good source of Vitamin A.

Whole grain and restored cereals supply energy, some protein, iron and "B" vitamins. Fortified cereals furnish important amounts of other essential nutrients. Whole grain and enriched breadstuffs contribute energy and vitamins and minerals.

Milk and milk beverages are good sources of protein, calcium, and riboflavin. Whole milk also supplies Vitamin A and most milk is fortified with Vitamin D.

Recommended Dietary Allowances

The recommended dietary allowances provide that one-fourth to one-third of the day's total nutritional requirements be supplied in this meal (CRM, 1978; Guthrie, 1975; Roper, 1952). The amount of nutritional recommendations depend on the age, weight, and sex of the individuals. Appendix B recommended breakfast allowances for women aged 18 to 27 years. Appendix C gives the recommended breakfast allowances for men aged 18 to 27 years old.

Change of Behavior

Motivating people to change their attitudes and eating patterns is an extremely difficult thing to accomplish (Sipple, 1971). The public is exposed to a copious amount of nutrition information via television, newspapers, journals, etc., and yet according to the United States Department of Agriculture's 1965 Household Food Consumption Survey, overall consumption patterns have not improved.

Part of this problem is that the public receives conflicting information. Some media reports can be responsible reporting based upon scientific research, but much of the media time is devoted to advertisements which may result in misconceptions about nutrition (Baker, 1972).

Maintaining good health is a goal of most people. It could then be

assumed that with an increase in knowledge about maintaining proper nutritional health, there would be a related increase in meeting these nutritional requirements. Results of education programs, however, show conflicting results. In some cases, acquisition of knowledge has not necessarily resulted in application of that knowledge in dietary practice (Roper, 1952; Sipple, 1971; Baker, 1972; Boone, 1976; Kilcoyne, 1976).

Conversely, some researchers did find change in dietary habits after an education unit in nutrition. In some studies the changes were noted immediately following the unit (Roth, 1976; Cooper, 1974), while another looked at sustained behavior change after a four-month period and noted some regression but not to the extent observed prior to the educational exposure (Gassie, 1972). Of particular interest in the Cooper (1974) study was the inclusion of an evaluation of teacher workshop training preceding the teaching unit. Because of the success of this unit in changing dietary habits one might suggest that teacher enthusiasm and confidence in the subject matter could be a motivational factor for the students.

There is widespread lack of consistent correlation between the nutrition facts students acquire and the application of nutrition information outside the classroom (Poolton, 1972). A student may learn facts about nutrition but it is his or her attitude toward nutrition and health that will determine whether or not the knowledge will be applied in food selection.

Positive results were reported from incorporating a breakfast

service program in a high school (Bradley, 1964). Academic grades and attitudes about nutrition improved, and some students were able to reduce excess weight as a result of participation. This suggests that when made available, students will avail themselves of the opportunity to eat breakfast and react favorably as they observe positive components of daily living for themselves as a result of eating a nutritious breakfast.

To be successful in teaching nutrition the educational process must convert nutrition as a science to nutrition as an applicable body of information readily useable by all people (Blackburn, 1970). In an effort to accomplish thisthe discussion method of teaching with concepts of group decision making has resulted in greater increase in knowledge and attitude than lecture methods (Radke and Caso, 1948; Lewin, 1943). Also, students in group decision making were more willing to change eating habits (more eager to attain <u>their</u> goal), and more satisfied with the level of the goal than were members of the group where the goal was requested by the lecturer.

Eating patterns learned and established throughout the childhood and adolescent years are carried over into adult years (Kilcoyne, 1976), and researchers understandably stress early education to establish sound attitudes, knowledge, and behavior (Owen, 1969; Kilcoyne, 1975; Cooper, 1974). As educators, however, we cannot ignore the need for education at the young adult level to compensate for a possible lack of earlier education. In general, studies of nutritional knowledge show that as the level of education increases, the level of nutrition knowledge also increases (Wakefield, 1971). Recent information also implicates diet

in six of our leading causes of death (Mayer, 1978). With this information and the recent findings about the close association between life style and health in general, college students may have a renewed interest in diet and motivation to improve eating habits.

Twenty-four Hour Recall Method

It has been difficult to find a fully reliable, valid, easy, and inexpensive way to determine the past food intake of a population group.

In most surveys, the procedure used is to assess the usual dietary intake during a specific time, usually longer than one or two days. Besides being time consuming and expensive, Becker, Indik, and Beeukes (1960) demonstrated with a memory curve how fast a person "forgets" information over a period of time and that the rate of forgetting is a negatively accelerating curve.

The 24-hour recall method, believed to have been originated by D. G. Wiehl in 1942 (Young, Hagen, Tucker, and Foster, 1952), is a measurement tool designed to estimate the quality and quantity of the past day's food intake. The measurements are obtained through an interview or a questionnaire. The individual is asked to recall and report everything he or she ate and drank during the whole previous day. This dietary tool is widely used in dietary or food consumption surveys of population groups under field conditions. The objectives of such surveys are either to assess nutrient intake, or food patterns and habits, or food availability. Reasons for the common use of the 24-hour recall method are that it is fast, inexpensive, and convenient and can be easily applied to almost any

population group. Results from several comparison studies show that the method seems to be similar enough to more expensive and elaborate ones and is farily accurate for mean estimation of groups of people (Young, et al., 1960; Pekkarinen, 1970).

The 24-hour recall method is farily accurate in obtaining the number of food items consumed and is therefore best employed for qualitative analysis of food intake. It has also been shown that on a meal basis, breakfast was very well remembered (95 percent) while the ability to recall dinner was low (68 percent) (Linussen, 1973).

CHAPTER III

METHODOLOGY

The purpose of this study was to determine whether or not a teaching unit of limited duration (three to four sessions) in a Health Survey Course, 366-101, at the University of Wisconsin - Stout would result in an increase of nutrition knowledge and in desirable change in behavior. The specific unit to be measured was a Nutrition Unit, and the specific behavior change was that of breakfast eating.

Subject Selection

The target population for this study was students aged 18 to 25 years who were enrolled in Health Survey Course, 366-101, at the University of Wisconsin - Stout during the first half of the second semester of the 1978-1979 academic year. The two sections selected met at 9:00 a.m. and 10:00 a.m. on Tuesday and Thursday mornings. The class enrollments were 32 for the 9:00 a.m. section and 30 for the 10:00 a.m. section. The students enrolled in Health Survey, 366-101, classes were required to take this course for their major areas of concentration. They came from all departments of the University and were both male and female. Thus, a wide range of interests and backgrounds was provided. Some lived in dormitories and ate most of their meals on campus at the University Food Service, and others lived off-campus in houses or apartments and may have prepared

some of their own meals. Their eating habits prior to coming to the University also were varied.

Procedures

The study design used was a pretest, posttest control design. One Health Survey, 366-101, class was the treatment group and the other class was the control group. Both classes were asked to fill out a 24-hour recall of their diet the previous day. The pretest and posttest 24-hour recall questionnaire were both administered on a Thursday for each group. The form used is found in Appendix D. Instructions for filling in the 24-hour recall are included at the beginning of the form. The entire 24-hour period of recall was used so the students would not be aware that the particular meal being studied was breakfast. The recall method was used rather than recording food intake as it was eaten, to avoid the Hawthorne Effect. At the same time, a nutrition knowledge pretest was given (Appendix E). Included in the knowledge test was a personal inventory questionnaire which provided information about the following variables: age, sex, residence, where meals were eaten, and whether or not breakfast was eaten in the formative years.

One Health Survey class was then involved in a 3-day nutrition education unit based on the objectives for the nutrition unit which were established by the instructor as a part of the entire Health Survey, 366-101 course. These objectives are found in Appendix A.

The other Health Survey, 366-101, class received a 3-day unit in another area of Health Education. Each class then filled out the 24-hour

recall form for the previous day and completed the nutrition knowledge test. They were informed that their grades would not be influenced or determined by the answers on any of these surveys. Each of the Health Survey, 366-101, sections was taught by the same instructor.

Instrumentation

Both treatment and control groups were asked to recall everything they had eaten during the previous 24-hour period and to write down the item and the amount eaten. The form used for the 24-hour recall is an adaptation of a form used for a similar purpose in the study conducted by Kilcoyne (1975). Instructions for completing the form were included with the questionnaire and suggestions were given for estimating the quantity of food eaten (Appendix D). The form was divided into sections for each of the major meals, breakfast, lunch, and supper, and also included space for morning, afternoon, and evening snacks. For this study, only the breakfast meal items were analyzed. However, the students were asked to recall everything eaten so they would not be aware of having only the breakfast meal studied.

The Nutrition Knowledge Questionnaire (Appendix E) is a series of multiple-choice questions written by the instructor of the classes and designed to measure the Health Survey, 366-101, course objectives (Appendix A). The students were asked to select one best answer from a list of four choices for each question. The questions included concepts relating to functions of nutrients in the body, food sources of nutrients, four-food group plan for attaining nutrients, and meal patterns to assure inclusion of the four-food groups.

The reliability coefficient for the nutrition knowledge test was .68 as computed by the Kuder Richardson test of reliability. The figure is low because the knowledge test had only 25 items while the Kuder Richardson formula is established for a fifty-item test. This would increase the reliability coefficient for this nutrition knowledge test.

Statistical Treatment

In order to assess the dietary adequacy of the breakfast meals recorded by the students, a computer program established by the Home Economic Department of University of Wisconsin - Stout was used. This dietary analysis program was based on the Nutritive Value of Foods, United States Department of Agriculture Home and Garden Bulletin Number 72, (1976). Each food item was assigned a number according to the serving size. This number was then typed into the computer terminal with the amount eaten in multiples of the serving size. When each of the food items eaten by the student had been typed in, the computer printout gave a list of nine nutrients and the amount of each supplied by the diet. The nine nutrients included in the program were: K calories, proteins, Vitamin A, Vitamin C, niacin, riboflavin, thiamin, calcium, and iron. A sample of the printout is in Appendix F. This data was then analyzed as to whether the breakfast was adequate or inadequate in supplying one-fourth of the day's recommended allowances of nutrients. The researcher computed these breakfast recommendations from the Recommended Daily Dietary Allowances established by the National Academy of Sciences, National Research Council. These allowances are found in Appendices B and C.

A t-test of paired comparisons was run to compare the pretest and posttest knowledge scores of each group to determine whether there was a significant difference between the mean scores of the two samples on nutrition knowledge.

The population groups used for this study were two sections of Health Survey, 366-101, as they were selected at the time of the university registration for the second semester schedules. No attempt was made to random sample. In order to adjust posttest knowledge scores for any pre-existing differences on the pretest knowledge scores the analysis of covariance was computed.

The coefficient of biserial correlation was computed to determine a possible correlation between knowledge test scores and dietary adequacy. This was a numerical value which represented the degree of relationship between these two sets of facts being compared. If dietary adequacy increased as knowledge increased, a numerical value of +1 would indicate this positive correlation. A negative correlation would be indicated by -1.

Assumptions of the use of this statistic were that the independent and dependent variables were normally distributed but that one variable was divided into two parts and that the only data available to the researcher was the record of which part of the distribution the observation belonged to. In this analysis the nutrition test scores were one of the variables and dietary adequacy was the other variable. The test scores represented a numerical variable. Each student's breakfast dietary intake was assessed as either adequate or inadequate in supplying one-fourth of the Recommended Dietary Allowances as established by the National Academy of Sciences, National Research Council.

The coefficient of biserial correlation was computed according to the formula:

$$r_{pbi} = \frac{M_p - M_q}{\sigma_t} \sqrt{pq}$$

CHAPTER IV

RESULTS AND DISCUSSION

The purpose of this study was to determine whether or not a teaching unit of limited duration (three to four sessions) in a Health Survey Course, 366-101, at the University of Wisconsin - Stout would result in an increase of nutrition knowledge and in desirable change in behavior. The specific unit to be measured was a Nutrition Unit, and the specific behavior change was that of breakfast eating.

Subjects

The subjects for the study were students enrolled in two different sections of Health Survey, 366-101, during the third quarter of the 1978-1979 academic school year at the University of Wisconsin - Stout. A total of 45 students completed both the pretest and posttest knowledge test and dietary record. Of the 45, 28 were male and 17 female. Twenty-three students in the treatment group completed both tests and 22 in the control group completed both tests. Absenteeism accounted for 10 people (30 percent loss) in the treatment group and 11 people (33 percent loss) in the control group not completing one portion of the tests. The subjects were aged 18 to 25 years and represented a variety of departments of the university. The study used existing groups registered for Health Survey, 366-101, and no attempt was made to random sample.

Results

For clarity each null hypothesis has been restated and followed by results.

Hypothesis 1: There will be no significant change at the .05 level of significance in nutrition knowledge among college students as a result of a nutrition education unit in Health Survey, 366-101.

The mean scores and range of scores for each of the pretests and posttests and the possible scores for the knowledge test are listed by group in Table 1. In the treatment group the range of scores on the pretest was 9 to 20 with a mean score of 14.44. Posttest scores ranged from 11 to 23 with a mean score of 17.13. In the control group the range of scores on the pretest was 11 to 18 with a mean score of 14.59. Posttest scores ranged from 11 to 19 with a mean score of 15.45.

TABLE 1

Means and Ranges of Scores for the Pretests and Posttests Measuring Nutrition Knowledge of Students in Control and Treatment Groups of Health Survey 366-101

	Pretest			Posttest		
Group n[a]	low score	high score	mean score	low score	high score	mean score
Control 33 (22)	11	18	14.59	11	19	15.45
Treatment 33 (23)	9	20	14.44	11	23	17.13

Note. Maximum score = 25.

[a]Numbers in parentheses indicate the number of students who completed both the tests.

The statistical test used to test hypothesis 1 was the analysis of covariance (Table 2). This test adjusted the posttest scores for any differences which may have existed on the pretest scores of the treatment and control groups. The F ratio of 5.98 was significant at the .05 level.

TABLE 2

Analysis of Covariance of Posttest Nutrition Knowledge Scores, Adjusted for Pretest Scores, for the Treatment and Control Groups of Health Survey 366-101

Source	SS	df	MS	F
Treatments	35.90	1	35.90	5.98*
Error	252.13	42	6.00	
Total	288.03	43		

Note. The mean for the treatment group was 17.19.
The mean for the control group was 15.40.

*F = 4.08 at the .05 level.

A paired t test was used to compare the pretest and posttest scores representing the level of knowledge of students in the treatment and control groups in Health Survey, 366-101, sections. The t score 4.72 for the treatment group was significant at the .05 level and indicates significant improvement in nutrition knowledge following the nutrition education unit. There was no significant gain in nutrition knowledge for the control group. The t score 1.72 was not significant at the .05 level.

Because the t and F values indicated that significant differences existed between the pretest and posttest scores of the treatment group and between the posttest scores of both the treatment group and control

the hypothesis was rejected. It appeared from these results that after a course in nutrition, nutrition knowledge significantly improved.

These findings would not seem to be unusual since the purpose of any educational unit would be to impart knowledge of the subject being studied. Assimilating knowledge and recalling it on test questions is a way of life for college students, and one would expect an improvement in nutrition knowledge after completing a study unit on nutrition, even when the duration of the unit is only 2 to 3 class sessions.

Other researchers in similar studies also found that the level of nutrition knowledge increased following an educational unit on nutrition, although their nutrition education units were of longer duration (Roper, 1952; Baker, 1972; Kilcoyne, 1976).

Hypothesis 2: There will be no significant change at the .05 level of significance in breakfast eating behavior among college students as a result of a nutrition education unit in Health Survey, 366-101.

The second null hypothesis of the study concerned the dietary habits of the students enrolled in Health Survey, 366-101. Specifically the breakfast meal was recorded and tabulated as being adequate or inadequate in terms of meeting one-fourth of the Recommended Daily Dietary Allowances for the following nine nutrients: Kilocalories, protein, vitamin C, vitamin A, thiamin, riboflavin, niacin, calcium, and iron.

Table 3 shows the percentages of adequate, inadequate, and non-breakfast eaters in this dietary study.

There was no significant improvement in breakfast eating behavior. In both groups there were more students who did not eat breakfast for the posttest dietary. The percentage of those eating an adequate breakfast for

TABLE 3

Breakfast Dietary Percentages of Adequate and Inadequate Breakfast Meal for Treatment and Control Groups for Pretest and Posttest Dietaries

	Pretest			Posttest		
Group	Adequate	Inadequate	None	Adequate	Inadequate	None
Treatment	13% (3)	59% (13)	31% (7)	9% (2)	50% (11)	40% (9)
Control	10% (2)	55% (13)	35% (7)	15% (3)	35% (9)	50% (10)

Note. Numbers in parentheses indicate the number of students in each category.

the control group was 10 percent for the pretest and 15 percent for the posttest. For the treatment group, the percentages were 13 percent for the pretest and .09 percent for the posttest. The percentages for those with an inadequate breakfast meal were divided between those who ate no breakfast and those who ate breakfast but failed to meet the recommended one-fourth of the recommended daily allowances as established by the National Academy of Sciences, National Research Council.

Statistically the coefficient of biserial correlation showed that there was no significant change in breakfast eating behavior as a result of a teaching unit in nutrition education (Table 4). The coefficients are all less than one and decrease for the treatment group between the pretest and posttest dietary analysis.

TABLE 4

Coefficient of Biserial Correlation Values of Mean Scores of Adequate Breakfast Eaters Correlated with Mean Scores of Inadequate Breakfast Eaters for Treatment and Control Groups

	Pretest	Posttest
Group	r	r
Treatment	.2899	.0649
Control	.0302	.0868

Based on the percentages observed and the statistics calculated, the second null hypothesis was no rejected. It would seem that increase in knowledge will not necessarily result in positive change in breakfast eating behavior.

These results agree with findings of other researchers noted in the Review of Literature (Baker, 1972; Boone, 1976; Kilcoyne, 1976). These researchers also concluded that improvement in knowledge did not show improvement in dietary behavior.

The correlation statistics indicated that no relationship existed between the level of knowledge and breakfast eating behavior. This was caused in part by the fact that the sample of adequate breakfast eaters was too small to allow the test to be statistically sound.

The correlation was a negative one for the treatment group. This statistic seems to show quite a difference because the knowledge scores increased for the posttest knowledge test. This increase would narrow the

range of correlation even though raw scores showed little change. The raw scores showed that there was a difference of only one student between the pretest and the posttest dietary.

The timing for the posttest may also have influenced the results. This test was administered during mid-semester time when college students typically stay up late studying for exams and finishing papers. The tendency then is to sleep as long as possible and get up in the morning in time to dash to a class. Eating breakfast would then probably be a low priority item. This may be a reason why more students did not eat any breakfast on the posttest than on the pretest. This was true for both groups.

Surveys of other researchers have shown that the overall dietary habits of college students are generally inadequate (Hinton, 1963; Shoor, 1972; Woody, 1973). This suggests that there are other priorities and interests for young people in the college environment. Their class and social activities will take precedence over nutritional considerations, and they will probably eat what is readily available and has taste appeal.

Question number one on the Personal Inventory portion of the questionnaire (Appendix E) referred to breakfast eating behavior. The students were asked to identify their own breakfast eating by choosing from: (a) never eating breakfast, (b) eating one to two times per week, (c) eating three to five times per week, (d) always eating breakfast. Using the "c" and "d" answers as an indication of regular breakfast eating the combined percentages of regular breakfast eaters range from 48 percent to 58 percent (Table 5). It would appear from these percentages that more students eat some type of breakfast than eat nothing for breakfast.

TABLE 5

Percentages of Regular Breakfast Eaters Taken from the Personal Inventory Questionnaire Item One for Pretest and Posttest Control and Treatment Groups*

	Pretest	Posttest
Group	%	%
Treatment	50%	54%
Control	58%	48%

*Combined percentages for "c" and "d" answers.

The Breakfast Dietary Percentages (Table 3) also indicated that 65 percent of the students in the control group ate breakfast while 72 percent in the treatment group ate some type of breakfast. These percentages suggest that students do want to eat breakfast but either do not have the time to prepare an adequate meal or do not have the food items readily available to provide the adequate nutrients. This may also suggest that more emphasis should be placed in the educational unit on what an adequate breakfast should include.

It was observed that the daily schedules of college students can be sporadic and unstructured. Their new independence from parents and home can result in more spontaneous activities at any hour of the day or night. Low on the priority list would be eating an adequate breakfast every morning under these circumstances. The breakfast dietary percentages (Table 3) seem to agree with this inconsistency in behavior. Some students who ate

breakfast on the pretest did not on the posttest, and the reverse is true. In the Personal Inventory portion of the questionnaire (Appendix E), items numbered four and five referred to breakfast eating behavior during high school. Item four was a measure of regular breakfast eating and item five referred to preparation of breakfast meals. In observing these percentages (Table 6), it was noted that the largest percentage of students ate breakfast regularly and that the largest percentage of students either had breakfast furnished by the high school or breakfast was prepared for them at home.

These findings may also suggest that the life style of college students affects their dietary practices.

TABLE 6

Personal Inventory Percentages of Regular Breakfast Eaters in High School (Item 4) and Percentages of Those Who Had Breakfast Provided for Them (Item 5)

	Pretest		Posttest	
Item	4	5	4	5
Group	%	%	%	%
Treatment	68%	61%	68%	53%
Control	85%	52%	79%	51%

CHAPTER V

CONCLUSIONS

Summary

The purpose of this study was to find whether or not an increase in nutrition knowledge and improvement in breakfast eating behavior would result after a teaching unit in nutrition education. A treatment group and a control group were each given a pretest and a posttest including a knowledge test and a 24-hour recall dietary survey. The treatment group received a teaching unit after the pretest based on the Behavioral Objectives established for the Health Survey, 366-101, class (Appendix A). The control group received a teaching unit in another area of health education.

The null hypotheses for the study were:

Hypothesis 1: There will be no significant change at the .05 level of significance in nutrition knowledge among college students as a result of a nutrition education unit in Health Survey, 366-101.

Hypothesis 2: There will be no significant change at the .05 level of significance in breakfast eating behavior among college students as a result of a nutrition education unit in Health Survey, 366-101.

The population for the study were students registered for Health Survey, 366-101, class at University of Wisconsin - Stout during the third quarter of the 1978-1979 academic year. One section of the class was the treatment group and another section was the control group. The students were aged 18 to 25 years of age, were both male and female, and represented a variety of major areas of study.

The design selected for the study was the Pretest, Posttest Control Design and used an educational unit in Nutrition Education for the treatment.

The knowledge test was analyzed by a t test for paired comparisons and the analysis of covariance. Nutrition knowledge and breakfast eating behavior were correlated by the computing of the coefficient of biserial correlation.

The improvement in knowledge was significantly higher after the nutrition education unit and hypothesis number one was rejected. Hypothesis number two was no rejected as there was no significant change in breakfast eating behavior following the nutrition education unit.

Conclusions

Improvement in nutrition knowledge for the students involved in this study was significantly higher following a teaching unit. Breakfast eating behavior did not show any improvement and no significant correlation was found between the knowledge of nutrition and its application in breakfast eating practices.

This study had shown that although nutrition education in the Health Survey Course, 366-101, at the University of Wisconsin - Stout may cause significant improvement in knowledge of human nutrition, this knowledge seems to have little relation to dietary habits. It is speculated that social, cultural, and time scheduling factors may have more of an effect on the eating behavior of young adults than their nutrition knowledge.

Other researchers (Roper, 1952; Baker, 1972; Kilcoyne, 1976) also found that though knowledge of nutritional facts increased with a unit

in nutrition education, there was not necessarily an application of that knowledge in dietary practice. These studies were conducted in situations where teaching units were of a longer duration than the unit in Health Survey, 366-101. Thus, the length of an educational unit does not necessarily seem to affect the results.

The results of this study may say something about priorities for college students. One of their major priorities would be that of gaining knowledge for their eventual baccalaureate degree and other would be earning grades to maintain a grade point average. Thus, the nutrition unit would show an increase in knowledge reflecting either one of these priorities.

It was observed that in the study the majority of students did eat something for the breakfast meal though inadequate in supplying one-fourth of the daily dietary recommendations. The majority of students also recorded a background of breakfast eating behavior in high school. The need then would seem to be emphasizing what constitutes an adequate breakfast and why these components are considered important.

Recommendations

Sound nutritional practices may have low priority for teen-agers and young adults, but as they mature and their lives become more structured and scheduled these same individuals may begin to utilize knowledge gained in the formative years. The nutrition educator's task deals very often with shaping attitudes as well as providing nutrition information. Therefore, nutrition education should be initiated in the pre-school and elementary grades and continually reinforced in the secondary years and at the

university level to provide a sound foundation for decision making. Older students may change their food behavior to the degree that motivation is internalized and to the degree they feel the information is useful to them. Quality of health is a slight motivating force because, for young adults the likelihood of losing health seems very remote. However, with more and more information being disseminated correlating health and life style, this motivation may become stronger.

Nutritional knowledge did show improvement in this study, but no provision was made for a follow-up test to determine degree of retention of this knowledge improvement. It is recommended that a follow-up test be utilized after a six-month lapse. This test would provide information about retention of knowledge after an educational unit of short duration and may offer a motivating factor for students to refresh their nutritional knowledge if there is a decrease in knowledge scores.

A suggested approach to the teaching unit would be to identify reasons for not eating breakfast and discover some motivation to change attitude, habits, and/or misconceptions related to these reasons. Some of these reasons could be lack of time, not hungry, fear of gaining weight, or lack of finances. These reasons for not eating breakfast were suggested by students during an informal survey taken for a Health Survey class prior to the ones used for this study. Part of the class assignment could then be to research breakfast studies to learn what these findings say about these reasons. The research reports would then be shared with the entire class.

Another segment of the class could research food items which could be economically inexpensive and yet fulfill the recommendations for an adequate breakfast.

Some of the studies noted in the Review of Literature found that when the breakfast meal was omitted or inadequate the missing nutrients were seldome made up in subsequent meals (Woody, 1973; Kilcoyne, 1978). In conjunction with this an out-of-class assignment could be to discover food items to include in the lunch and supper meals to assure the individual adequate total nutrient intake for the day in the even the breakfast meal was omitted.

It was observed in this study that a greater percentage of students did eat some type of breakfast though in most cases it was inadequate in supplying one-fourth of the daily recommended allowances. Instead of using the lecture method to impart knowledge, it is suggested that after receiving basic nutrition knowledge the students then be asked to devise sample breakfast menus, including those suggested in breakfast studies, those popular with students, those economical to provide. The students would then be challenged to participate in their own experiment by eating the various breakfasts to determine what is the most beneficial for them in terms of their feelings and their physical and mental performance. This experiment should also include eating no breakfast. This individual goal setting may help to improve attitude and behavior toward daily breakfast eating.

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APPENDIX A

NUTRITION UNIT OBJECTIVES

The student will be able to:

1. Identify the four food groups

2. Categorize foods into the four food groups

3. Describe the role of calories, fats, proteins, carbohydrates, vitamins, and minerals in the individual diet

4. Demonstrate working knowledge of the Recommended Daily Dietary Allowances by estimating needed food to supply daily recommendations

5. Categorize foods into nutrients supplied

6. Demonstrate working knowledge of nutritional values of foods by distributing food groups into accepted daily standard of three meals

7. Compute basal metabolic calorie needs and estimate calorie needs for individual as per activity levels

APPENDIX B

Recommended Breakfast Allowances* for
Women Aged Fifteen to Twenty-Four

	Females		
Age (years)	15-18	19-22	23-27
Energy (Kcal)	525-700	525-700	500-667
Protein (g)	12-16	11.5-15.3	11.5-15.3
Vitamin A (IU)	1000-1333	1000-1333	1000-1333
Vitamin C (mg)	11.2-15	11.2-15	11.2-15
Niacin (mg)	3.5-4.6	3.5-4.6	3.3-4.3
Riboflavin (mg)	0.35-0.46	0.35-0.46	0.3-0.4
Thiamin (mg)	0.28-0.37	0.28-0.37	0.25-0.33
Calcium (mg)	300-400	200-267	200-267
Iron (mg)	4.25-6.0	4.5-6.0	4.5-6.0

*One-fourth to one-third of the Recommended Dietary Allowances established by the National Academy of Sciences, National Research Council.

APPENDIX C

Recommended Breakfast Allowances* for
Men Aged Fifteen to Twenty-Seven

	Males		
Age (years)	15-18	19-22	23-27
Energy (Kcal)	750-900	750-900	675-891
Protein (g)	13-17	13-17	14-18
Vitamin A (IU)	1250-1650	1250-1650	1250-1650
Vitamin C (mg)	11.2-15	11.2-.5	11.2-15
Niacin (mg)	5-6	5-6	4.5-5.9
Riboflavin (mg)	.45-.59	.45-.59	.40-.52
Thiamin (mg)	.3-.4	.3-.4	.3-.4
Calcium (mg)	300-400	200-267	200-267
Iron (mg)	5-6	2.5-3.3	2.5-3.3

*One-fourth to one-third of the Recommended Dietary Allowances established by the National Academy of Sciences, National Research Council.

APPENDIX D

FOOD INTAKE SURVEY INSTRUCTIONS

1. Record everything you ate or drank (except water) for the past 24 hours. Include snacks, candy, pop, and anything consumed during regular eating times and between.

2. Be as accurate as you can in recording amounts and types of food. Include amounts, and any descriptive data concerning what you have eaten. For example: a serving of meat is usually about 3 oz., and a serving of vegetables is about 1/2 cup. Brand names should be used whenever possible.

   Examples:

   Milk: Whole, 2%, skim
   Break: Whole grain enriched, bun, doughnut, muffin
   Cereal: Cooked, uncooked, sugar-coated, brand name
   Soup: Cream, vegetable, boullion
   Fish: Tuna, batter fried, baked
   Combinations: List foods individually and try to estimate amounts of each you ate.

   Remember your grade is in no way affected by your participation in this survey.

Food Intake Survey

Name _____

Soc Sec _____ Class Sect. ___

Breakfast	Food	Amount

Morning Snack:

Noon Meal:

Afternoon Snack:

Evening Meal:

Evening Snack:

APPENDIX E

PERSONAL INVENTORY AND NUTRITION KNOWLEDGE TEST

1. I eat breakfast

   a. never
   b. 1-2 times per week
   c. 3-5 times per week
   d. always

2. I live:

   a. in a dormitory
   b. at home with parents
   c. in apartment or house
   d. in off-campus room

3. My meals normally are prepared by:

   a. parent
   b. fellow students
   c. university food service
   d. restaurant
   e. myself

4. When in high school I ate breakfast:

   a. never
   b. 1-2 times per week
   c. 3-5 times per week
   d. always

5. When in high school breakfast was:

   a. always/usually prepared for me at home
   b. furnished by the school
   c. prepared by myself
   d. never/seldom prepared for me at home
   e. never eaten

6. Which of the following includes all 4 food groups?

   a. Milk, Bread, Cottage Cheese, Turkey
   b. Grapes, Bread, Carrots, Turkey
   c. Milk, Bread, Carrots, Turkey
   d. Milk, Bread, Eggs, Turkey

7. If an individual takes in more calories than he burns, the extra calories are converted to:

   a. waste
   b. fat
   c. muscle
   d. carbohydrate

8. Which group contains only foods rich in iron?

   a. Milk, Banana, Doughnut, Liver
   b. Ice cream, Orange, Apple, Eggs
   c. Liver, Beef, Raisins
   d. Spinach, Broccoli, Pear, Orange

9. The best sources of essential amino acids are:

   a. Animal proteins
   b. Vegetable proteins
   c. Cereal proteins
   d. Bread proteins

10. The primary diet problem in the U. S. seems to be:

   a. Deficiency malnutrition
   b. Lack of availability of fresh fruits and vegetables
   c. An imbalance between nutrients
   d. Inadequate food preparation

11. A calcium deficiency can be caused by:

   a. not enough niacin
   b. too much niacin
   c. too much phosphorus
   d. not enough phosphorus

12. The substances in fresh fruits and vegetables that prevents scurvy is:

   a. iron
   b. Vitamin A
   c. Vitamin B^{12}
   d. Vitamin C

13. Which group shows the most nutritious breakfast?

   a. Cereal and milk, hot chocolate, doughnut
   b. Orange, hot coffee, toast and butter
   c. Tomato juice, roll and butter, milk
   d. Tomato juice, hot chocolate, egg and toast

14. Which group shows only foods that are rich in calcium?

   a. Peas, bread, chicken, grapes
   b. Rice, meat, tomato juice, banana
   c. Corn, strawberries, cottage cheese, turkey
   d. Milk, ice cream, cottage cheese

15. Which group shows only foods that are rich in vitamin C?

a. Orange, liver, milk
b. Orange juice, strawberries, cabbage slaw
c. Apple, Banana, peach
d. Beef, milk, eggs

16. Which group shows only foods rich in vitamin A?

a. Spinach, carrots, broccoli, cantaloupe
b. Potato, peas, cucumber, raisins
c. Orange juice, bacon, carrots, cheese
d. Tomato, eggs, whole wheat bread, lettuce

17. Select the group that gives the correct formula for the four food groups for an adult.

a. 3 bread, 4 fruits and vegetables, 2 milk, 3 meat
b. 4 bread, 4 fruits and vegetables, 2 milk, 2 meat
c. 4 bread, 4 fruits and vegetables, 3 milk, 4 meat
d. 2 bread, 4 fruits and vegetables, 3 milk, 4 meat

18. Select the group that has good sources of protein.

a. Cabbage, grapes, bread
b. Eggs, beef, dry beans, cheese
c. Macaroni, apple, green pepper, broccoli
d. Bread, banana, potato, tomato

19. Which of the following foods are the highest in energy per spoonful?

a. Roll, beef steak, milk, macaroni
b. Crisco, corn oil, butter, cream
c. Orange, corn flakes, carrot, candy bar
d. Corn, peas, celery, carrots

20. Which group shows the foods that are main sources of energy for the body?

a. Milk, green beans, tomato, eggs
b. Spinach, grapes, pear, lettuce
c. Macaroni, butter, rice, potato
d. Lean meat, corn, eggs, cheese

21. Which part of your body has a special need for vitamin A?

a. teeth
b. heart
c. eyes
d. ears

22. Which group includes foods that are good meat substitutes?

a. Dried prunes, raisins
b. Nuts, dry beans, peas and lentils
c. Oatmeal cereal, macaroni, wheat bread
d. Potato, corn, green beans

23. An adequate breakfast:

a. Isn't important if you plan to eat a good lunch
b. Should be high in energy foods to get us going
c. Should provide 1/4 to 1/3 of the Recommended Daily Allowances
d. Should always include eggs

24. When an amino acid is called essential it means that your body needs it:

a. and can make it from other amino acids
b. but cannot make it from other amino acids
c. and has a good supply
d. and can make all it needs

25. In order to prevent feeling hungry in the late morning hours one should include the folowing in the breakfast meal:

a. fat, protein, and carbohydrate
b. carbohydrate
c. carbohydrate and protein
d. fat
e. protein

26. We need a source of vitamin C everyday because:

a. We cannot store this vitamin in the body
b. Vitamin C promotes normal bone and tooth development
c. We need large amounts of the vitamin
d. Both "a" and "b"

27. If you want to lose a pound of weight per week, how many calories per day would you have to subtract from your normal daily intake?

a. 100
b. 1,000
c. 500
d. 700
e. 3,500

28. Besides being sources of carbohydrates, enriched or whole grain breads and cereals are good sources of:

a. Vitamins C & D
b. B vitamins and iron
c. Calcium and iron
d. Vitamins A & C

29. The best source of vitamin D is:

a. green leafy vegetables
b. fortified milk
c. apple juice
d. steak

30. Enrichment of a food such as breads or cereals means that it has:

a. added caloric value
b. color enhancers
c. added vitamins and minerals
d. preservers added

APPENDIX F

SAMPLE COMPUTER PRINTOUT FOR DIETARY ANALYSIS

```
ENTER THE FOLLOWING INFORMATION (SEPARATED BY A COMMA):

     1.  USDA FOOD# LISTED ON YOUR DATA SHEET
     2.  QUANTITY EATEN IN MULTIPLES OF THE SERVING SIZE

WHEN ALL OF YOUR FOODS HAVE BEEN ENTERED, THEN TYPE ),) FOR THE DATA
INQUIRY.

TYPE IN THE DATA OF FOOD#  1 ? 3,2
TYPE IN THE DATA OF FOOD#  2 ? 57,3
TYPE IN THE DATA OF FOOD#  3 ? 170,2
TYPE IN THE DATA OF FOOD#  4 ? 225,1
TYPE IN THE DATA OF FOOD#  5 ? 340,1
TYPE IN THE DATA OF FOOD#  6 ? 564,1
TYPE IN THE DATA OF FOOD#  7 ? 0,0


THE TOTAL NUTRIENTS CONSUMED ARE -


FOOD ENERGY  :  1435 CALORIES,
PROTEIN  :        85 GRAMS,
CALCIUM  :      1419 MILLIGRAMS
IRON  :            9 MILLIGRAMS,
VITAMIN A  :    3510 INTERNATIONAL UNITS,
THIAMIN:           1 MILLIGRAMS,
RIBOFLAVIN  :      2 MILLIGRAMS,
NIACIN  :         12 MILLIGRAMS,
ASCORBIC ACID  :  46 MILLIGRAMS.


END OF DIETARY ANALYSIS

WOULD YOU LIKE ANOTHER ANALYSIS?  NO

Ready

BYEY
```