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NUTRITION KNOWLEDGE, ATTITUDES AND PRACTICES
OF SECONDARY TEACHERS OF HEALTH/PHYSICAL EDUCATION,
HOME ECONOMICS, SCIENCE AND SOCIAL SCIENCE

presented by

Karen Pesaresi Penner

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Kathryn Kolasa
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By

Karen [illegible]

A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Food Science
and Human Nutrition

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ABSTRACT

NUTRITION KNOWLEDGE, ATTITUDES AND PRACTICES
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Likert, semantic differential and Galileo scales for measuring nutrition attitudes were developed. Additionally, the nutrition knowledge, attitudes and practices of secondary teachers of health/physical education, home economics, science and social science were assessed. Data from 32 teacher interviews were used to formulate a questionnaire containing Likert and semantic differential attitude scales, demographic and nutrition practices questions, and an instrument for Galileo multidimensional attitude assessment. The two instruments and the Michigan State University Nutrition Knowledge Test (NKT) were mailed to a random sample of 1191 Michigan secondary teachers of health/physical education, home economics, science and social science.

Of 518 teachers completing the survey, 43 percent had never taken a food/nutrition course, 63 percent never had inservice food/nutrition training. Distributions of teachers by sex and years of teaching experience across the four subjects were significantly different ($p \leq .001$). The overall

mean NKT score was 57 percent. Home economics teachers' score of 70 percent was significantly higher than those of the other teacher groups($p \leq .05$). Home economics teachers reported the most positive attitudes toward teaching nutrition on a 14-statement Likert and a 7-pair semantic differential scale. Significant mean differences were found among teacher groups on the Likert scale and among three teacher groups on the semantic differential scale ($p \leq .05$). Significant score variation across subjects was found on the semantic differential personal nutrition scale, but Scheffe's test found no differences among the means of the four subject groups. Alpha reliability coefficients for the three scales ranged from .72 to .96.

Significant differences were found in distributions of teachers who taught food/nutrition by subject, sex and nutrition interest ($p \leq .001$). Teachers who taught food/nutrition had higher NKT scores and more favorable attitudes toward teaching food/nutrition than those who did not, but the same attitudes toward their own nutrition and same years of teaching experience. Those who taught also had taken more courses but not more inservice training, except for home economics teachers. Topics taught differed across the subject groups ($p \leq .001$). Significant correlations were noted between scores and other variables.

To

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INTRODUCTION

A goal for nutrition educators is to teach people to consume a variety of foods in quantities appropriate to nourish their bodies. That seems simple enough, but with the enormous variety of foods available to the average American, such food choices do not come naturally. Food behaviors are learned.

Food habits, as other behaviors, are generally acquired at home, beginning with the first foods presented to babies. Later, they may be modified by social contacts, advertising, activities, income, work and psychological needs of the individual. However, it is easier to teach people while food habits are first being formed. For that reason, nutrition education efforts have focused primarily on children or on pregnant women who are nourishing a growing fetus and will soon be feeding (teaching food behaviors to) their babies. Nutrition education, beginning in early childhood and continuing throughout elementary and secondary school was recommended by conferees of the White House Conference on Food, Nutrition and Health (White House Conference on Food, Nutrition and Health, 1969).

In 1977, the National School Lunch Act and Child Nutrition Amendment provided entitlement funds for 2 years to develop Nutrition Education and Training (NET) programs through departments of education in every state (Public Law 95-166, 1977). Though nutrition is not an established curriculum topic in schools except through some home economics and health courses, it is important to the well-being and learning of all school students. Heretofore, the primary focus of the programs authorized by the School Lunch Act was the provision of nutritious school lunches. The passage and implementation of Public Law 95-166 greatly increased the impetus to teach nutrition in schools in all grades and many subjects. The law also encouraged the involvement of parents, foodservice workers, teachers and students.

For several years, nutrition curricula and other teaching aids have been available from the Cooperative Extension Service, the National Dairy Council, Inc., and private industries. Recently, more comprehensive K-12 curriculum guides have been developed by the Pennsylvania State University, the National Dairy Council, Inc., Utah State University, Weight Watchers, Inc., and many State Departments of Education. Some nutritionists have recommended the integration of nutrition into standard courses of the sciences and humanities (Stare and Whelan, 1978). The report of the White House Conference indicated nutrition education in the schools could be effectively integrated into many curriculum areas, or that nutrition could be taught as a separate subject (White House Conference on Food, Nutrition and Health, 1969).

The idea that nutrition is a multidisciplinary topic that can be taught in a variety of subjects replaced the traditional treatment of nutrition as only a home economics subject.

Each day, children spend a large block of time at school, during which they need to eat. Thus, teachers have an opportunity to promote good eating habits with children (Petersen and Kies, 1972). However, the teaching of food and nutrition is not mandated in most states and it is not required in most locally determined curricula. The inclusion of food and nutrition in a particular course is generally determined by the individual teacher. Therefore, teachers' attitudes toward nutrition and nutrition education are important.

Michigan is one of ten states that has legislation regarding nutrition education in the schools (Johnson and Butler, 1975). The Critical Health Problems Education Act was passed to create a critical health problems education program, defined as:

> A systematic and integrated program designed to provide appropriate learning experiences based on scientific knowledge of the human organism as it functions within its environment and designed to favorably influence the health, understanding, attitudes and practices of the individual child which will enable him to adapt to chaning health problems of our society. The program shall be designed to edudate youth with regard to critical health problems and shall include, but not be limited to,

> the following topics as the basis for comprehensive education curricula in all elementary and secondary schools: drugs, narcotics, alcohol, tobacco, mental health, dental health, vision care, nutrition, disease prevention and control, accident prevention and related health and safety topics (Michigan Act 226, 1969).

Thus, nutrition is mandated by state law to be included as a component of health education in Michigan.

A nutrition strand was included as part of the Minimal Performance Objectives for Health Education in Michigan for grades 1-3, 4-6 and 7-9 (Michigan Department of Education, 1974). Recently, the Statewide Nutrition Commission stated a goal to increase the number of teachers with an adequate knowledge of nutrition, to be measured by an increase in number of students achieving minimum performance on the nutrition portion of the State Health Assessment tool of the Michigan Department of Education (Michigan Statewide Nutrition Commission, 1980). Student objective attainment rates on the nutrition portion of assessment tests were low at all three grade levels tested, but especially for grades 7 and 10 (Michigan School Health Association, 1980). Thus, there is at the state level, interest and support for nutrition education in the schools, at all grade levels.

In the past three years, the Department of Food Science and Human Nutrition at Michigan State University has been involved in two statewide nutrition education research studies: The Michigan School Breakfast Survey and the Nutrition Education and Training (NET) project. Both studies were funded through the Michigan Department of Education and the Michigan Agricultural Experiment Station.

The Michigan School Breakfast Survey focused on food behaviors of students in grades K-12 and on food/service workers; school administrators' and teachers' views of school meals programs and nutrition education (Kolasa and Lackey, 1979; Lackey and Kolasa, 1979).

The Nutrition Education and Training (NET) activities have been funded through Public Law 95-166. The Department of Food Science and Human Nutrition activities during the first year of funding, 1978-1979, included the development of a valid and reliable nutrition knowledge test and preliminary work toward the development of nutrition attitude scales. (Kolasa et al., 1979; Lackey et al., 1981). One NET activity for 1979-80 was a study of elementary teachers to determine their opinions of and techniques for nutrition education (Mutch, 1980).

This research supplemented the work Michigan State University has been involved with previously concerning nutrition education, including the continuation of attitude scale development since valid and reliable scales to assess secondary teachers attitudes toward nutrition and toward teaching nutrition had not been reported at the onset of this study.

Little information has been published regarding the nutrition knowledge, attitudes and practices of secondary teachers in Michigan or elsewhere. It is also unlikely that nutrition will become a mandated curriculum offering other than as a component of health education. Because PL 95-166 and available nutrition education materials support an integrated approach to teaching nutrition, it was of interest to survey secondary teachers. In addition, valid and reliable attitude scales to assess secondary teachers' attitudes toward nutrition and teaching nutrition were unknown to the investigator. Thus there was two main objectives to this study: (1) to compare the nutrition knowledge, attitudes and practices of health/physical education, home economics, science and social science secondary teachers and (2) to develop Likert, semantic differential and multidimensional scales to assess teacher attitudes.

REVIEW OF LITERATURE

Teachers' Nutrition Knowledge

Teachers can have an important role in nutrition education. Section 19 of Public Law 95-166, the National School Lunch and Child Nutrition Amendment of 1977, provides impetus to the integration of nutrition into preprimary, elementary and secondary curricula (Public Law 95-166, 1977). If teachers are to include food/nutrition information in their lessons, they must have at least a minimal level of substantive knowledge. A few researchers have studied teachers' knowledge of nutrition at the elementary level (Knudtson, 1972; Petersen and Kies, 1972; Carver and Lewis, 1979; Mutch, 1980). Little was found in the published literature regarding secondary teachers. This is probably because earlier nutrition education efforts have focused on elementary grade students. And, the White House Conference stressed the need for a nutrition background for all elementary teachers (White House Conference on Food, Nutrition and Health, 1969).

Generally, nutrition knowledge scores of teachers at all grade levels have been low (Knudtson, 1972; Petersen and Kies, 1972; Gigliotti, 1976; Kolasa et al., 1979; Carver and

Lewis, 1979; Mutch, 1980). Eighteen percent of fifth and sixth grade Iowa teachers surveyed answered incorrectly more than half the items on a 35-item true-false knowledge test (Knudtson,1972). Nebraska kindergarten through third grade teachers scored 41 percent on a 140 point test (Petersen and Kies, 1972). In another study of elementary teachers, nutrition knowledge was assessed with the Michigan State 40-item objective test (Mutch,1980). The teachers' mean score was 50 percent. Using a two-part test, elementary teachers scored 64 percent on true-false items and 22 percent on interpretive items (Carver and Lewis, 1979).

The nutrition knowledge of K-12 teachers was tested with a 50-item true-false and multiple-choice item test. (Kolasa et al., 1979). Six percent achieved a score of 75 percent or more. Only one study reporting the nutrition knowledge of secondary teachers was found (Gigliotti, 1976). Low nutrition knowledge scores on a 15-item test were reported, consistent with findings of other studies. However, home economics teachers had higher scores than teachers of other subjects.

The amount of nutrition training received by teachers either at the college pre-service level or during inservice varies. The nutrition background of teachers sometimes has been positively associated with increased levels of nutrition knowledge, as measured on a paper and pencil test. (Carver and Lewis, 1979). One might expect those who have taken food/nutrition coursework or who have had inservice training to score higher on tests of nutrition knowledge than those with less training. It has been concluded that a preservice nutrition course or inservice nutrition training resulted in increased nutrition knowledge (Carver and Lewis, 1979). Secondary teachers who had studied nutrition had significantly higher knowledge scores than those who had not (Gigliotti, 1976).

Others have reported no relationship between teachers' previous food and nutrition training and knowledge score (Mutch, 1980).

The relationship between certain demographic variables and teachers' nutrition knowledge have been reported. The relationship between nutrition knowledge and age has been investigated with different groups of people (Young et al., 1956; Vickstrom and Fox, 1966; Schwartz, 1976). A few investigators have explored the relationship between sex and knowledge scores (Hoffman-LaRoche, 1978; Mutch, 1980).

Age has been indirectly related to nutrition knowledge of mothers and of nurses (Young et al., 1956; Vickstrom and Fox, 1976). In another study, knowledge scores of younger public health nurses were significantly lower than scores of older nurses (Schwartz, 1976).

The relationship between teachers' knowledge and age was explored for a subsample of K-12 teachers surveyed as part of Nutrition Education and Training Activities (Kolasa, 1980). No relationship was found. Mutch also reported no relationship of age to knowledge for elementary teachers (Mutch, 1980).

While some differences of opinion have been noted, investigators have generally found no relationship between nutrition knowledge scores and subjects' age.

Food/nutrition education traditionally has been part of home economics courses which are most often taught by women. In addition, women have traditionally handled the flow of food through the family. Therefore, it might be expected that female teachers would score higher on a test of nutrition knowledge than male teachers. A recent report indicated that female educators did score higher than males (Hoffman-LaRoche, 1978). Another investigator found no differences in scores between male and female teachers (Mutch, 1980).

In summary, teachers generally have had low scores on tests of nutrition knowledge. The amount of preservice and/or inservice nutrition training has varied and has not always been directly related to teachers' nutrition knowledge scores. Discrepancies occur in the literature regarding the relationship of age to nutrition knowledge, however, no relationship has been reported for secondary teachers. A consistent relationship between teachers' sex and knowledge scores have not been reported.

Teachers' Nutrition Attitudes

Attitudes, along with opinions, beliefs and values may be partially responsible for determining human behavior. Nutrition educators have often viewed attitudes as having a role in changing or often improving eating behavior. In a discussion of "Nutrition Education As Planned Change," attitudes, values and other psychological constructs such as motivation, ego and human needs are discussed as having effects on changing behavior (Gifft, Washbon, and Harrison, 1972). A stated goal for nutrition education of the National Nutrition Consortium is to "create positive attitudes toward good nutrition" (National Nutrition Consortium, 1980). The Consortium's "Statement of Nutrition Education Policy" further indicates that educational efforts should include evaluation components to assess attitudinal, cognitive and/or behavioral change.

Because teachers can play an important role in nutrition education, their attitudes toward nutrition and the teaching of nutrition are important, particularly since they are not generally required to teach nutrition topics in their classes.

Attitude Toward the Importance of Nutrition

O'Connell and co-workers (1979) believed that teachers' attitudes toward nutrition education would be influenced by the degree of importance they placed on nutrition in general. They, therefore, developed a scale which they called "Nutrition is Important". In an experimental study, they detected no difference in teachers' attitudes toward the importance of nutrition between the group of teachers who taught nutrition and the group that did not. Both groups had positive attitudes toward the importance of nutrition before the study began.

Attitudes Toward Nutrition Education

In a study of Nebraska kindergarten through third grade teachers, no relationship was found between nutrition knowledge and attitudes toward nutrition education (Petersen and Kies, 1972). More recently, the attitudes of kindergarten through sixth grade teachers toward nutrition education was significantly related to the time they devoted to teaching nutrition (Cook et al., 1977). Those who spent more time in the activity also had more favorable attitudes.

An experiment was conducted to test the hypothesis that teachers who taught nutrition would have significantly different attitudes toward nutrition education than teachers who did not teach nutrition (O'Connell, et al., 1979). However, pre-post attitude assessments on a scale called "Favors Nutrition in Schools" found no significant differences between those teaching nutrition and those not teaching nutrition. In another study, those investigators found that teachers perceived a high need for nutrition education in grades seven through twelve, but also unfavorable attitudes toward teaching nutrition (O'Connell et al., 1979).

This is similar to the finding that while 70 percent of teachers surveyed thought nutrition should be taught in elementary school, the majority thought it should be taught in a grade other than their own (Cook et al., 1977).

Teachers generally are positive about the importance of nutrition education. A survey by the Florida Department of Education found teachers in favor of mandating nutrition education (O'Farrell and Kendrick, 1972). Both administrators and teachers supported nutrition education.

Ninety-five percent of educators felt it was important for them to teach nutrition (Hoffman-LaRoche, 1978). The educators in that study were elementary and secondary teachers (75%), school nurses (24%) and administrators (1%).

In summary, teachers have favorable attitudes toward nutrition and toward nutrition education. However, favorable attitudes toward nutrition education do not necessarily imply favorable attitudes toward teaching nutrition. That is, while teachers may feel nutrition education is important, they may not want to be involved personally in the teaching of nutrition.

Teachers' Nutrition Teaching Practices

Generally, a majority of elementary teachers have included some nutrition teaching in their classes. In one study, 86 percent of the teachers responding to a survey were currently teaching nutrition (Petersen and Kies,1972). Cook and co-workers (1977), reported 75 percent of the teachers they surveyed taught food or nutrition in their classes that year. Responding to interview questions, 54 percent of teachers reported teaching nutrition currently while an additional 31 percent indicated they had taught nutrition in the past (Mutch, 1980).

In a study of teachers grades K-12, 80 percent of those interviewed reported that they included nutrition teaching in their classrooms during that academic year (Lackey and Kolasa, 1979).

More time was spent on nutrition education by teachers of grades K-3 than by teachers of grades 4-6 (Cook et al., 1977). Teachers in the entire K-6 sample taught nutrition/foods an average of 9.7 hours during the school year.

Of K-12 teachers interviewed, 65 percent spent 10 hours or less during the year on nutrition education (Lackey and Kolasa, 1979).

At the secondary level, home economics teachers had the greatest responsibility for nutrition education (Hoffman-LaRoche, 1978). They spent a greater percentage of their time teaching nutrition than did health or science teachers.

The topic most often taught at the elementary level was the Basic Four Food Groups (Mutch, 1980). Nutrition topics most often taught at the secondary level were related to diet and health (Levine et al.,1979; Hoffman-LaRoche,1978).

In summary, the majority of elementary teachers have taught food/nutrition in their classes. However, the amount of time spent on nutrition education by teachers at all grade levels was small. Home economics teachers spent more of their time teaching nutrition at the secondary level than did teachers of other subjects. Topics most often taught at the secondary level were related to diet and health.

Measurement of Nutrition Knowledge

Educators have long-tested for knowledge in the classroom, and the process is well-defined (Ebel, 1979; Thorndike, 1971). Generally, nutrition education researchers have developed their own instruments which ranged from listing and defining the Basic Four Food Groups to paper and pencil objective tests of nutrition knowledge. Few authors have reported methods of preparing and pretesting instruments, reliability coefficients or methods of determining test validity. The lack of standard methods and instruments to test nutrition knowledge makes it difficult to compare results and to draw conclusions about any particular group. A few examples are given to demonstrate the methods which have been used to assess nutrition knowledge.

Young and co-workers (1956) based nutrition knowledge on the ability of homemarkers to tell why foods from the Basic Four Food Groups should be included in the family meals. Using an interview procedure, adequate knowledge was considered being able to give reasons for including three of the four groups in the family's meals.

Mothers' nutrition knowledge was tested using telephone interviews (Emmons and Hayes, 1973). They were asked two questions:

1. What foods or types of food do you try to include in your child's diet each day?
2. Why do you feel each of these foods should be included?

Their children, grades 1-4, were asked at school:

1. If you could choose your food for a day, what foods would you choose to make you strong and healthy?
2. Why do you think each of these foods is important?

Scores were obtained by listing the Basic Four Food Groups or foods from those groups. Points also were given for listing nutrients. Both studies viewed nutrition knowledge as being able to list foods in the Basic Four Food Groups without other knowledge components. Neither the procedure of Young et al.(1956) nor the procedure of Emmons and Hayes (1973) seems adequate to test nutrition knowledge since they focus on only one aspect of the subject.

Several nutrition education researchers have used another testing scheme first noted by Eppright et al.(1970). True-false items that underwent review by a group of nutritionists were compiled into a test of nutrition knowledge.

Other authors in that research group were involved later in developing similar nutrition knowledge tests for a variety of groups (Petersen and Kies, 1972; Cho and Fryer, 1974; Vickstrom and Fox, 1976; Krause and Fox, 1977; Stansfield and Fox, 1977; Werblow et al, 1978). Generally, in those studies subjects were mailed a list of 30-35 true-false items. Respondents also had an option to indicate a "Don't know" category. In addition to answering true, false, or don't know, subjects rated their degree of response certainty on scales of 3-5 degrees for each item. Weighted scoring was used for each possible combination of true-false/degrees of certainty responses. The result gave a wider range of possible scores, however, the value of the more complicated scoring system has been questioned (Ebel, 1979). More effort is required for scoring and subjects' scores will generally be in the same rank order as would be obtained from a simpler scoring system.

Others have reported using adaptations of the true-false/degrees of certainty test for assessing nutrition knowledge. (Petersen and Kies, 1972; Schwartz, 1975, 1976). Sims also used that type of test plus an evaluation of knowledge of the Basic Four Food Groups (1976).

There is little mention in any of the above reports of instrument reliability coefficients or item analysis data. Generally, content validity when reported, was determined by using external judges to evaluate test items.

The nutrition content of the tests was probably valid since items were developed and reviewed by nutritionists. However, the ability of the tests to measure consistently and the ability of the selected items to discriminate between those who were knowledgeable and those who were not knowledgeable about nutrition was not determined.

A variety of other procedures have been followed to develop nutrition knowledge tests. Some researchers have pretested instruments to obtain reliability and item analysis data before developing the final test form to be given to subjects of interest (Harrison et al., 1969; Phillips, 1971). Others have obtained test data after administering the test to the subjects of interest (Dwyer et al., 1970; Grotkowski and Sims, 1978). Other combinations have been reported.

A nutrition knowledge test given to nurses was pretested on nurses and two control groups (Harrison et al., 1969). While the authors did not specify the analysis used, they did indicate that two nondiscriminative items were deleted prior to presenting the 67-item instrument to subjects. Test item response format was true, false or don't know. No reliability coefficient was reported.

Nutrition knowledge of high school students was measured using 100 multiple choice items (Dwyer et al., 1970). Questions were based on concepts obtained from widely used high school health, home economics and science textbooks.

Items were reviewed by a panel of nutritionists, teachers and other professionals for importance to the general public and for accuracy. The resulting nutrition knowledge test was pretested on a few students but not item analyzed until after presentation to the research subjects. Concurrent validity was assessed by giving the test to groups with various levels of nutrition background. Test-retest reliability was assessed on two groups of students, each of which took the test twice, two weeks apart. The correlations between the two sets of scores obtained from the same students at the two testings were determined. For the two groups, test-retest correlation coefficients were .77 and .95, respectively. Thus, the test was reliable.

Multiple choice items were developed to test knowledge of normal and therapeutic nutrition of medical students (Phillips, 1971). Content validity was determined by a review panel. Items were pretested, item analyzed, and revised. The Kuder-Richardson reliability coefficient for the revised test was .65. The test was then presented to subjects.

In another example, Yetley and Roderuck (1980) began nutrition knowledge test development with 66 items. After evaluation by faculty and pretesting on college students with subsequent item analysis, only 11 items remained. The 11-item test was given to two groups of students, and reliability coefficients of .64 and .61 were obtained (Cronbach's alpha).

While some authors failed to mention any methodology for developing instruments to measure nutrition knowledge (Toma, 1974; Philipps, et al., 1978), methodological studies detailing procedures for knowledge test construction have been reported (Pre'fontaine, 1975; Carver and Lewis, 1979; Lackey et al., 1981).

The methods reported for developing instruments to measure nutrition knowledge have ranged from minimal to including pretesting with statistical analyses. However, few investigators have followed fully the methodology outlined by education measurement specialists. (Thorndike, 1971; Mehrens and Lehman, 1978; Ebel, 1979). Generally, test development includes the following procedures: (1) developing the test specifications, (2) writing the test items,(3) pretesting the items and analyzing the item statistics,(4) compiling preliminary test forms, (5) trying out the preliminary test forms to verify difficulty, time limits, reliability, (6) compiling final test forms, (7) administering the final test forms (Tinkelman,1971).

In this study, knowledge of general nutrition will be measured using the Nutrition Knowledge Test (NKT) for teachers developed at Michigan State University, as part of the NET project funded in 1978-1979 (Kolasa et al., 1979; Lackey, et al., 1981). This test was designed for teachers of grades K-12 using established methods of test construction. It includes 28 multiple choice and 12 true-false items and does not require weighted scoring or degree of certainty response.

Attitude Measurement

Testing for attitudes is more difficult than testing for knowledge, partly because psychological constructs generally are more difficult to understand and define than knowledge. However, various techniques and measurement considerations have been outlined (Edwards, 1957; Torgerson, 1958; Oppenheim, 1966; Shaw and Wright, 1967).

Attitude

The use and definition of the term range widely. However, existing definitions agree on one common characteristic: attitude entails an existing predisposition to respond to social objects which, in interaction with situational and other dispositional variables, guides and directs overt behavior of the individual (Shaw and Wright, 1967).

Some authors have conceptualized attitudes as having three components: cognitive, affective and behavioral (Rosenberg and Hovland, 1960; Krech et al., 1962). Others have viewed attitudes as limited to primarily an affective component, based on evaluation by the holder of the attitude (Osgood et al., 1957; Shaw and Wright, 1967). The latter view reflects a unidimensional concept of attitudes and is consistent with the Likert and semantic differential methods used in this study. On the other hand, multidimensional methods provide a broader concept of attitudes and assumes that responses are based on many components or dimensions, not just evaluation or affect.

Attitudes are products of the socialization process, and influence peoples' responses to cultural products, to other persons, and to groups of persons. If the attitude of a person toward a given object, or class of objects is known, it can be used in conjunction with situational and other dispositional variables to predict and explain reactions of the person to that class of objects (Shaw and Wright, 1967).

Formally, attitudes are different from the other similar constructs, opinion and belief (Shaw and Wright, 1967). Belief refers to a level of acceptance of a proposition regarding characteristics of an object. As such, a belief becomes an attitude when it is accompanied by an affective evaluation component of the preferability of those characteristics. Opinion is similar to belief and attitude. However, opinions can be verbalized, while attitudes may be unconscious. Opinions are responses while attitudes are response predispositions. Though the distinction is made between attitudes and opinions (Shaw and Wright, 1967), many reports in the literature use the terms synonymously.

Attitudes have the following characteristics (Shaw and Wright, 1967):

1. Attitudes are based upon evaluative concepts regarding the referent object and can give rise to motivated behavior.

2. Attitudes are construed as varying in quality and intensity on a continuum from positive through neutral to negative.

3. Attitudes are learned through interaction with social objects, events or situations.

4. Attitudes have specific social objects or referents.

5. Attitudes have varying degrees of interrelatedness to one another.

6. Attitudes are relatively stable and enduring (Shaw and Wright, 1967). However, they are not inflexible or rigid elements of personality, but are ranges within which responses move (Likert, 1932).

Attitude Scales - Unidimensional

Traditional or unidimensional attitude scales of the Likert-type may consist of attitude statements with which respondents are asked to agree or disagree. There is a relatively small number of statements in the final instrument, which results from analyzing responses to a larger number of statements. Such scales are used to divide people into broad groups with regard to a particular attitude. They are relative, not absolute, measures.

Unidimensional or traditional scales have several characteristics. Generally, scales are assumed to be unidimensional, assessing, for example, an evaluative (good-bad) or a positive-negative attitude toward some object.

Unidimensional means the attitude scales are assumed to be linear, that is, one dimensional and that the scale items taken together represent one factor or construct. Factor analysis is often used to determine items that are highly correlated, that is, they "load" to form a factor.

However, Oppenheim (1966)pointed out that thinking on the nature of attitudes has been primitive. Measurement efforts have concentrated on placing people's attitudes along a straight line continuum. He further indicated that the linear model was not necessarily correct, but it did make attitude measurement easier.

Others have rejected the linear or unidimensional scaling methods in favor of multidimensional approaches because they provide more mathematically precise measures (Torgerson, 1958; Woelfel and Fink, 1980).

A characteristic of traditional scales is that they are bounded; that is, they have upper and lower limits or maximum and minimum values that can be used as scores. Also, the distance between score units is assumed to be equal, and that assumption is usually not tested. The *a priori* assumption of equal units, i.e., 1, 2, 3, 4, 5 does not assure equi-distance between 1-2 and 2-3 and so forth. Ideally, they should be the same; equal numerical differences should reflect equal attitude differences.

Additionally, the scoring range of each scale item is short. If a person's attitude is relatively positive on a pre-test, the attitude may increase significantly as a result of a treatment or intervention and yet the change may be undetectable with a post-test. The effective scoring range is extended by having several statements or items over which the subject's scores on individual scale items are summed. This somewhat alleviates the score range problem.

Another characteristic of traditional attitude scales is that the extreme values are assumed to be polar opposites, for example, strongly agree and strongly disagree. Lastly, the attributes or items that define an attitude are generally determined subjectively by the researcher. These attributes themselves are usually untested. That is, they are determined by fiat or subjective evaluation, and the attitude instrument becomes an operational definition of the attitude being measured. In other words, scale items or statements are assumed by researchers to be indicators of some underlying attitude. While that is not bad in and of itself, an infinite number of scale could be developed to measure one attitude, and comparisons of research results is difficult.

While there are some measurement problems with unidimensional scales, they have been used extensively in the social sciences throughout the last half century and in the area of nutrition education research (Eppright et al., 1970; Petersen and Kies, 1972; Schwartz, 1975, 1976; Grotkowski and Sims, 1978; O'Connell et al., 1979; Perkins et al., 1980). Depending on the procedure used to develop the scales, unidimensional scales are relatively easy to construct. However, their primary merit seems to lie in their ease of response. For survey research, they are easily adaptable.

And, otherwise unmotivated subjects can respond in little time.

Attitude Scales-Multidimensional

Torgerson has criticized unidimensional scaling methods for lacking rigor (Torgerson, 1958). He indicated that their primary disadvantage lies in the infinite number of ways they can be constructed, using an analogy of a math test, in which any number of math problems could be devised to measure math knowledge. Thus, they measure by definition as opposed to fundamental measurement in which numbers can be assigned to represent a property without measuring any other variables.

As previously noted, Oppenheim (1966) questioned the assumption of linearity of attitude scales. Even those researchers who use factor analysis to obtain unidimensional scales recognize the multidimensional nature of the scaled responses to traditional type attitude scales. Otherwise, the factor analysis procedure would not be needed or used.

The recognition that unidimensional scales may not be adequate for precise attitude measurement has led to the development of multidimensional scaling (MDS) procedures for measuring attitudes. Multidimensional scaling is actually a class of techniques which requires proximities or distance estimates among objects as the form of response from subjects. The chief output from MDS analysis is a geometric (multidimensional) or spatial configuration of points, as on a map (Kruskal and Wish, 1978). Thus, there are two distinct steps in any multidimensional scaling procedure: (1) a unidimensional distance estimation for determining distances between all pairs of stimuli under investigation, and (2) a spatial determination for obtaining the dimensionality of the space and the locations of the stimulus in that space (Torgerson, 1958).

The Galileo system of measurement is one MDS procedure for measuring attitudes (Woelfel, 1976; Gillham and Woelfel, 1977), and it will be used in this study. There are many advantages to using the Galileo system over traditional unidimensional scaling methods. (1) Concepts are defined in the domain of the topic by respondents who provide key words that they associate with the attitude topic in question.(2) The Galileo system may be readily used to analyze groups of subjects.(3) The interrelations among concepts are measured by estimating the distance between concepts of all possible concept pairs, compared as a ratio to a given standard. (4) The precision allows for the use of a fully metric MDS procedure to generate a plot of coordinates or spatial map. (5) The system can provide for analysis over time to determine if concepts have moved in the perception of a group based on some treatment, message or intervention.(6) The GALILEO™ computer analysis which is a component of this measurement system, can generate a statement or message, projecting the effects of every possible combination of messages that might be sent about a topic to determine which combination will produce the desired behavioral outcome. That is, the messages are designed to motivate people to some desired behavior. This system is described more technically by Gillham and Woelfel (1977).

Use of the Galileo system of measurement to determine nutrition attitudes has not been reported in the nutrition education literature. However, Penner and coworkers (1980) demonstrated that scales developed using the Galileo system could distinguish attitude differences between nutrition and non-nutrition students.

The Galileo system of measurement was developed for use in the field of communications. It has been used since the mid-1970s within that field to develop advertising strategies (Simmons et al., 1979; Korzenny et al., 1980). However it has also been used by the Dairy Herd Improvement Association to increase utilization of the dairy herd testing service (Wallace, 1979) and by the Cooperative Extension Service to develop strategies for retaining volunteer 4-H club leaders in urban settings (Woelfel and Fink, 1980). It seems feasible that information gathered from Galileo measurement could be used to promote better eating habits or to encourage teachers to teach nutrition as applications in the field of nutrition education.

The Galileo system of measurement has been compared with unidimensional scaling techniques and found to provide greater precision in measurement (Gillham and Woelfel,1977).

A disadvantage of the method might be the greater difficulty of response required. While distance estimation requires a more complex type of response from subjects (Torgerson, 1958), the average Galileo instrument (105 paired comparisons) can be completed by high school students in 15-20 minutes (Gillham and Woelfel, 1977).

Other Measurement Concerns for Attitude Instruments

Regardless of the type of measurement, an attitude instrument should be reliable and valid. Instrument reliability refers to internal or test-retest consistency of the scale. Internal consistency reliability is determined by computing a complete correlation matrix between all items and between items and total scores. Then, the reliability coefficient known as coefficient alpha or Cronbach's alpha, can be determined for the entire scale. (Cronbach, 1951). The test-retest reliability estimate is the correlation coefficient between two sets of test scores.

The attitude instrument is valid if it measures what it intends to measure. Criterion groups may be used to compare score results of group members versus non-group members to determine if the scales can distinguish between the two groups, but there are problems with the use of criterion groups for determining instrument reliability. Sometimes, appropriate criterion groups cannot be found, or responses of such groups may not be consistent enough to serve as adequate comparisons. For example, one could make the assumption that all members of the Society for Nutrition Education would have very positive attitudes toward teaching nutrition. However, people belong to groups for a variety of reasons and attitudes of members may be inconsistent. Alternatively, another well-established valid instrument could be correlated with a new instrument. If the newer instrument correlated highly and positively with the older instrument, the two instruments likely measure the same thing, and the newer instrument would also be valid. However, if another, valid instrument were available, there would be little point in developing a newer one.

There appears to be no way of determining the validity of an attitude instrument. However, one can strive for unidimensionality in traditional scales, thereby promoting construct validity. If a scale is unidimensional, its component items measure the same construct. A construct is a hypothetical variable, a name given to a group of attitude statements or items thought to be interrelated. If statements are highly interrelated, it follows then that they should be unidimensional. Factor analysis has been applied as a technique for construct validation. Factor analysis will determine which statements are correlated with a factor. However, it does not assure that the statements, in fact, measure the construct named by the investigator. Care must be taken in the naming of statements that form a dimension or factor or scale. The naming of a dimension because of apparent similarities in the statements does not assure or validate that the items measure the named attribute. The effects of the misnaming of factors on the subsequent interpretation of data have been reported (Armstrong, 1967).

Methods of Scale Construction

Several methods of developing unidimensional attitude scales are described below. The different methods have different purposes and characteristics. Several methods have concentrated on unidimensionality, one on multidimensionality.

Likert. The Likert (1932) technique is based on the development of statements to which subjects respond often along a 5 point scale of "strongly agree" to "strongly disagree". The score for each person is summed. Item analysis using a correlation between each item mean and total scale mean will indicate which items to remove from the scale. Those statements with low correlations to the total should be omitted since they do not show differentiation among individuals, therefore contributing nothing to the scale. Likert used a split-halves (odd-even) reliability estimate, corrected with the Spearman-Brown formula to determine reliability of the entire scale. Coefficient alpha is a better reliability estimate since it is the average of all possible split-halves (Cronbach, 1951). It was developed after Likert reported his method of scale construction.

Likert compared his method with Thurstone's method of scale construction. He obtained higher reliability for his method, and correlations between the two methods were .83 and .92, when corrected, validating Likert's procedure.

The Likert method has the advantage of being relatively easy to construct and score. It has been criticized as producing only ordinal level scores, but many researchers treat scores as interval level, determining means and using interval level tests of significance. The same criticism could be leveled at any classroom or achievement test, and it is probably more useful to treat the data in the manner which makes it most interpretable, calculating mean scores and reporting them for different groups. This method of scale construction and scoring will be used in this study.

Thurstone and Chave (1929). The Thurstone and Chave (1929) method of scale construction also involves the use of many attitude statements of the same type used in Likert scales. In addition, it requires the use of a great many people to serve as judges of the statements. As a first step, judges are supposed to objectively sort statements into 11 piles ranging from favorable to unfavorable, without allowing their own personal biases to intervene. The piles are separated by the investigator, and for each attitude statement, pile number frequencies are graphed. Q values, or semi-interquartiles are determined. The value of Q is the value assigned to that attitude statement.

When statements are presented to subjects, they are asked to check only those statements to which they are favorable. The checked statement Q values are then added and that sum becomes the individual's score.

This method produces a scale with equal intervals or equal-appearing intervals, and scores can be treated as interval level data. But because of major drawbacks to this approach to scaling this method was not selected for use in this study.

Semantic-differential (Osgood et al., 1965). This method of scale construction involves the evaluation of key concepts with adjectives. Sets of bi-polor adjectives are presented to subjects along with the attitude concept in question. Subjects check space between the adjectives which corresponds to their description of the concept, along a continuum, i.e.,

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good:___:___:___:___:___:___:___:bad
valuable:___:___:___:___:___:___:___:worthless

Generally, adjective pairs can be used to test attitudes toward any concept. The investigator selects as few or as many of the pairs as seem appropriate to the concept.

Osgood et al., (1965) has shown that adjectives form three dimensions of meaning: evaluation, potency and activity. Those names were given to the dimensions obtained from factor analysis based on the types of adjectives loading highly in each factor. Thus, evaluative adjectives are those such as good-bad, clean-dirty, beautiful-ugly, pleasant-unpleasant. Adjectives in the potency factor include: large-small, strong-weak, heavy-light. Examples of adjectives in the activity factor are: fast-slow, active-passive. Only evaluative adjectives are used for attitude scoring although others may be presented in the list given to subjects.

Many adjective pairs have already been factor-analyzed by Osgood et al (1965) to form the three groups of meanings and they can be used by researchers. However, it is a good idea to factor analyze the specific adjective pairs selected for a given scale since interpretation of the adjectives may vary depending on the concept in question and on the specific group for whom the scale is intended. Adjective pairs which do not have high factor loadings to form a unidimensional scale should be omitted. Scoring for this method is the same as for Likert-type items, but using a 7-point scale. Scores for each pair of adjectives are summed and means are usually reported. The great advantage to this technique is the elimination of the time required to construct attitude statements. This semantic differential method of scaling will be used in this study.

<u>Guttman-Scalogram</u> (Guttman, 1950). Attitude statements are developed such that each succeeding item becomes

more agreeable or disagreeable. The subject agrees (or disagrees) with each item up to the crossover point where he/she can no longer agree (disagree). That crossover point becomes the subject's score. A coefficient of reproducibility can be calculated for the scale using responses of all subjects. It takes into account the errors that occur when subjects agree with an item in the scale after they have passed their crossover points. Reproducibility and unidimensionality are key concerns of this method of scale construction.

This scale is difficult to construct. It is time-consuming and reproducibility is not assured. Data are assumed to be ordinal. This technique will not be used in this study.

Galileo System (Gillham and Woelfel, 1977). The Galileo system of measurement assumes attitudes are multidimensional. It uses key words associated with a particular attitude object. Subjects estimate distances between all possible pairs of the key words including the word "Me", compared to a standard pair of key words which is set equal to 100 units. If, for example, A and B are more similar than the standard, they are given a value less than 100. If they are less similar, they are given a value greater than 100, with no upper limit. If A and B are equal, they are assigned a value of zero. The data for all respondents are averaged and then plotted into multidimensional spaces, using the GALILEO[tm] metric multidimensional scaling program so that a "map" of the location of the key words relative to each other and to the "Me" can be obtained.

This instrument takes some time to develop since key words and the word pair used as the measurement standard must be derived from interviews with people from the population of interest and from analysis of distance estimates on the key words compared to an arbitrary standard set equal to 100, in a pretest. After pretest means, standard deviations and coefficients of variation are determined, a stable standard word pair can be selected which will be set equal to 100 units. The standard pair will have a mean close to the grand mean, a small standard deviation and a small coefficient of variation. Thus, it should be stable and the two key words comprising the standard pair should have similar meanings to most respondents. The final instrument can be compiled, then, substituting the domain-related standard pair for the arbitrary standard.

A major disadvantage of this instrument is that it takes considerable time to complete. However, this type of measurement has potential for evaluating change over time, for designing effective intervention messages and for obtaining precise data regarding the perceptions of people toward any concept. Therefore, this methodology will be used in this study.

In summary, the measurement of attitudes using unidimensional and multidimensional scaling methods was discussed. Unidimensional scales have the advantage of ease of response while lacking measurement sophistication. The multidimensional scaling method discussed is a superior measurement procedure, but may be difficult to use. In this study, both unidimensional Likert and semantic differential scales and the multidimensional Galileo system will be used to investigate teachers' attitudes.

Measurement of Nutrition Attitudes

Food/nutrition attitudes have been reviewed by Foley et al., (1979). Attitudes were discussed as preferences, as food behavior, as agreement and as complexities of meanings.

This review is based on methodology of scale construction and analysis.

Likert-Type Measures

Most nutrition researchers have used Likert-type scales to measure attitudes. Each attitude item is composed of a statement to which subjects indicate a degree of agreement or disagreement. Eppright and coworkers (1970) derived attitude statements from interviews and open-ended questionnaires. Responses of homemakers were analyzed to select the most highly correlated items for the final scales. Possible responses were "agree" or "disagree" and "favorable" or "unfavorable" with five degrees of certainty. Scores for attitudes toward nutrition, meal planning, food preparation, and permissiveness in child-rearing were determined for homemakers. All intercorrelations among the four attitude scores and nutrition knowledge were positive and significant at the .01 level of probability.

Many investigators have used or adapted the attitude instruments developed by Eppright and coworkers (1970) for the North Central Regional (NCR) Study of Diets of Preschool Children. The 40 NCR attitude items were used to assess attitudes of college home economics students (Gormley, 1973). Pre-post administration of attitude scales to students enrolled in home economics courses indicated significantly increased attitude scores as a result of the nutrition education in those courses. Scoring was based on agreement or disagreement with the statements and degree of certainty.

Others have reported adaptations of this kind of attitude assessment (Petersen and Kies, 1972; Schwartz, 1975; 1975; Thompson and Schwartz, 1977; Grotkowski and Sims, 1978; Schwartz and Barr, 1977; O'Connell et al., 1979; Sims, 1978a; Perkins et al., 1980). Teacher attitudes toward classroom teaching of nutrition and school feeding programs were assessed using statements with responses ranging from "strongly agree" to "strongly disagree" over a 5-point range (Petersen and Kies, 1972). Scores were not summed across items for the two sets of statements. Data were presented as percentages of teachers indicating, agreement or disagreement for each individual attitude statement.

The importance of nutrition to high school graduates and to public health nurses was assessed (Schwartz, 1975, 1976). The instrument for high school graduates consisted of 30 statements; 11 reflected attitude toward nutrition and eating habits, 8 attitude toward meal planning and 11 attitudes toward food preparation. The instrument for nurses had 14 statements related to nutrition and eating habits, nutrition counseling, personal nutrition, meal planning and meal preparation. For both instruments, responses were "agree" or "disagree" with degrees of certainty.

Attitude scores for high school graduates were not reported, but the author indicated that lower mean scores were noted for statements reflecting attitude toward meal preparation than for statements reflecting attitude toward meal planning. The author also discussed correlations between attitudes, knowledge and practices. However, the values of the correlation coefficients were not given. It was also not possible to determine if correlation calculations were performed on the summed score of the 30 attitude statements or on each statement individually.

In the second report, nurses'mean attitude score was reported as a percentage of the total possible, 87.7 percent (Schwartz, 1976). Again, the author discussed relationships between attitudes and other variables without providing the correlation coefficients. While attitudes may be significantly related to certain variables ($p \leq .01$), the strength of the relationship cannot be determined by readers when correlation values are omitted.

In 1977, adolescent attitudes toward nutrition were measured using a 15-statement instrument related to food selection, dietary adequacy, and importance of nutrition to health (Thompson and Schwartz, 1977). Following the pattern of Schwartz's work, described above, responses were "agree" or "disagree" with degrees of certainty. A mean score of 66.9 percent was reported. Significant, positive correlation coefficients were found for nutrition knowledge and attitudes ($r=.50$) and attitudes and practices ($r=.21$).

Grotkowski and Sims (1978) reported reliability estimates associated with the attitude scales they used. Reports of reliability coefficients were lacking in the studies mentioned previously. Three of the four attitude measures had Cronbach alpha reliability coefficients of .70 or greater. Attitude statements on (1) misconceptions about weight-reducing diets (2) importance of nutrition (3) use of food and supplements as medicines and (4) necessity of vitamin/mineral supplements were derived in part from statements in the NCR study. Responses ranged from "strongly agree" to "strongly disagree" on a 5-point scale. Scores for items were summed for each of the four measures. Correlations were determined between attitudes and other variables, and analysis of variance was performed to determine differences in attitudes among purchasers of various "health" foods. Highest correlations ($p \leq .001$) were found between knowledge scores and attitude that nutrition is important ($r=.51$) and attitude that food and supplements can be used as medicine ($r=.-45$), between attitude that nutrition is important and attitude that food and supplements can be used as medicine ($r=.-49$) and between attitude toward misconceptions about weight-reducing diets and use of food and supplements as medicine ($r=.55$).

Mothers' attitudes reflecting aspects of nutrition during pregnancy and infancy were assessed with a 23-statement instrument with the same response format used earlier by Schwartz (Schwartz and Barr, 1977). The authors reported that the statements had been validated in a previous study.

The authors indicated they were analyzing relationships of environmental variables to attitude scores. However, they performed analysis of variance and t-tests which analyzes scores for differences between means rather than correlational analysis which indicates degrees of linear relationship between two variables. Attitudes scores were higher for those with higher socioeconomic levels ($p \leq .00001$) for those with at least a high school education ($p \leq .001$), for those whose husbands had highest educational levels ($p \leq .001$) and for those who attended prenatal classes ($p \leq .001$). Those women whose source of information was a physician had lower scores ($p \leq .01$) than those using some other source.

In another study by Sims (1978a), Likert statements were used to assess attitudes/beliefs of vegetarians. Statements regarding the importance of nutrition had been derived from previous work. Other statements were compiled to reflect beliefs about health foods, vitamin and mineral supplements, the food industry, food additives, and weight reduction. All items were factor analyzed to determine dimensions and, thus, scales. Reliability coefficients for the various scales ranged from .73 to .90. Significant differences between vegetarian and non-vegetarians were found on several of the scales. Vegetarians believed more strongly in health foods ($p \leq .001$) and had fewer misconceptions about weight reduction ($p \leq .001$). Vegetarians also believed less strongly in the need for vitamin/mineral supplementation. Non-vegetarians were more positive about the importance of nutrition ($p \leq .05$).

Teacher attitudes were assessed using two types of instruments (O'Connell et al., 1979). The first was a Likert-type instrument to assess teachers' attitudes toward nutrition education. Statements reflected importance of nutrition and the favorability of nutrition education in the schools. Statements reflecting the importance of nutrition were derived from previous work (Eppright et al., 1970; Sims, 1978b; Grotkowski and Sims, 1978). Other items reflecting nutrition education in the schools were originated for that study. Factor analysis was used,and reliability determinations yielded coefficients of .84 and .87, respectively.

The second instrument used a funnel technique (Stouffer, 1955) and was designed to measure teachers' commitment to teaching nutrition. Three types of items were used (1) elicited free response (2) assigned ranking based on desirability and (3) forced choice. The test-retest reliability coefficient for this scale was .94.

The Likert instrument was scored by summing the scores for each individual statement. Scoring of the commitment scale was based on the hierarchical arrangement of the questions. Points were assigned only to positive responses,and those responses at the beginning of the instrument were assigned a greater value than those at the end. Thus, the earlier or more often that nutrition was mentioned or chosen, the higher the score obtained.

Pre and post-test means were obtained. Change scores were determined. One way analysis of variance was performed and Tukey's test was used to compare differences between means. Relationships among the two attitude scale prescores and commitment prescores were examined using Pearson correlations. Teacher attitude scores did not change significantly as a result of a 10-week nutrition course. Teachers in both the experimental and control group entered the study with positive attitude scores. This is often a problem with Likert-type attitude measurement. Each item score ranges from 1-5 points. If people tend to respond favorably to begin with, the effective score range becomes reduced from 5 points to perhaps as little as two. Thus, it becomes very difficult to detect change or movement.

Low but significant correlations were found between the attitudes "Nutrition Is Important" and "Favors Nutrition Education in Schools" (r=.41, p .001); and "Nutrition Is Important" and "Commitment to Teaching," (r=.23, p .05); and between "Favors Nutrition Education in Schools" and "Commitment to Teaching Nutrition," (r =.41, p .001). The authors concluded that there was some commonality in disposition reflected by the three scales but that the scales reflected different aspects of the underlying dimension.

A 53-statement Likert-type attitude instrument was developed to measure teachers' attitudes toward the school lunch program (Perkins et al., 1980). Statements were derived from other studies on factors influencing school lunch participation. A four point response scale was used: "strongly agree", "agree", "disagree" and "strongly disagree". The 53-statements were assigned to 13 categories by independent evaluation and discussion by the project group. The categories also formed the basis for attitude scales. Reliability coefficients were determined for the 13 scales. Items were eliminated from three of the scales to enhance reliability. The scales were considered acceptable when coefficients of .50 or greater were obtained, following Nunnally (1967). Four scales or categories could not be modified to obtain coefficients of .50 so they were omitted from the regression analysis. However, the scale statements along with means and standard deviations were still reported in the article. If the scales are not measuring reliably, the value of the summary data seems questionable. Using regression analysis, teachers attitudes toward nutrition education, toward eating with the class and toward quality of food served were significant predictors of average daily school lunch participation. When these other variables were included with the attitude scale scores in the regression analysis, the percentage of free and reduced priced lunches was the best single predictor of lunch participation followed by the percentage of bussed students. Significant attitude predictors were attitude toward eating with the class and attitude toward quality of the food served. Teachers' attitudes toward eating with their classes were negatively related to the school lunch participation of their students.

Seven-point Likert-attitude scales were developed and used in a study designed to predict food purchases (Schutz et al., 1977). This was a market-oriented application of attitude research. The authors factor analyzed the data and used composite scores for the rest of the analysis. The use of factor scores to represent many variables has not been noted in other nutrition attitude studies.

Step-wise regression analysis was used to analyze the impact of certain variables on food purchase frequencies.

One methodology paper was found in which conceptual and empirical approaches to Likert attitude scale construction were compared (Lohr and Carruth, 1979). The authors derived from the literature or wrote attitude statements to assess nursing students' attitude toward nutrition. Items were evaluated against Edward's informal criteria for attitude item construction (Edwards, 1957).

The response format was a five-point continuum from "strongly agree" to "strongly disagree". The authors discussed coefficient alpha and split-half reliability coefficients and the use of item total correlations to eliminate items that did not correlate highly with the total. That improves unidimensionality and increases the value of the reliability estimate. The authors indicated that scales developed using the empirical method and the coefficient alpha reliability estimates are the most promising for assessing nutrition attitudes. They stressed the need for improving the attitude research methodology used by nutrition education researchers.

During the 1970s, measurement of nutrition attitudes with Likert scales has improved considerably. The most recent reports include reliability estimates and statements are frequently derived from other studies and/or have undergone extensive evaluation. Sims and her coworkers have generally used factor analysis to obtain empirical evidence to justify inclusion of statements in attitude scales (Sims, 1978a ; O'Connell, et al., 1979). Reliability determinations and factor analysis both lead to improving the unidimensionality of scales. Factor analysis can delineate the multiple dimenions found in a set of statements and aid in reducing a large number of items to a smaller number of better items that comprise scales within the larger set.

For this study, Likert statements will be derived from previous NET project work (Kolasa et al., 1979), from the work of other researchers and from statements of teachers in the interview phase of the study. Empirical data from factor analysis, reliability estimations, and analysis of variance also will be used to determine final scales.

Thurstone/Likert Measure

Only one application of the Thurstone scaling method to assess nutrition attitude was found (Carruth and Anderson, 1977a). One hundred twenty-eight food/nutrition attitude statements were obtained from interviews, television, popular magazines and the nutrition education literature. A panel of 25 professionals was asked to judge each statement as to whether it reflected the attitude of flexibility or inflexibility regarding a nutrition practice. After evaluation, 60 statements remained. This step constituted validation of content. Next, to determine the degree of flexibility represented by each statement, the statements were placed in a Thurstone format so that each respondent answered by marking any of 11 equal-appearing intervals from most rigid to most flexible. The 60 statements were ranked by 20 supervising home economists in the Kansas Expanded Food and Nutrition Program (EFNEP) and by a group of 33 home economics education college seniors. The rankings were used to calculate scale (S) values and interquartile (Q) values. Forty statements with the smallest Q and S values were selected for the final instrument. They were formatted as Likert statements.

The instrument was given to 43 EFNEP assistants. Trace line and principal component factor analyses were used to determine unidimensionality of the instrument. Those items with factor coefficients of .35 or greater were regarded as contributing significantly to the composition of a factor ($p \leq .01$). Seventeen statements were delineated by factor analysis as unidimensional and comprised Factor I. Factor I accounted for 35 percent of the variance. This factor appeared to assess an evaluation of change, i.e.: "change is good". Two other dimensions obtained, however, together they accounted for only 5 percent of the variance. The authors suggested that EPNEP assistants' attitudes toward the practice of nutrition may have several dimensions. Thus, attitudes may be better measured on scales designed for multidimensional scaling analysis.

Semantic Differential Measures

Carruth has also used semantic differential scales to assess nutrition attitudes (Carruth and Musgrave, 1979). Semantic differential scales are composed of adjective pairs which are used as descriptors of the concept in question. Subjects mark the adjective scale as they perceive it best describes the concept.

Twenty-five bipolar adjective pairs were selected to evaluate the concepts "Nutrition Education" and "Community Nutrition". An assumption of reliability and validity was made based on numerous published data which demonstrated an evaluation factor could be tapped by certain adjectives. The scales were administered to students enrolled in a community nutrition course during the first and last weeks of winter quarter for four years. Responses were factor analyzed and 2 factors were obtained for each of the concepts. The significance of changes in students pre-post ratings was determined using McNemar's test. The authors suggest this type of assessment can be used for evaluating students' attitudes toward courses over time because significant changes were found on a number of the adjective scales as a result of the community nutrition course.

The semantic differential adjective pairs were assumed by these researchers to be unidimensional because they were believed to tap the evaluative dimension. Clearly, the factor analytic results indicated the scales were not unidimensional. Previously in the "Attitude Measurement" section of this review, it was noted that factor analysis data should be obtained for adjective pairs because interpretation of different concepts varies. This should be done as a pretest so that final scales will tap only one dimension or factor.

In a somewhat different application, the semantic differential was used to measure connotative meanings of foods (Fewster et al., 1973). The researchers sought to determine connotative or implied meanings of foods and underlying dimensions of meaning. Several foods or food groups were selected as the concepts for evaluation: meat, steak, vegetables, green beans, dairy products, fresh milk and powdered milk. Bipolar adjectives and phrases were selected to fit into 12 categories: economic perceptions, food value perceptions, convenience perceptions, communication perceptions, perceived health needs, perceived health apprehensions, aesthetic-sensory perceptions, perceived group differences, perceived sex differences, perceived status group differences, communication behavior perceptions concerning information needs and sources and personal and group influences. Seventy-eight adjective/phrase scales were pretested by high-income and low-income respondents. Data were factor analyzed and 38 scales remained for further analysis. The test-retest reliability was determined using another group of homemakers who were tested one week apart. The coefficient for all 38 scales was not reported, however, the authors indicated 12 of the 38 scales had a correlation of .81 when the correlation between the two testings was determined. Thus, the reliability for the 38 scales is not known.

Factor analysis resulted in four major factors which were named (1) evaluative, (2) communications, (3) nutrition and (4) health apprehension. Factor loadings above .60 were reported. The first factor accounted for 22 percent of the total variance.

Discriminant analysis, a multi-variate procedure, was used to provide additional information in assessing the combinations of scales that discriminate best among the observations. That is, it provides the best linear combinations of the 38 scales. In addition, two-way analysis of variance was used to determine differences between foods and the two groups high and low-income . On the basis of the various analyses, 22 scales were selected for retention and future testing of the instrument. Those authors made more use of statistical analyses than most nutrition researchers in development of their instrument.

For this study, semantic differential adjective pairs will be selected intially from the work of Osgood et al., (1967). They will be pretested on students and tested again on teachers in the interview sample. Responses from teachers will be factor analyzed and adjective pairs with high loadings on the evaluative dimension will be selected for inclusion in the final scales presented to teachers in the mail survey. In addition, reliability estimates will be determined and pairs not contributing highly to scale reliability will be eliminated. Thus, scales used for the final data anslysis should be unidimensional and reliable. Furthermore, the selection of the adjective pairs will be justified by empirical data.

Summary

Nutrition attitude researchers have made most use of Likert scales. They are easy for respondents to mark and appear to be easy to construct. However, perhaps due to the apparent ease of constructing such scales the methods and analyses used have often been less than rigorous. Some authors have not even determined reliability coefficients. On the other hand, a few of the reports included reliability estimates and the use of factor analysis to determine unidimensionality/multi-dimensionality of the scales. One report was found using a funnel-technique to measure commitment. Another report was found using Thurstone's method for scaling. However, this method is very time consuming, requires many judges and its usefulness seems limited. Two semantic differential applications which included factor analysis of the adjective pairs were noted. This method has potential for further use in nutrition education research because of its relative ease of development and response indicating it could be a useful technique. This research will make use of both the Likert and the semantic differential methods of scale construction.

Measurement of Nutrition Practices Teaching and Personal

Methods of obtaining nutrition practices data has often relied on subjects' self-report on a survey instrument or on verbal response to interview questions. When teachers have been the primary focus, self-report of nutrition education practices has been used. Direct observation by investigators has been used in the school lunchroom to measure actual quantities of foods consumed, or plate waste when students have been the subjects of interest. In addition, self-report by students and reports by parents have been used to determine personal nutrition practices.

Nutrition education practices of teachers have been measured by several variables. Whether or not the teachers teach nutrition in the classroom (Cook et al., 1977; Mutch, 1980) the amount of time spent in teaching nutrition (Cook et al., 1977; Lackey and Kolasa, 1979; Levine et al., 1979), resources used to teach nutrition (Mutch, 1980), grade levels at which nutrition education takes place (Gigliotti, 1976; Cook et al., 1977; Lackey and Kolasa, 1979), subjects in which nutrition is taught (Gigliotti, 1976; Levine et al., 1979; Marr et al., 1980), types of activities or teaching methods used (Head, 1974; Gigliotti, 1976; Marr et al., 1980;

Mutch, 1980), and topics actually taught (Gigliotti, 1976; Hoffman-LaRoche, 1978; Mutch, 1980) have been measured.

Generally, mail surveys were used to collect data (Cook et al., 1977; Gigliotti, 1976; Levine, 1979; Marr et al., 1980). Interviews were also conducted (Lackey and Kolasa, 1979; Mutch, 1980). Most of the authors mentioned pre-testing their instruments, but limited information of this nature is provided in published articles.

Nutrition-related behaviors of non-formal adult educators, Extension Nutrition Education Assistants (NEA's) were assessed by three measures: (Carruth, et al., 1977b):

1. brochure requests for free nutrition literature
2. verbal statements of nutrition practices and
3. observed overt nutrition-related behaviors.

Those behaviors were related to both teaching nutrition and to personal nutrition. That combination of measures may provide better indicators of behavior than one type of measure alone.

Generally, personal nutrition practices data for teachers have not been reported. Some diet and health variables were assessed during the NET project, 1978-1979 (Kolasa et al., 1979). Few teachers reported following special diets related to weight reduction (14%) or to diseases (2% or less) for each health problem identified.

Personal nutrition practices of children have been measured by determining the actual amount of vegetables and milk consumed in the school lunchroom for 5 consecutive days, (Bell and Lamb, 1973), by measuring and by nutrient analyses of the waste (Head, 1974).

Changes in amount and nutrient composition of plate waste were determined with pre-post treatment assessments (Head, 1974). These direct measures provide greater accuracy but are more costly and inconvenient than self-report measures. Also, only the noon meal was evaluated so no information was obtained regarding consumption at other times of the day.

A self-report method for assessing food intake, the 24-hour dietary recall has been used in many studies (Gassie and Jones, 1972; Lackey and Kolasa, 1979). Accuracy of this measure depends on the skill of the interviewer, the subject's ability to remember and the subject's desire to provide honest information. In addition, the days' food intake, even if accurately described, may not be representative of a person's usual food intake.

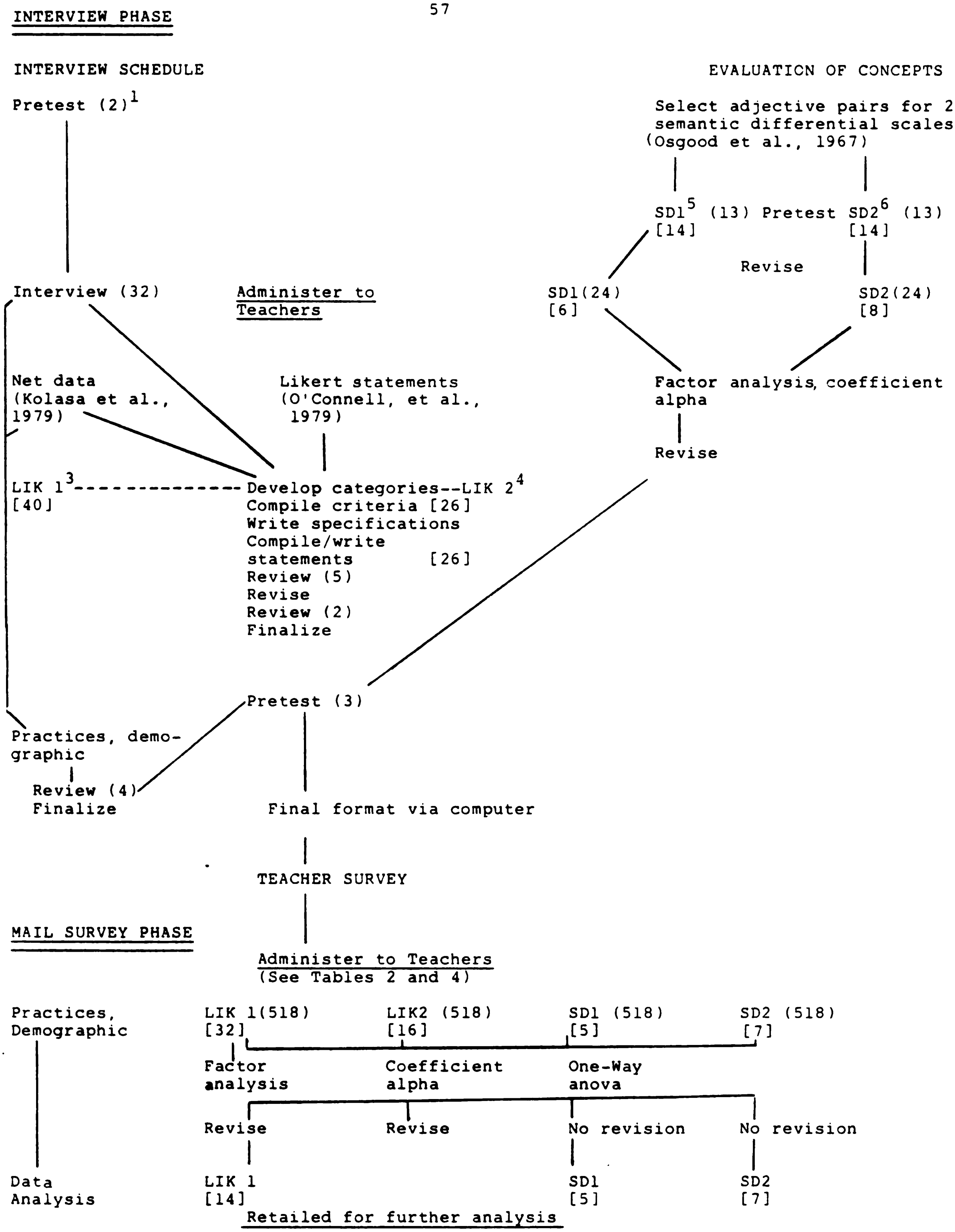
For young children, practices have often been reported by mothers (Eppright, et al., 1969; Sanjur and Scoma, 1971). However, it has been shown that children over the age of four can report their own preferences (Birch, 1979; Phillips and Kolasa, 1979).

In this study, teachers' nutrition teaching practices will be assessed along with some personal nutrition practices. Preliminary data will be obtained from teachers responses to interview questions. Subsequent questions will be devised for inclusion in the mail teacher survey.

METHODS AND PROCEDURES

In this study, the nutrition knowledge, attitudes and practices of secondary teachers of health/physical education, home economics, science and social sciences were assessed. The study had two data collection components. The procedures followed are summarized in Figures 1 and 2. Interviews were conducted on a small sample of teachers to obtain preliminary knowledge, attitude and practices data (1) for determining variables to include in the second phase, and (2) for use in the development of attitude scales. (See Appendix A for interview schedule). Oppenheim (1966) has stressed the need for interviewing subjects from the target population before developing attitude statements.

Following analysis of the interview data, the Teacher Survey (Appendix B) questionnaire containing Likert and semamtic differential attitude scales, demographic and practices questions were developed, along with the Nutrition Perceptions instrument for the Galileo attitude assessment (Appendix B). The two forms developed in this study and the Michigan State University (M.S.U.) Nutrition Knowledge Test (NKT) (Appendix A) were mailed to a larger sample of Michigan seconday teachers of health/physical education, home economics, science and social sciences. The final Likert and semantic



[1]Number in parentheses refers to number of pretesters or respondents

[2]Number in brackets refers to number of items in scale

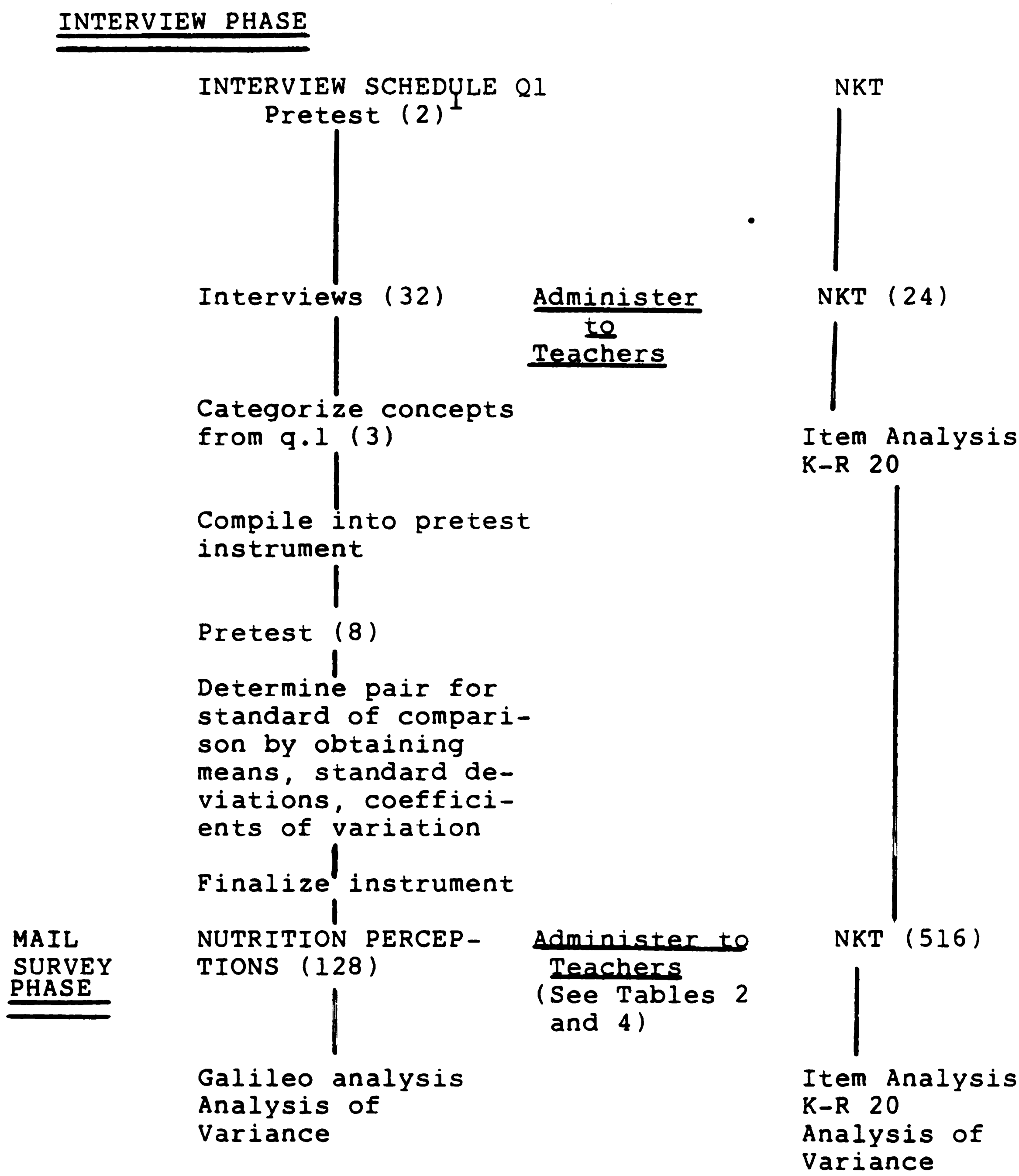
[3]Likert scale for assessing attitude toward teaching nutrition

[4]Likert scale for assessing attitude toward personal nutrition

[5]Semantic differential scale, "My Own Nutrition"

[6]Semantic differential scale, "My Teaching Food and Nutrition"

FIGURE 1: PROCEDURES TO DEVELOP LIKERT AND SEMANTIC DIFFERENTIAL SCALES AND TO OBTAIN TEACHER DEMOGRAPHIC AND PRACTICES DATA



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[1]Number in parentheses refers to number of pretesters or respondents

FIGURE 2: PROCEDURES TO DEVELOP GALILEO SCALES AND TO OBTAIN NUTRITION KNOWLEDGE DATA

differential scales were determined. The data for all teachers and for each teacher subject group were analyzed using programs available at the Michigan State University Computer Center.

Interview Phase

The Interview Plan

The plan for the interview phase of the study provided for interviews from 40 teachers; 10 from each subject, and three geographic locations as noted in the table below (Table 1).

TABLE 1: PLAN FOR NUMBER OF TEACHERS TO BE INTERVIEWED IN THREE LOCATIONS DURING INTERVIEW PHASE

Teacher Subject Group	Teachers in Each Location		
	Detroit Number	Lansing Number	Upper Peninsula Number
Health/Physical Education	4	4	2
Home Economics	4	4	2
Science	4	4	2
Social Science	4	4	2

Three interview sites in Michigan, Marquette, Detroit, and the Lansing area were selected because of their diverse natures and because of the expected level of assistance in obtaining a sample from the Nutrition Education and Training (NET) regional center coordinators, based on consulation with the State NET Coordinator.

Sample Selection

The teacher sample was obtained by contacting the NET regional center coordinator for three locations and after that, the procedure varied considerably. One coordinator obtained approval from school principals and arranged interview dates. Another one provided names of teachers and principals for the investigator to contact, and the third provided forms to complete and names of administrators to contact for obtaining permission to conduct research in the school system. The criteria for selecting teachers were that teachers taught in one of the four subject areas under investigation, and that they taught at grades 6-12.

The Interview

The interview was designed to take approximately 45 minutes and consisted of a combination of open-ended and close-ended questions regarding teacher views of nutrition, students' eating habits, role of nutrition education in the schools, persons who should teach nutrition, subjects in which nutrition should be taught, teacher impact on students' eating habits, feelings about school meal programs, availability of vending machines and snack counters. Teachers were also asked to select reasons from a list provided that would keep more food and nutrition from being taught in the schools. Then they were asked to select from the same list, items that would keep *them* from teaching more foods and nutrition in their classes (Appendix A).

Teachers were asked specific questions regarding their own eating/nutrition practices, and finally, they were asked for background data such as grades/subjects taught, years of teaching experience and about previous course work and training in foods and nutrition.

At the close of the interview, teachers were asked to complete the 40-item MSU Nutrition Knowledge Test (NKT) (Kolasa et al., 1979) and two semantic-differential attitudes scales (described p. 63). The instruments were left with the teachers along with stamped envelopes pre-addressed to Michigan State University. Teachers were encouraged to complete the instruments within the next few days. Before interviewing the investigator participated in two interview training sessions.

Consent Forms

A consent form was developed to explain to teachers that their participation was voluntary, the information would be treated confidentially, they could end the interview at anytime, and they could obtain a summary of the project results (Appendix A). Prior to collecting data, approval for the study was obtained from the University Commitee on Research Involving Human Subjects.

Interview Phase - Development of Instruments

Interview Schedule

The interview schedule developed to obtain preliminary attitude and practices data contained 61 open-ended and forced choice questions (Appendix A). The first 22 questions related to teachers views of nutrition, and nutrition education, questions 23-38 asked for their views about specific eating behaviors of people and questions 39-46 concerned teachers personal nutrition practices. The last section of the interview schedule, titled Teacher Background, contained 13 questions related to teaching responsibility, training and nutrition information sources. The interview schedule underwent several revisions before it was considered ready for pretesting. The interview was designed to be completed in 45-50 minutes.

Probe Cards

The probe careds were developed to assist the teachers in responding to three multiple choice-type questions (qs.9, 22 and 23) and to lengthy statements (qs 23-37) that otherwise would require rereading by the interviewer (Appendix A).

The cards contained the same response choices or statements as the interview schedule. The probe cards were made of 4" x 6" white cardboard with the information in large type for easy reading. The white cards were attached to colored paper and heat-laminated with plastic for durability.

Evaluation of Concepts

A three page instrument containing, semantic differential attitude items was compiled (Appendix A). The first page explained the process of marking the scales. Pages two and three contained the concepts "My Own Nutrition" to reflect attitudes toward personal nutrition and "Teaching Nutrition", to reflect teachers' attitudes toward teaching nutrition, respectively. Each concept was accompanied by sets of bipolar adjectives to be used for evaluating the key concept. Initially, adjectives were chosen subjectively by the investigator for inclusion in the scales from the work of Osgood et al., (1957). Adjective pairs were selected from those with high factor loadings on the evaluative dimension that were thought to relate to the two key concepts. The scales and instructions were pretested on graduate students of community nutrition and revised based on their comments and scoring.

Nutrition Knowledge Test (NKT)

The 40-item Michigan State University (MSU) Nutrition Knowledge Test (NKT) containing 12 true-false and 22 multiple choice items was used to measure teachers' general knowledge of nutrition (Appendix A). The NKT had been developed using test specifications, item tryout and item analysis, item-revision and reliability analysis. Previous use of the test has shown it to measure teachers' knowledge reliably (Kolasa et al., 1979).

Pretesting

The interview schedule was pretested initially for length, ease of administration and clarity with two junior high teachers known by the investigator. Since teachers would be interviewed during a class period, the interview could take no more than 45-50 minutes.

The interview schedule and other instruments were also reviewed by the investigator's major professor and committee members.

Interview Phase - Data Collection

All teacher interviews were conducted during the school day at the teacher's school. Interviews were conducted in the classroom, in the teachers' lounge or in an unused office in the principal's suite of offices.

Prior to the interview, the study was briefly explained and the teacher's signed consent was obtained.

At the close of the interview, teachers were given a copy of the NKT and the semantic differential concept evaluation for completion at another time and to be mailed to the investigator (Appendix A). The forms were described briefly by the investigator. In addition, teachers were given a copy of the dietary guidelines, "Nutrition and Your Health," and thanked for their participation.

Interview Phase - Data Analysis

Date collected on the interview schedule, the MSU Nutrition Knowledge Test scores and the scale scores from the semantic differential Evaluation of Concepts were coded by the investigator. The data were key punched onto cards at Michigan State University's Data Preparation Center, and were analyzed on the Cyber 750 Computer using programs in the Statistical Package for the Social Sciences (Nie, et al., 1975) the SPSS-6000 Supplement (Michigan State University, Computer Laboratory, 1978) and the RPX programs (Standard Research, Inc., 1980).

Frequencies were calculated for all variables. T-tests were used to evaluate differences between means of samples divided on certain dichotomous variables. Semantic differential items were factor analyzed using principal factoring and varimax rotation. The NKT was machine scored and item-analyzed at the Michigan State University Scoring Office.

Mail Survey Phase

The Survey Plan

The survey plan called for mailing survey instruments to 1200 teachers, 300 from each of the four subject areas under study. The goal was to receive at least 100 returned instruments from each teacher subject group.

Sample Selection

Four samples of teachers,one for each subject area (1) health/physical education;(2) home economics; (3) sciences; (4) social sciences, were randomly drawn from the 1978-79 microfiche certification files of the Michigan Department of Education. The certification list used was one with the names of all teachers employed during the 1979-80 academic year. It was the most complete and up-to-date list available containing approximately 110,000 alphabetized names with subject, grade level, intermediate school district and school building codes. To randomly select teachers, 207 numbers were placed in a box representing the 207 pages of names/microfiche card. Numbers were drawn with replacement to obtain the page number to scan on the microfiche card. When a page was determined, the first name on the page having both the desired subject code and grade level code (secondary) was picked. For each microfiche card, 29 numbers were drawn, with replacement. When a page number was drawn twice, the second person meeting both criterion was used. This process was followed for the first 10 microfiche cards. The eleventh card had proportionately fewer pages of names and only 10 names were drawn from it. This entire procedure was followed four times to obtain the four separate lists of names and building codes. Later, building codes were used to obtain the teachers' addresses from a computer print out.

Mail Survey Phase - Development of Instruments

Teacher Survey Questionnaire

A self-administered questionnaire was developed and printed onto marked-sense computer cards with the assistance of the Social Science Research Bureau and Applications Programming Office in the Computer Center at Michigan State University (Appendix B). The questionnaire contained 48 Likert-type statements for assessing attitudes toward teaching nutrition and toward personal nutrition, and two concepts, "My Own Nutrition" and "My Teaching Food and

Nutrition" for semantic differential attitude evaluation. The remaining fourteen questions were demographic or related to teachers' background and responsibility, nutrition education, teachers' personal nutrition/health practices and interest in nutrition. The questionnaire also contained space for writing in the teacher's name and address to receive results of the survey.

The overall layout of the instrument, wordings for questions and instructions and ink color were based on recommendations from Michigan State University Computer Center personnel working with the Survey Research System on interactive design of survey cards.

Teacher Survey - Likert Attitude Scales

Previous NET data on Likert attitude items (Kolasa et al., 1979), the attitude assessment work reported by O'Connell et al., (1979) and the data obtained from the interviews in this study were reviewed for ideas and statements that could be developed into Likert attitude statements. Categories were identified from the previous MSU NET work (Kolasa et al., 1979) and from responses to several interview questions for which statements would be compiled or written. Final categories were subjectively determined by the investigator. Specifications were written to aid in developing the two Likert scales: one to assess attitude toward teaching nutrition, one to assess attitude toward personal nutrition (Appendix C). Criteria were compiled for constructing attitude statements from the works of Likert (1932) and of Edwards (1957; Appendix C).

For the Likert scale to assess attitude toward teaching nutrition, the following categories were derived: time, resources, responsibility, student interest, subject/grade, teacher preparation, influence of teaching on student behavior, and role modeling. Statements from O'Connell et al., (1979) and from previous MSU NET work (Kolasa et al., 1979) were used or rewritten for inclusion within certain categories (See Specifications for Teaching Nutrition and Personal Nutrition Scales, Appendix C). In addition, other statements were written relating to reasons teachers gave that would keep them from teaching nutrition in their classrooms. Forty statements were compiled. The statements underwent review by Drs. Carolyn Lackey and Kathryn Kolasa and by three community nutrition graduate students who had previous experience developing attitude statements, against a list of criteria mentioned above (Appendix C). After review, revision and final review, 32 items remained relating to attitudes toward teaching nutrition.

For the Likert personal nutrition scale, the following categories were identified: weight control, fitness/exercise, health, eating habits, shopping/consumer interest. Some initial statements were taken from the attitude work on the MSU NET project 1978-89 (Kolasa et al.,1979). Additional statements were written by the researcher based on teacher responses to several questions during the interview phase of this study (See Specifications, Appendix C). In all, 26 statements were written for review by the group of reviewers mentioned above. The statements were revised and reviewed again.

The 32 statements comprising the Likert teaching nutrition attitude scale and the 16 statements comprising the Likert personal nutrition scale were randomly assigned item numbers 1-48 on the Teacher Survey questionnaire rather than presenting them as two distinct sets, to minimize response set by teachers. The teaching nutrition scale statements were: 2, 3, 5, 6, 7, 8, 9, 12, 13, 14, 15, 17, 19, 20, 21, 22, 24, 25, 26, 27, 28, 31, 35, 36, 37, 39, 40, 42, 44, 45, 47 and 48 on the Teacher Survey questionnaire.

The personal nutrition scale items were 1, 4, 10, 11, 16, 18, 23, 29, 30, 32, 33, 34, 38, 41 and 46 on the Teacher Survey Questionnaire. The statements for the two scales are listed separately in Appendix C.

Teacher Survey - Semantic Differential Attitude Scales

The two semantic differential scales, "My Own Nutrition" and "My Teaching Food and Nutrition" were developed based on reliability analysis and factor analysis of data collected during the interview phase of the study. They were the adjective pairs contributing most to scale reliability and having highest factor loadings. For the scale, "My Own Nutrition", the meaningful/meaningless adjective pair had a loading of .16. The reliability coefficient alpha increased slightly, from .87 to .89 as a result. For the teaching nutrition scale, the adjective pair, reputable-disreputable was eliminated because of a factor loading of .03. Coefficient alpha changed from .85 to .89.

The second concept was renamed from "Teaching Nutrition" to "My Teaching Food and Nutrition". This was done to (1) personalize the concept and to (2) suggest a broader connotation to the word "nutrition". While nutritionists are aware that nutrition implies a relationship to food, teachers may have a narrower concept of the term, especially as used in the form of "nutrition education". (Mutch, 1980). Thus, throughout the survey instrument food/nutrition is used.

The two semantic differential scales were printed onto side 3 of the Teacher Survey questionnaire (Appendix B). The adjective pairs were presented as two distinct sets because teachers have to respond to a stated concept. An effort was made to avoid set responses by changing the positive/negative order in which adjective pairs were presented.

Nutrition Perceptions - Attitude Instrument

The Nutrition Perceptions questionnaire was developed based on methodology described by Penner et al. (1980), using the Galileo system of measurement (Gillham and Woelfel, 1977; Woelfel and Fink, 1980; Appendix B). Concepts for a pretest instrument were derived from teacher responses to question 1 of the interview schedule. Responses were compiled into 11 concepts. Another concept, "Me", was added. Each concept was paired with every other concept to form 66 nonredundant pairs. The 66 paired concepts were compared for similarity to an arbitrary standard, "Red and White = 100 perceptual inches apart" by 8 teachers known by the investigator. Those preliminary comparisons provided values to use in determining a domain-related concept pair to use as the reference standard.

Paired concept means for the 8 teachers were calculated for all 66 pairs. The grand mean, 61.8, was determined. Standard deviations and coefficients of variation were determined for those concept pairs having means close to the grand mean. The mean of the pair, "Dieting and Food Costs," was found to be closest to the grand mean, 62.5. It had the smallest deviation, 30.2 and the smallest coefficient of variation, .48 of the 10 pairs evaluated. Thus, it would be stable, represent nearly the same meanings to people and represent an average rather than extreme values. The pair would fulfill the criteria for a good standard for comparison.

The final form of the instrument was compiled with "Dieting and Food Costs" as the standard for comparison, set

100 perceptual inches apart. Another concept, "Teaching Food/Nutrition" was added since this is a key perception of interest in this study. Thus, 78 concept pairs resulted.

Nutrition Knowledge Test (NKT)

The NKT mailed to teachers was the same instrument described in the interview section (Appendix A).

Mail Survey Phase - Data Collection

The MSU Nutrition Knowledge Test (NKT),the Teacher Survey questionnaire and the Nutrition Perceptions instrument along with a cover letter addressed personally to the teacher (Appendix B) were compiled and mailed to teachers of health/physical education, home economics, science and social science in November, 1980. Because of the more complex nature of response and the increased time required for an additional instrument, the Nutrition Perceptions instrument form was mailed to only half the teachers in each subject sample. The mailing scheme is indicated in Table 2.

Teachers were provided with a stamped return envelope which had a subject code (1, 2, 3 or 4) and a code (A or B) to indicate whether the teacher had received the Nutrition Perceptions instrument. The codes were placed on the return address as a room number, i.e., 1A, 3B, 4B. The coding facilitated sorting the returned instruments and

TABLE 2: SURVEY INSTRUMENTS[1] MAILED TO TEACHERS OF FOUR SUBJECTS

Teacher Subject Group	Teacher Subgroup	Number Mailed
Health/Physical Education	A	150
	B	149
	Combined	299
Home Economics	A	150
	B	150
	Combined	300
Science	A	149
	B	147
	Combined	296
Social Science	A	150
	B	146
	Combined	296
All	A	599
	B	592
	Total	1191

1

A, Teachers received the NKT and Teacher Survey Instruments;

B, Teachers received the NKT, Teacher Survey and Nutrition Perceptions Instrument.

allowed a check to determine the effect of the additional instrument on response rate. The cover letter specified a date by which responses should be returned and also phone numbers to call collect if questions arose. A full month was alotted to receive instruments before analyzing the data.

A consent form was not enclosed with the survey instruments. It was assumed that teachers who responded gave implied consent. They completed the forms voluntarily and without pressure from repeated mailings or phone calls.

Mail Survey Phase - Data Analysis

Nutrition Knowledge Test

The NKT was machine scored and item analyzed by the Michigan State University Scoring Office. Individual scores were interactively added to the Teacher Survey data file for further analysis. Item analysis of NKT data included the Kuder-Richardson 20 reliability coefficient; the index of discrimination and the index of difficulty. NKT data analyses were obtained for each teacher group and for the entire set of tests.

Teacher Survey Questionnaire

After cleaning obvious stray marks, the Teacher Survey cards were read directly into the computer with the use of a special card reader. Additional stray marks and other errors such as multiple responses on single response items were detected by the reader. Those cards were cleaned and read again. A codebook was generated by the computer and the data were transferred into a file, ready for analysis.

The data were analyzed using SPSS programs (Nie, et al., 1975) and the SPSS-6000 Supplement programs (Michigan State University Computer Laboratory, 1978). Frequencies and associated statistics were obtained for all variables for the total set of data. Sub files were created to determine frequencies for each teacher group. Cross tabulations with chi-square tests were determined for selected nominal level data.

Attitude scales were analyzed using the reliability and factor analysis programs. T-tests were used to determine differences between means dividing the groups on selected dichotomous variables. Analysis of variance was used to determine difference between means for the four teacher groups. When one-way analysis of variance was conducted, Scheffe's test was performed to determine where the differences at the .05 probability level occurred. The test is a conservative test and is exact for unequal cell sizes (Nie, et al., 1975). The groups are divided into homogeneous subsets, where the difference in the means of any two groups is not significant. Pearson product moment correlations were determined between selected continuous variables.

Nutrition Perceptions

The pre-coded Nutrition Perceptions instruments were key-punched by the Michigan State University Data Processing Center. Frequencies and associated statistics and oneway analysis of variance were performed for each paired concept using SPSS programs (Nie, et al., 1975). The GALILEO^{tm} program was used for the multidimensional scaling analysis (Woelfel and Fink, 1980).

Selection of Final Likert and Semantic Differential Attitude Scales

Four attitude scales were compiled on the Teacher Survey, a 32 statement Likert scale to assess attitudes toward teaching nutrition, a 16-statement Likert scale to assess attitude toward personal nutrition, a 5-adjective pair semantic differential scale to assess attitude toward "My Own Nutrition" and a 7-statement semantic differential scale to assess attitude toward "My Teaching Food and Nutrition". The final scales using data obtained on the returned Teacher Survey were determined before conducting further analysis or determining attitude scale scores.

Factor Analysis

Principle factoring factor analysis with varimax rotation was used to determine dimensionality of the four scales (Nie, et al., 1975). Reliability analysis and one-way analysis of variance was also used in selecting final scale statements.

For the Likert teaching nutrition scale, seven factors were extracted (Table D-1,p253). Factor loadings in the first factor were used to select statements for the final scale since the first factor extracted always accounts for the most variance.

The first factor contained 14 statements with loadings greater than .400. The value of .400 was selected as a cut off value because it eliminates all statements but one with higher loadings on other factors and still provides for an adequate number of statements to be retained in the scale. The scale comprising all 32 statements achieved a reliability coefficent, (coefficient alpha), .90 without any statement deletion.

The 14 statements selected for the final scale were: 6, 9, 15, 17, 21, 24, 25, 26, 28, 36, 37, 39, 42, and 45. All of the original categories for which statements were written are represented by at least one of the statements with the exception of the category of teacher as a role model (Appendix C). The four statements with the highest loadings on factor 2 are the four role modeling statements.

For the Likert personal nutrition scale, five factors were extracted (Table D-2, p254). Six statements had loadings of

.300 or greater. Use of .300 as a cut off eliminated statements that loaded highly on other factors. Five statements had loadings less than .100; one was negative. Four of the six statements loading highly on the first factor were related to exercise, one to nutrition labels and one to eating and health. Weight and health are also key words in some of the statements. Thus, it appears that the scale reflects more of a personal health attitude than personal nutrition attitude. The final scale consisted of statements: 16, 18, 29, 33, 38 and 43.

The two items loading highly on factor 2 refer to balanced diets and on factor 3, the highest loading is on a statement dealing with overweight and health. However, neither of those two factors had enough statements with high loadings to form additional scales.

For each of the two semantic differential scales, "My Own Nutrition" and "My Teaching Food and Nutrition", only one factor was extracted. The factor loadings are listed in Tables D-3 and D-4, p255. All of the loadings are above .500 except one and all adjective pairs were kept in the final scales. The initial reliability analysis indicated the coefficient value could be improved by deleting the pair important/unimportant from the scale, "My Own Nutrition". However, since the loading was adequate, .406, and the reliability estimate was close to the goal of .80, the pair was retained.

Reliability Estimation

Coefficient alpha reliability estimates for all four scales were determined to obtain data useful in eliminating statements that contribute little to scale reliability (Table 3).

TABLE 3: COEFFICIENT ALPHA RELIABILITY COEFFICIENTS FOR FOUR ATTITUDE SCALES

Likert Scales		Semantic Differential Scales	
Teaching Nutrition	Personal Nutrition	My Own Nutrition	My Teaching Food and Nutrition
Alpha	Alpha	Alpha	Alpha
.90	.68	.79	.94

Initially, all of the reliability coefficients for the four attitude scales were satisfactory with the exception of the .68 value obtained on the Likert personal nutrition scale. The deletion of statements with low factor loadings was expected to improve the homogeneity of the scales and thus, to improve the reliability. However, the reliability also generally decreases when the number of statements or items decreases.

All the coefficients are acceptable, if .50 is used as the criteria (Nunnally, 1967). However, higher coefficient are always sought. Oppenheim (1966) has indicated that coefficients of .85 are often obtained for Likert scales. The specifications for the two Likert scales indicated a coefficient of .80 was to be sought. Therefore, the .68 achieved for the Likert personal nutrition scale seems too low for use in this study. The reliabilty coefficients for the revised Likert scales were not greatly improved by elimination of statements with low factor loadings. Rather, there was a slight increase, to .93 for the 14-statement teaching nutrition scale and the same value, .68, was attained for the 6-statement personal nutrition scale. The lack of improvement in the reliability coefficients was probably due to the significant reduction in number of items since the value of the coefficient is directly related to the number of items.

Analysis of Variance

To supplement the factor analytic and reliability data, one-way analysis of variance was performed on each Likert statement and adjective pair on the Teacher Survey. That would indicate if statements or adjective pairs could discriminate among the teachers in each subject. If statements or adjective pairs could not discriminate, a decision was made to delete or retain them based on comparison with the factor loading and reliability data.

For the Likert teaching nutrition scale, four items were found that did not elicit significantly different responses among the teacher groups (Table D-5, p. 256). Those items also did not have high factor loadings and were not included in the final scale. The Likert teaching nutrition scale was retained for subsequent data analysis.

For the Likert personal nutrition scale, analysis of variance yielded three non-discriminating items. Two of those items, 18 and 43, were included, however, in the final scale because of their factor loadings, .300 and .613,respectively.

Perkins and coworkers reported that only 9 of 53 Likert statements detected significant differences among teacher groups (Perkins et al., 1980). However, scales were used and considered reliable.

It was previously mentioned that from the factor analysis results the Likert personal nutrition scale appeared to assess an attitude more reflective of health rather than nutrition. In addition, the reliability of the scale was acceptable but not close to the desired goal of .80. Therefore, this scale was not used for further data analysis.

Analysis of variance of items in the semantic differential scale, "My Own Nutrition," detected no differences among subject group means (Table D-7, p 258). However factor loadings were all high on one factor indicating construct validity. The reliability coefficient was also acceptable. Therefore, if individual scale items detected no differences among the four teacher subject groups, it would not be due to invalidity or unreliability. Differences in teachers attitudes toward their own nutrition may not exist.

This scale was retained for further analysis to determine scale scores and to determine if significant differences among teacher groups could be detected when item scores were totaled.

Likert and Semantic Differential Scale Scores

Each Likert statement was scored from 1 to 5. For Likert statements reflecting a favorable attitude, the strongly agree response was 5, and the strongly disagree response was assigned a value of 1 (Statements 6, 9, 21, 24, 25, 36, 37, 39, 42,45 Teacher Survey, Appendix B). For the statements reflecting an unfavorable attitude, the scoring was reversed so that the strongly agree response was assigned a value of 1 (Statements 15, 17, 26,28). Scores were summed across the 14 statements so that a total of 70 was possible for the Likert teaching nutrition scale. The semantic differential scales were scored from 1 to 7. Therefore, the highest scores could be 35 and 49, for "My Own Nutrition" and "My Teaching Food and Nutrition", respectively. For all scales, the higher the score, the more positive or favorable the attitude being measured.

Summary

Factor analysis, reliability estimation and one-way analysis of variance were used to select statements to include in final Likert scales and adjective pairs to include in final semantic differential scales. The revised Likert teaching nutrition scale (14 statements) and the two unrevised semantic differential scales, "My Own Nutrition", and "My Teaching Food and Nutrition" were retained.

Overall Summary

A small sample of teachers was interviewed and tested to obtain preliminary nutrition knowledge, attitudes and practices data. Likert scales were devised and semantic differential scales were revised. The Nutrition Perceptions instrument was developed using the Galileo system for attitude measurement. The Teacher Survey questionnaire was compiled with Likert and semantic differential attitude scales and demographic and nutrition practices questions. The Teacher Survey, NKT, and Nutrition Perceptions instruments were mailed to a large sample of health/physical education, home economics, science and social science teachers. Final Likert and semantic differential attitude scales were derived from analysis of the survey data. Three scales,a Likert scale to assess attitude toward teaching nutrition and two semantic differential scales, "My Own Nutrition" and "My Teaching Food and Nutrition" were selected for use in subsequent data analysis.

RESULTS AND DISCUSSION

Interview Phase

During the interview phase, an interview schedule was administered to obtain teachers' views on nutrition education, statements for use in developing Likert attitude statements, data pertaining to teachers' nutrition education practices and to personal nutrition practices and demographic information. The NKT and the Evaluation of Concepts form containing two semantic differential scales were left with teachers, to be completed at a later date. In all, 32 teachers were interviewed: 7 from Marquette, 17 from Lansing and 8 from Detroit. Twenty-four teachers completed and returned the NKT and Evaluation of Concepts.

Teachers' mean NKT score was 24.5 (61%). No significant differences among teacher subject means were found using one-way analysis of variance, however, cell sizes were small, ranging from 4 to 8. The Kuder-Richardson 20 (K-R 20) reliability coefficient was .88. Item analysis determined the mean item difficulty of 39 and the mean item discrimination of 46. The NKT measured the knowledge of this sample of teachers reliably and therefore, could be used in the large scale survey.

Factor analysis and reliability analysis of the two semantic differential scales, "My Own Nutrition" and "Teaching Nutrition," resulted in the deletion of one adjective pair from each scale. Those pairs had lower factor loadings and had lower item-total correlations than the remaining adjective pairs. Subsequent reliability analysis resulted in improved coefficient alphas. For the scale, "My Own Nutrition", alpha increased from .87 to .89. For the scale, "Teaching Nutrition" alpha increased from .85 to .89. The revised scales were considered more homogeneous, reflecting the concepts under investigation, and more reliable than the unrevised scales.

Teachers' attitude scores were determined for both semantic differential scales before they were revised. Teachers' mean scores was 37 out of 42 (88%) on the scale "My Own Nutrition" and 50 out of 56 (89%) on the scale "Teaching Nutrition". Thus, teachers had positive attitudes toward both their own nutrition and teaching nutrition. One-way analysis of variance yielded no significant differences among means of either scale. However, as previously mentioned, cell sizes were very small.

Using t-tests, significant differences in knowledge scores were found based on sex of teachers ($p \leq .001$) and on having inservice training ($p \leq .05$). Significant differences in teachers' attitudes toward "My Own Nutrition" were found based on sex of teachers ($p \leq .05$), teaching nutrition ($p \leq .01$), having inservice training ($p \leq .001$) and on taking a college level nutrition course ($p \leq .05$). No differences were detected in teachers' attitude toward "Teaching Nutrition" based on t-tests comparing teachers holding bachelor's degrees with those holding master's degrees, males with females, those who taught with those who did not teach nutrition, those who exercised with those who did not, those having inservice training with those who did not, those who had high school nutrition courses with those who did not, or teachers who took college nutrition courses with those who did not. Pearson correlations were determined between knowledge and attitude scores and continuous practices variables. However, no relationships were found between scores and number of alcoholic drinks, amount of exercise or number of times teachers ate the school lunch. Significant correlations were found between knowledge scores and years of teaching experience ($r = -.55$, $p \leq .001$) and attitude toward "Teaching Nutrition" ($r = .42$ $p \leq .05$).

The interviews were also used to obtain statements and ideas for Likert attitude scale development. Supporting data for developing Likert statements are found in Appendix C.

Responses to Question 1 of the interview were used to obtain concepts for the Galileo attitude scales, the Nutrition Perceptions instrument. All responses were sorted and categorized for use on the pretest form.

Mail Survey Phase

A total of 1191 teacher names were selected to receive survey instruments. Table 4 indicates the number of envelopes mailed, returned and useable for each subject group and subgroup of teachers. In some cases, teachers returned completed instruments but indicated they were not teaching any of the four subjects. Those instruments were not used. Some teachers marked a different subject as the one of their major teaching responsibility (Question 54, Teacher Survey) than was expected from the mailing list codes. For example, someone on the social studies list was teaching science. If it could be determined that the teacher taught one of the four desired subjects, the teacher's own subject indication was used if different from that on the mailing list.

The count of returned instruments for each group in Table 4 was based on the precoded letter designations on the return envelopes. Those teachers precoded as science teachers had the highest rate of total useable instruments, 54 percent. They were followed by home economics teachers, 51 percent, by social science teachers, 41 percent, and by health/physical education teachers, 31 percent.

The frequency of teachers in subgroup A responding was significantly higher than that for subgroup B, based on the Chi-square test ($p \leq .01$). The difference in response could be due to the more complicated responses required for

TABLE 4: NUMBER OF ENVELOPES CONTAINING SURVEY INSTRUMENTS MAILED, RETURNED AND ANALYZED BY EACH TEACHER SUBJECT GROUP AND SUBGROUP

Teacher Subject Group	Subgroup	Mailed	Returned Number (Percentage)	Undeliverable Number (Percentage)	Unuseable Number (Percentage)	Analyzed[2] Number (Percentage)
Health/ Phy.Ed.	A	150	60(40)	2	1	57(38)
	B	149	42(28)	4	3	35(23)
	Combined	299	102(34)	6	4	92(31)
Home Economics	A	150	87(58)	2	3	82(55)
	B	150	72(48)	1	1	70(47)
	Combined	300	159(53)	3	4	152(51)
Sciences	A	149	91(61)	1	2	88(59)
	B	147	75(51)	0	4	71(48)
	Combined	296	166(56)	1	5	159(54)
Social Sciences	A	150	72(48)	0	2	70(47)
	B	146	57(39)	1	3	53(36)
	Combined	296	129(44)	1	5	123(41)
All	A	599	310(52)	5	8	297(50)
	B	592	245(44)	6	10	229(39)
	Combined	1191	556(47)	11	18	526(44)

[1] Includes instruments received too late to use

[2] Envelopes containing at least 1 useable instrument

[A] Received the NKT and Teacher Survey instruments

[B] Received the NKT , Teacher Survey and Nutrition Perceptions instrument the Nutrition Perceptions instrument, or to the greater length of time any third form would require.

The overall response rate was 52 percent for subgroup A teachers and 44 percent for subgroup B teachers, for a total of 47 percent return. The percentages of useable forms for subgroup A, subgroup B and all teachers were 50 percent, 39 percent and 45 percent respectively.

Others have reported higher return rates for teachers (Levine et al., 1979; Perkins et al., 1980). However, Levine and coworkers mailed their forms to principals who were asked to forward them to teachers involved in nutrition education. Thus, the higher return rate of 70 percent might be expected from teachers already interested in nutrition. Follow-up mailings were used to obtain 85 percent of questionnaires returned (Perkins et al., 1980). No follow-up techniques were used for this study.

In previous surveys to Michigan teachers return rates at 61 percent and 44 percent were reported for teachers who were on a mailing list provided by the Dairy Council of Michigan and for K-12 teachers belonging to the Michigan Education Association, respectively (Kolasa, et al., 1979).

A return rate of 41 percent was reported for secondary teachers in Delaware (Giglotti, 1976). Thus, the returned and useable rate of 44 percent obtained in this study was comparable to other return rates for secondary teachers who have not already indicated an interest in nutrition and for whom follow-up mailings were not used. It is likely that a higher response rate would have resulted if only the NKT and the Teacher Survey had been mailed to all teachers.

It should be noted that while 526 (44%) envelopes were returned with at least one useable form, only 518 teachers completed the Teacher Survey, 516 completed the NKT and 128 completed the Nutrition Perceptions instrument. That is, some teachers only completed one instrument.

Sample Characteristics

A total of 518 teachers completed the Teacher Survey. Their subjects of greatest teaching responsibility as self-reported are indicated in Table 5.

Home economics teachers had the highest percentage of respondents to the Teacher Survey, 31 percent. They were followed by science teachers, 27 percent; social science teachers, 21 percent; and by health/physical education teachers, 20 percent.

TABLE 5: NUMBER AND PERCENTAGE OF TEACHERS RESPONDING TO THE TEACHER SURVEY BY SUBJECT GROUP (n=518)

Teacher Subject Group	Number	Percentage
Health/Physical Education	103	20
Home Economics	159	31
Science	142	27
Social Science	108	21
No Answers	6	1

A cross tabulation of teachers' sex by subject (Table 6) and chi-square test indicated significant differences in subject distribution of male and female teachers with females predominating in home economics and males predominating in science and social science. This was not surprising. Traditionally, female teachers have taught home economics and males have taught the sciences and social sciences in larger numbers. Because health/physical education has been a sex-segregated subject, approximately equal distribution of male/female teachers also was expected in that subject group.

TABLE 6: DISTRIBUTION OF FEMALE AND MALE TEACHERS RESPONDING TO THE TEACHER SURVEY BY SUBJECT GROUP

Teacher Subject Group	Female (n=236)	Male (n=258)	Total (n=494)
	Number	(Percentage)	
Health/Physical Education	48 (10)	53 (11)	101 (20)
Home Economics	147 (30)	7 (1)	154 (31)
Science	19 (4)	119 (24)	138 (28)
Social Science	22 (4)	79 (16)	101 (20)

Chi-square = 232, (d.f. = 3) ; $p \leq .001$

This indicates that while differences may be found for teachers in the different subject groups on other variables, the differences may be due to differences in sex rather than to subject per se.

Teaching Experience

Teachers had 13.5 years average teaching experience with a range of 0-43 years. Table 7 indicates the largest percentage of teachers had between 6 and 15 years of experience.

TABLE 7: DISTRIBUTION OF TEACHERS BY YEARS OF TEACHING EXPERIENCE (n=518)

Years of Teaching	Number	Percentage
Less than 1	3	1
1-5	58	11
6-10	130	25
11-15	132	25
16-20	86	17
21-25	43	8
26-30	26	5
31-35	13	2
36-40	0	0
41-45	1	0
No answers	27	6

Two-way analysis of variance indicated there was a significant difference among mean years of teaching experience for teachers due to subject group ($p \leq .001$) and to the joint effects of teachers' sex and subject group ($p \leq .001$). However, the effect of sex alone was not significant. The means and standard deviations for each teacher subject group are reported in Table 8, with social science teachers having the highest mean years of experience, and home economics teachers the lowest.

TABLE 8: MEANS AND STANDARD DEVIATIONS FOR TEACHERS' YEARS OF EXPERIENCE BY TEACHER SUBJECT GROUP

Teacher Subject Group	Mean Years	Standard Deviation
Health/Physical Education	12.6	6.6
Home Economics	11.0	6.6
Science	15.3	7.2
Social Science	17.7	13.1

Grades Taught

Responding teachers taught grades 6-12 with more respondents teaching in the upper grades (Table 9). Each teacher could mark as many grades as applied. Therefore, the total is greater than 518 for all teachers.

TABLE 9: DISTRIBUTION OF GRADES TAUGHT BY TEACHERS FOR EACH TEACHER SUBJECT GROUP

Grade	Teacher Subject Group: Health/ Physical Education	Home Economics	Science	Social Science	All
	Number (Percentage)				
6	27(25)	17(11)	6(4)	5(5)	55(11)
7	48(45)	76(47)	35(25)	16(15)	175(34)
8	44(41)	81(50)	47(34)	24(22)	196(38)
9	45(42)	88(55)	49(35)	23(21)	205(40)
10	50(47)	76(47)	64(46)	32(29)	222(40)
11	45(42)	77(48)	66(46)	56(51)	242(43)
12	41(38)	81(50)	56(40)	55(50)	233(45)

Food/Nutrition Background

Forty-three percent of the teachers reported never having taken a food/nutrition course (Table 10). The remainder had 1-9 or more courses.

TABLE 10: DISTRIBUTION, MEANS AND STANDARD DEVIATIONS OF FOOD/NUTRITION COURSES TAKEN BY TEACHERS FOR EACH TEACHER SUBJECT GROUP

Courses	Teacher Subject Group: Health/ Physical Education	Home Economics	Science	Social Science	All
	Number (Percentage)				
0	42(39)	8(5)	95(68)	79(72)	224(43)
1	21(20)	8(5)	16(11)	11(10)	56(11)
2	16(15)	14(9)	11(8)	4(4)	45(9)
3	17(16)	34(21)	9(6)	6(6)	66(13)
4	5(5)	26(16)	4(3)	1(1)	36(7)
5	2(2)	25(16)	1(1)	--	28(5)
6	--	8(5)	--	--	8(2)
7	--	8(5)	--	--	8(2)
8	2(2)	8(5)	--	--	10(2)
9 or more	2(2)	13(8)	--	--	13(3)
No Answer	2(2)	9(6)	4(3)	9(8)	24(5)
Mean	1.4	4.3	.6	.4	1.9
Standard Deviation	1.6	2.4	1.1	.9	2.3

The mean number of food/nutrition courses taken by teachers was 1.9. Two-way analysis of variance was used to determine the effect of subject and sex on number of courses taken. Significant joint effects ($p \leq .001$), effects due to subject ($p \leq .001$) and due to sex ($p \leq .01$) were obtained. In addition, significant interaction effects of subject and sex resulted ($p \leq .001$). According to Hayes (1973), when interaction effects exist, varying differences exist between populations representing different column treatments depending on the row treatments applied. For this analysis, the interaction effect means that varying differences in number of courses occurred for teachers in the different subject groups depending on whether teachers were male or female. An indication of this may also be noted by the standard deviations which are larger for the means for all the teacher groups except home economics (Table 10).

A one-way analysis of variance followed by Scheffe's test resulted in three subsets of teachers having significantly different mean number of food/nutrition courses: home economics, health/physical education and science-social science. Home economics teachers had the highest mean number of food/nutrition courses, 4.3. Only 5 percent of home economics teachers reported never taking a food/nutrition course, whereas 68 percent of science teachers and 72 percent of social science teachers reported taking no food/nutrition courses.

Some teachers have had additional food/nutrition training. However, nearly 65 percent of all teachers reported taking no hours of food/nutrition training since they had started teaching (Table 11). The remaining 28 percent had 1-99 hours with a mean of 4.6 hours.

TABLE 11: DISTRIBUTION, MEANS AND STANDARD DEVIATIONS OF HOURS OF FOOD/NUTRITION TRAINING RECEIVED BY TEACHERS IN EACH SUBJECT GROUP AFTER BEGINNING TO TEACH

Training Hours	Teacher Subject Group				
	Health/ Physical Education	Home Economics	Science	Social Science	All
	Number (Percentage)				
0	72(67)	68(42)	117(84)	99(90)	357(69)
1-10	21(20)	43(27)	14(10)	2(2)	80(15)
11-20	5(5)	15(9)	1(1)	2(2)	21(4)
21-30	2(2)	10(6)	1(1)	--	13(3)
31-40	--	5(3)	2(1)	--	7(1)
41-50	--	2(1)	1(1)	--	3(1)
51-60	2(2)	1(1)	--	--	3(1)
61-70	22(18)	2(1)	--	--	2(1)
71-80	--	3(2)	--	--	3(1)
81-90	--	--	--	--	--
91-99	--	2(1)	--	--	2(1)
No Answer	5(5)	10(6)	4(3)	7(6)	26(5)
Mean	3.7	10.7	1.8	.5	4.6
Standard Deviation	9.7	19.7	6.7	2.9	13.0

Two-way analysis of variance resulted in significant joint effects ($p \leq .001$) and effects due to teachers' subject ($p \leq .001$) on number of hours of food/nutrition training obtained by teachers after they began teaching. No interaction effects were noted. One-way analysis of variance followed by Scheffe's test indicated home economics teachers had significantly more training hours of food/nutrition than the other three teacher groups ($p \leq .05$). Health/physical education, science and social science teachers had similar mean hours of training. Home economics teachers had the highest mean hours of training, 10.7 followed by health/physical education teachers with 3.7 hours. The overall mean was 4.6. Also, for every teacher subject group larger standard deviations than means were noted indicating high variability in each group.

Summary

Five hundred eighteen teachers responded to the Teacher Survey. Nearly one-third were home economics teachers. Significant differences in distribution of teachers by sex were found for each subject group ($p \leq .001$). Teachers averaged 13.5 years of teaching experience. Significant differences in years of teaching experience were due to subject group ($p \leq .001$) and to the joint effects of sex and subject ($p \leq .001$). More teachers taught in the upper secondary grades than in the lower. The average number of food/nutrition courses taken by teachers was 1.9. Significant differences in the number of food/nutrition courses taken by teachers were due to teacher subject ($p \leq .001$), sex of teachers

($p \leq .01$), joint effects of sex and subject ($p \leq .001$) and to interaction effects of sex and teachers' subject ($p \leq .001$). One-way analysis of variance indicated home economics teachers had significantly more courses than health/physical education teachers and science-social science teachers. Sixty-five percent of teachers had no food/nutrition training after they started teaching. The average number of training hours for all teachers was 4.6. Significant variation in the number of training hours in food/nutrition was due to joint effects of subject and sex ($p \leq .001$) and to subject with home economics teachers having significantly more training hours than the other teacher subject groups. Because of the significant difference in distribution of male and female teachers within each subject group and to differences in the number of food/nutrition courses taken due to sex, further data analyses were conducted to determine the effect of teachers' sex on scores and other variables.

Teachers' Nutrition Knowledge

Results of administration of the 40-item Nutrition Knowledge Test (NKT, Appendix A), included test scores, item analysis and reliability determinations. A total of 516 teachers (43%) completed the test. Home economics teachers had the highest mean correct score, 28, or 70 percent correct (Table 12). Social science teachers had the lowest score, 19 or 57 percent correct. Means for science teachers and health/physical education teachers were 23, 57 percent, and 21, 52 percent, respectively. The overall mean for the entire group was 23, 57 percent.

Two-way analysis of variance of the effect of subject and sex on teachers' score resulted in significant variation in mean NKT scores due to teachers' subject ($p \leq .001$), sex ($p \leq .001$), joint effects of sex and subject ($p \leq .001$), and to interaction of the two variables ($p \leq .001$). Thus, NKT scores were significantly affected by both subject and sex and variability within subjects was different for males and females.

When NKT scores were analyzed without controlling for sex, using one-way analysis of variance, home economics teachers' scores were significantly different from scores of health/physical education teachers-science teachers and from scores of social science-health/physical education teachers.

TABLE 12: MEANS, STANDARD DEVIATIONS AND RANGES FOR NUTRITION KNOWLEDGE TEST SCORES OF TEACHERS BY SUBJECT GROUP (40-Item Test)

Teacher Subject Group	Number of Teachers	Mean Score	Standard Deviation	Range
Health/Physical Education	103	21	5.9	5-38
Home Economics	162	28	5.9	8-37
Science	141	23	5.1	9-38
Social Science	110	19	5.2	8-32
All	516	23	6.6	5-38

Score distributions for the teacher groups are shown in Appendix E.

NKT tests were subjected to item analysis. Item analysis data are summarized in Appendix E. The mean item difficulty was lowest for home economics teachers, 30; and highest for social science teachers, 53 (Table 13). This was an expected result since home economics teachers would have more nutrition and science-related course work in their undergraduate training than would social science teachers. Thus, items should be easier for them. Ideally, difficulty indices should be in the mid-range since items of middle difficulty tend to increase the variance of test scores and, therefore, test reliability (Tinkelman, 1971). Item difficulty indices are summarized in Table 13.

The most difficult NKT items for each group of teachers were questions 15 and 35 (Table 14). Both of these items were written to test knowledge of the White House Conference (WHC) Concept, number 4, that nutrient needs vary in amount throughout the lifespan (White House Conference on Food, Nutrition and Health, 1969).

Question 15 called for a definition of Recommended Dietary Allowances (RDA's) and question 35 was concerned with dietary recommendations during pregnancy. The easiest items for teachers varied by subject group.

For health/physical education teachers, the easiest items were questions 24 and 25, yielding indices of difficulty of 16 and 18, respectively. The questions dealt with the

TABLE 13: DISTRIBUTION OF NKT ITEMS BY DIFFICULTY INDICES FOR TEACHERS IN EACH SUBJECT GROUP

Item Difficulty Indices	Teacher Subject Group: Health/ Physical Education	Home Economics	Science	Social Science	All
	Number of Items (Percentage)				
91-100	2(5)	0(0)	0(0)	1(2)	1(2)
81-90	0(0)	1(2)	2(5)	1(2)	1(2)
71-80	1(2)	1(2)	3(7)	4(10)	1(2)
61-70	5(13)	3(7)	3(7)	8(20)	0(0)
51-60	8(20)	0(0)	7(17)	5(13)	8(20)
41-50	9(22)	3(7)	5(13)	9(22)	7(17)
31-40	8(20)	10(25)	6(15)	10(25)	10(25)
21-30	5(13)	6(15)	10(25)	2(5)	12(25)
11-20	2(5)	10(25)	2(5)	0(0)	2(5)
00-10	0(0)	6(15)	2(5)	0(0)	0(0)
Mean	48	30	43	53	42

TABLE 14: MOST DIFFICULT NKT ITEMS FOR TEACHERS IN EACH SUBJECT GROUP

Item Number	Teacher Subject Group: Health/ Physical Education	Home Economics	Science	Social Science	All
	Index of Difficulty				
15	91	88	89	96	91
35	92	78	88	89	86

function of carbohydrate and the function of sodium both testing for knowledge of the second WHC concept: food is made up of chemicals that interact with body chemicals to serve the body's needs--specific nutrients have certain uses. (White House Conference on Food, Nutrition and Health, 1969).

Several questions were very easy for home economics teachers, having indices of difficulty less than 10. Questions 14, 20, 23, 24, 30 and 34 had indices of 8, 9, 6, 4, 7 and 9 respectively. The first three questions relate to vitamins, the fourth to carbohydrate function and the last two to the Daily Food Guide. The first four questions all test for knowledge components of the second WHC concept, particularly the subconcepts of nutrient uses and nutrient sources. The last two questions pretained to the WHC concept: nutrient needs vary throughout the lifespan (WHC concept 4).

Science teachers' easiest questions were 24 and 25, the same as for health/physical education teachers, mentioned above, with indices of difficulty, 6 and 9, respectively. The lowest difficulty indices for social science teachers were for the same two questions and were 28 and 28, respectively.

For all teachers, questions 24 and 25 were the least difficult, with indices of 12 and 16, respectively. Similar results were obtained by Mutch (1980). She reported difficulty indices of 28 for both items 24 and 25. The low difficulty of those two items for teachers in all four of the secondary subjects and for elementary teachers (Mutch, 1980) indicates that questions 24 and 25 may be known to many people. Carbohydrate and sodium function may be of health interest to teachers and information about the nutrients may be available in food advertising or in the popular press.

In summary, the two most difficult questions for all teachers were one requiring a definition of the RDA and one related to nutrition requirements of pregnancy, both reflecting the fourth WHC concept that nutrient needs vary throughout the lifespan. The easiest items for health/physical education, science and social science teachers were questions 24 and 25, related to carbohydrate and sodium function, testing for WHC concept 4, the subconcept regarding nutrient use in the body.

Several questions relating to vitamins, carbohydrate function and the Daily Food Guide were the easiest questions for home economics teachers reflecting their knowledge of subgroups of WHC concept 2 regarding nutrient uses and sources and a subgroup of WHC concept 4 pertaining to the Daily Food Guide.

The mean item discriminations for the teacher subject groups ranged from 31-36, with the overall mean of 41 for all teachers (Table 15). Generally, discriminations greater than 40 are desired since they contribute most to the reliability of the test (Ebel, 1979).

TABLE 15: DISTRIBUTION OF NKT ITEMS BY DISCRIMINATION INDICES FOR TEACHERS IN EACH SUBJECT

	Teacher Subject Group				
Discrimination Indices	Health/ Physical Education	Home Economics	Science	Social Science	All
	Number of Items (Percentage)				
91-100	0(0)	0(0)	0(0)	0(0)	0(0)
81-90	0(0)	0(0)	0(0)	0(0)	0(0)
71-80	0(0)	0(0)	0(0)	0(0)	1(2)
61-70	3(7)	3(7)	1(2)	0(0)	4(10)
51-60	8(20)	6(15)	1(2)	7(17)	5(13)
41-50	8(20)	3(7)	8(20)	7(17)	7(17)
31-40	5(13)	14(35)	10(25)	6(15)	12(30)
21-30	7(17)	7(17)	11(27)	11(27)	8(20)
11-20	5(13)	6(15)	5(13)	5(13)	3(7)
00-10	4(10)	1(2)	4(10)	4(10)	0(0)
Less than 00	0(0)	0(0)	0(0)	0(0)	0(0)
Mean	36	35	31	32	41

Highest discrimination indices for health/physical education teachers were found for questions 14 and 31, falling into the second and fourth WHC concept categories. The values were both 67. Question 14 required the identification of a vitamin name, and question 31 required naming the food group to which eggs belong.

The most discriminating items for home economics teachers were questions 2, 21 and 27 with discrimination indices of 65, 65 and 67 respectively. Question 2 requires knowing that vitamin E is fat soluble and that fat soluble vitamins can be stored. Question 21 asks to identify fat soluble vitamins. Both questions tested for knowledge of a subconcept of WHC concept 2, that nutrients have specific uses in the body. Question 27 requires knowledge that vitamin A is part of the fat fraction in milk, which tests for knowledge of WHC concept 3: food handling affects nutrients.

Discrimination indices of 58 and 64 were found for science teachers responding to questions 19 and 27, respectively. Question 19 asks for identification of the most concentrated sources of calories, testing for a subconcept of WHC concept 2, regarding sources of nutrients. Question 27 was just discussed above.

The highest discrimination indices for social science teachers were both 59 for questions 14 and 38. Question 14 required identification of a vitamin (WHC concept 2) and question 38 concerned labeling an ingredient list in descending order by weight. Question 38, tested for knowledge of WHC concept 7, dealing with food as it relates to society.

For all teachers, the highest discrimination index, 72, was found for question 28, regarding the number of fruits and vegetables recommended in the Daily Food Guide, testing for a subconcept of WHC concept 4, pertaining to the Daily Food Guide. No negative discrimination indices were obtained for any group.

To summarize, the overall mean item discrimination index was 41. Mean item discriminations for each subject group were all less than 40, indicating they were acceptable but could be improved (Ebel, 1979). The highly discriminating items varied with each teacher subject group. For health/physical education teachers, questions regarding identification of a vitamin and the food group for eggs were most discriminating. The most discriminating items for home economics teachers were those related to fat soluble vitamins. For science teachers, questions related to vitamin A and to fat as the most concentrated source of calories were most discriminating. Questions on identification of a vitamin and ingredient listing by weight were highly discriminating for social science teachers. When data for all teachers were combined, the most discriminating item was one calling for the recommended servings of fruits and vegetables from the food guide. Thus, for each teacher subject group, at least one of the most discriminating questions tested for knowledge of WHC concept 2--that food is made up of chemicals; subconcepts pertained to the use of nutrients and to sources of nutrients. Other discriminating items reflected WHC concept 4, nutrient needs vary throughout the lifespan, particularly the subconcepts for the Daily Food Guide and for nutrient need differences based on age, health and growth. WHC 3 pertaining to food handling and WHC 7 regarding food and society were also concepts having discriminating questions.

Kuder-Richardson 20 (K-R 20) reliability coefficients were determined for each teacher subject group and for all teachers combined. The K-R 20 reliability coefficients for the subject groups ranged from a low of .69 for social science teachers to .82 for home economics teachers (Table 16).

TABLE 16: NUTRITION KNOWLEDGE TEST KUDER-RICHARDSON 20 RELIABILITY COEFFICIENTS FOR EACH TEACHER SUBJECT GROUP

Teacher Subject Group				
Health/ Physical Education	Home Economics	Science	Social Science	All
	K-R 20			
.77	.82	.72	.69	.82

The K-R 20 tends to be higher when subjects are heterogeneous and items are homogeneous. The K-R 20 is higher for home economics teachers in part because the sample included teachers of clothing, family living, and other non-food/ nutrition subjects, possibly making this group more heterogeneous than social science teachers, for example. There were home economics teachers who knew quite a bit about nutrition, and others who knew less, as evidenced by the larger standard deviation for home economics than for social science teachers. In addition, home economics teachers had the highest average discrimination index among the teacher groups which would enhance reliability.

The K-R 20 reliability coefficient was found to be .93 in final pretesting of the NKT during its development (Kolasa et al., 1979). The test was administered to two groups of Michigan teachers and to a group of Society for Nutrition Education members. When scores were pooled, the total group was more heterogeneous than a teacher subject group alone, and the larger K-R 20 was obtained (Kolasa et al.,1979). Mutch obtained a K-R 20 of .71 when the NKT was given to elementary teachers (1980). The higher K-R 20's obtained for all teacher groups but one in this study may reflect more heterogeneity among the secondary teachers.

The reliability coefficients obtained in this study were considered acceptable even though the values obtained for science and for social science teachers were somewhat low. Tinkelman (1971) has suggested that for group survey purposes, a reliability coefficient of .75 may be tolerated.

In summary, teachers' nutrition knowledge was measured using the 40-item NKT (Appendix A). Mean scores for the four teacher subject groups ranged from 28 for home economics teachers to 19 for social science teachers. The overall mean score was 23. Significant variation in mean scores were due to teachers' subject group ($p \leq .001$) and to teachers' sex ($p \leq .001$). Interaction of sex and subject also significantly influenced mean score variation ($p \leq .001$), making results difficult to interpret. One-way analysis of variance resulted in three subsets of teacher groups with significantly different means: home economics, health/physical education-science, and health/physical education-social science. The mean item difficulty was lowest for home economics teachers and highest for social science teachers. The mean item discrimination was highest for health/physical education teachers and lowest for social science teachers. K-R 20 reliability coefficients ranged from .82 for home economics teachers to .69 for social science teachers. The values were considered acceptable for measuring the nutrition knowledge of teachers in this study.

Teachers' Attitudes

Teachers' attitudes toward teaching nutrition were assessed on a 14-statement Likert scale (Appendix C) and on a 7-adjective pair semantic differential scale, "My Teaching Food and Nutrition" (Teacher Survey, Appendix B). A 5-adjective pair semantic differential scale was used to assess attitude toward "My Own Nutrition." The Nutrition Perceptions instrument (Appendix B), following the Galileo measurement system and incorporating 13 paired concepts, was used for a multidimensional approach to assessing teacher nutrition attitudes. In addition, a direct question regarding teachers' nutrition interest level was asked on the Teacher Survey (Appendix B). Results obtained from these scales and questions will be discussed in this section.

Likert and Semantic Differential Scores

Total scores for each teacher on the Likert and two semantic differential scales were determined. Means and standard deviations of scores for each teacher group and for all teachers are reported (Table 17). The complete item response summary data for all Likert and semantic differential items on the Teacher Survey are in Appendix F.

TABLE 17: MEANS AND STANDARD DEVIATIONS ON LIKERT AND SEMANTIC DIFFERENTIAL SCALES FOR EACH TEACHER SUBJECT GROUP

Teacher Subject Group	Likert Scale	Semantic Differential Scales	
	Teaching Nutrition[1]	My Teaching Food & Nutrition[2]	My Own Nutrition[3]
	Mean (Standard Deviation)		
Health/ Physical Education	52.9(6.4)	30.1(16.2)	24.9(10.5)
Home Economics	56.5(9.7)	38.6(14.2)	29.0(8.4)
Science	49.6(8.2)	31.6(13.2)	26.8(9.5)
Social Science	44.1(10.3)	23.1(14.7)	26.2(10.3)
All	51.3(9.9)	31.6(15.)	27.0(7.9)

[1]70 points possible

[2]49 points possible

[3]35 points possible

For each scale, home economics teachers had the highest mean scores indicating they had the most favorable attitudes toward teaching nutrition (both scales) and toward their own nutrition. Social science teachers had the lowest mean scale scores on the Likert and semantic differential scales reflecting attitude toward teaching nutrition. Mean attitude scores for all teacher groups on all scales reflect positive or favorable attitude with the exception of social science teachers score on the scale, "My Teaching Food and Nutrition". The score, 23.1, reflects a somewhat negative attitude toward teaching nutrition since a neutral response on each scale item would yield a score of 28.

O'Connell et al., (1979) reported favorable K-6 grade teachers attitude scores on a Likert scale, "Favors Nutrition Education in Schools". No pre-posttest score changes were detected as the result of teachers' teaching nutrition or as the result of receiving teacher preparation. However, those investigators also reported 7-12 grade teachers had unfavorable scores on a Likert scale, "Personal Interest in Teaching Nutrition", differing with the findings of this study. However, home economics teachers surveyed had the highest mean score, consistent with this study.

Two-way analysis of variance of the summed Likert attitude scores among the teacher groups resulted in significant score variation due to teachers' subject ($p \leq .001$) and to sex of teachers ($p \leq .05$). Joint effects of subject and sex were significant at the .001 level of probability. A subsequent one-way analysis of variance, in which sex of teachers was not controlled, was performed, followed by Scheffe's test to detect where differences among means occurred. Significant differences ($p \leq .05$) in mean attitude scores were detected among all four teacher subject groups. Similarly, in the work of O'Connell et al., (1979) Scheffe's test detected differences in mean attitude scores on the interest in teaching scale between home economics and health/ physical education teachers and all other teachers surveyed. No differences were found between science and social science teachers (O'Connell et al., 1979).

For the semantic differential scale, "My Teaching Food and Nutrition", significant variation in attitude scores were found due to the effect of teachers' subject ($p \leq .001$) and to joint effects of teachers' subject and sex ($p \leq .001$) using two-way analysis of variance. However, no difference was found due to sex alone. Scheffe's test following a one-way analysis of variance resulted in significant differences among means scores of home economics, social science and health/physical education-science teachers ($p \leq .05$) with home economics teachers having the highest score, social science teachers the lowest. No differences were found between the mean scores of health/physical education teachers and science teachers.

Two-way analysis of variance of attitude scores on the scale, "My Own Nutrition," detected differences due to teachers' subject ($p \leq .01$) and to joint effects of teachers' sex and subject ($p \leq .05$). No effect was attributed to sex alone. A one-way analysis of variance with Scheffe's test resulted in significant mean score differences ($p \leq .05$) between two subsets of the four teacher groups: (1) health/physical education, science, social sciences and (2) home economics, science and social science with the second subset having higher scores than the first. Since two of the teacher subject groups are included in each subset, distinct differences between subject groups were not obtained. This result is not surprising since it was previously noted that one-way analysis of variance of individual scale items did not result in significant differences based on teachers' subject group. The significant effect due to subject on the entire attitude scale score probably occurred because the individual scale items were combined, increasing the score range and variability. It is also possible that distinct differences among teacher groups were not obtained for this scale because teachers may, in general, have positive attitudes toward their own nutrition. The mean percentage score for all teachers on the semantic differential scale, "My Own Nutrition," was 77 percent. For the Likert teaching scale the mean percentage score was 73 percent and for the semantic differential teaching scale the mean percentage score was 64 percent. Thus, teachers were more positive regarding their own nutrition than they were regarding the teaching of nutrition. This finding is similar to one noted by O'Connell and coworkers (1979). Most teachers in that study felt that nutrition was important before the study even began, based on favorable Likert scores on the scale, "Nutrition is Important".

To summarize the results obtained from attitude scale scores, home economics teachers obtained the highest, i.e. most positive scale scores for the Likert and the two semantic differential scales. Social science teachers had a negative attitude toward teaching food and nutrition, assessed on the semantic differential scale and also the lowest scores on both the Likert and semantic differential teaching scales. Significant differences in attitude score on the Likert teaching nutrition scale were due to teachers' subject ($p \leq .001$) and to teachers' sex ($p \leq .05$) with home economics teachers scoring highest and social science teachers lowest. For the semantic differential scale, "My Teaching Food and Nutrition," significant scale score differences were found due to teachers' subject ($p \leq .001$) with home economics teachers scoring highest, social science teachers scoring lowest. Significant variation in scores on the scale, "My Own Nutrition" were due to teachers' subject ($p \leq .01$) but distinct differences were not found among the four groups. No effect on the semantic differential scales were found due to sex of teachers alone.

Coefficient Alpha Reliability Estimates

Coefficient alpha reliability estimates were determined for the Likert and two semantic differential scales using an SPSS Supplement program (Michigan State University

Computer Lab, 1978). The coefficients obtained are listed for each teacher subject group in Table 18.

The reliability estimates for all teacher groups were highest for the scale, "My Teaching Food and Nutrition", and lowest for the scale, "My Own Nutritin", ranging from .72 to .94. While a goal of .80 was set, the scales were considered reliable for use in this study since none of the reliability coefficients was much lower than that value. In addition, the reliability coefficients were higher than those reported by other nutrition education researchers (Perkins et al., 1980).

For the Likert teaching nutrition scale, highest scale reliability was noted for social science teachers. Those teachers also had the largest standard deviation, and the reliability coefficient is directly related to score variability. Health/physical education teachers were the group with the highest coefficient alpha value on the semantic differential scale, "My Teaching Food and Nutrition". Those teachers also had the highest standard deviation for that scale score. On the semantic differential scale, "My Own Nutrition", the highest reliability coefficient was found for social science teachers again, because of a high standard deviation. Thus, social sciece teachers responded more heterogeneously on the Likert scale and on the semantic differential scale, "My Own Nutrition," than did the other teacher groups. Health/physical education teachers responded more variably on the semantic differential scale, "My Teaching Food and Nutrition," than did the other teacher groups.

TABLE 18: COEFFICIENT ALPHA RELIABILITY ESTIMATES FOR LIKERT AND SEMANTIC DIFFERENTIAL ATTITUDE SCALES FOR EACH TEACHER SUBJECT GROUP

Teacher Subject Group	Likert Scale	Semantic Differential Scale	
	Teaching Nutrition[1]	My Teaching Food & Nutrition[2]	My Own Nutrition[3]
	Coefficient Alpha		
Health / Physical Education	.82	.96	.72
Home Economics	.84	.88	.76
Science	.91	.92	.76
Social Science	.92	.92	.81
All	.92	.94	.79

[1] 14 items

[2] 7 items

[3] 5 items

In summary, coefficient alpha reliability estimates were highest for the Likert and semantic differential scales reflecting attitude toward teaching food/nutrition. The coefficients for those two scales were all above .80. For the semantic differential scale, "My Own Nutrition," alpha values ranged from .72 to .81. All values were considered acceptable for this study.

Galileo Attitude Assessment - The Nutrition Perceptions Instrument

Distance estimates comparing distances between paired nutrition concepts relative to the standard distance, "Dieting and Food Costs = 100 perceptual inches apart," were made by teachers on 12 nutrition concepts and the concept "Me". The 13 concepts were paired in every possible combination to yield 78 paired comparison of estimates of distance between the concepts. When the paired concepts were viewed as more different or farther apart than the standard, they were to be assigned a value greater than 100. If the paired concepts were viewed as more alike, or closer together, than the standard, they were to be assigned a value less than 100. When the concepts were considered to be the same, i.e. no distances apart, they were to be given a zero.

One-way analysis of variance was performed on the mean estimates for each of the concept pairs among the teacher subject groups. Nine pairs yielded significant F ratios (Table 19). However, Scheffe's test revealed no distinct differences between one teacher group and any of the others. For the concept

TABLE 19 : CONCEPT PAIRS WITH SIGNIFICANT F RATIOS BASED ON ANALYSIS OF VARIANCE AMONG THE FOUR TEACHER SUBJECT GROUPS ON DISTANCE ESTIMATES OF THE NUTRITION PERCEPTIONS INSTRUMENT

Concept Pair	F Ratio	Scheffe's Test Results	
		One Subset Formed	Two Subsets Formed
Balanced Meals and Maternal/ Child Food Needs	2.9*	X	-
Dieting and Me	3.5*	-	X
Food Costs and Teaching Food/ Nutrition	3.4*	-	X
Food Preparation and Nutrients	3.3*	-	X
Food Preparation and Teaching Food/Nutrition	2.9*	-	X
Good Health and Teaching Food/ Nutrition	4.3**	-	X
Maternal/Child Food Needs and Teaching Food/Nutrition	4.2**	-	X
Me and Physical Fitness	5.2**	-	X
Nutrients and Physical Fitness	2.9*	-	X
Nutrients and Teaching Food/ Nutrition	5.1**	X	-

* $p \leq .05$
** $p \leq .01$

"Balanced Meals and Maternal Child Food Needs," only one subset was formed indicating there were no significant differences among the means at the .05 level of probability. The F test indicated there was significant variability in distance estimates, that is, that at least one group mean deviated significantly from the grand mean. However, the other group means were also similar to the one that deviated significantly, since Scheffe's discerned no difference among them. Scheffe's test on the concept pair, "Nutrients and Physical Fitness" also revealed no differences among subject group means.

Four of the concepts pairs yielded two subsets of teacher groups whose means were significantly different based on Scheffe's test ($p \leq .05$). The concept pairs were: "Dieting and Me," "Food Costs and Teaching Food/Nutrition," "Food Preparation and Nutrients," and "Food Preparation and Teaching Food Nutrition". On these concepts, health/physical education, home economics and social science teachers had similar means that were significantly different from the means of health/physical education, science and social science teachers. For each of the two subsets, two teacher groups overlapped. Thus no distinct differences among the means for the four teacher subject groups under investigation were found.

For each of the remaining concept pairs in Table 19, Scheffe's test also resulted in two teacher group subsets. However, the combinations of groups within each subset varied with each concept pair. For the concept pair, "Good Health and Teaching Food/Nutrition", health/physical education, home economics and social science teachers had similar means that were different from the means of science and social science teachers combined. For the concept, "Maternal/Child Food Needs and Teaching Food/Nutrition," the subsets of means for health/physical education, home economics and social science teachers and for health/physical education and science teachers were formed. "Me and Physical Fitness" resulted in similar means for health/physical education and social science teachers which were different from the means of home economics, science and social science teachers. Lastly, "Nutrients and Teaching Food/Nutrition " had two subsets of means for health/physical education, home economics and science teachers and for health/physical education, science and social science teachers.

The importance of the subsets formed above is that while certain combinations of teacher groups had means that were different from another combination of teacher groups, the groups overlapped and no differences were found among means for the four groups under investigation in this study.

A review of the means and standard deviations obtained for the concept pairs having significant F ratios indicates why Scheffe's tests detected no differences among teacher subject group means (Table 20). The majority of the standard deviations are larger than their means. This indicates wide variability of distance estimation on the concept pairs within teacher groups. The variability within groups relative to the variability among groups would have to be minimized for differences among groups to be found.

TABLE 20 :MEANS AND STANDARD DEVIATIONS OF DISTANCE ESTIMATES FOR CONCEPT PAIRS WITH SIGNIFICANT F RATIOS FOR EACH TEACHER SUBJECT GROUP

Concept Pair	Teacher Subject Group: Health/ Physical Education	Home Economics	Science	Social Science
	Mean (Standard Deviation)			
Balanced Meals and Maternal/ Child Food Needs	5.6 (6.1)	24.8 (46.5)	10.6 (11.6)	12.7 (17.0)
Dieting and Me	68.4 (184.7)	40.5 (39.1)	163.9 (294.0)	54.0 (46.2)
Food Costs and Teaching Food/ Nutrition	61.4 (41.4)	49.5 (56.3)	96.5 (90.4)	65.1 (47.0)
Food Preparation and Nutrients	28.9 (26.8)	16.9 (20.0)	37.6 (35.7)	29.1 (29.9)
Food Preparation and Teaching Food/ Nutrition	37.5 (30.1)	25.1 (33.7)	55.0 (56.7)	38.3 (44.2)
Good Health and Teaching Food/ Nutriton	18.3 (17.7)	21.6 (37.0)	45.5 (32.2)	32.0 (35.4)
Maternal/Child Food Needs and Teaching Food/Nutrition	26.1 (31.7)	22.0 (35.3)	54.1 (66.3)	21.9 (22.0)
Me and Physical Fitness	9.5 (9.7)	31.0 (31.3)	36.2 (28.6)	26.3 (31.5)
Nutrients and Physical Fitness	18.2 (23.7)	41.4 (51.6)	30.2 (30.1)	20.4 (25.5)
Nutrients Teaching Food/ Nutrition	15.6 (21.3)	12.5 (31.6)	31.6 (29.4)	37.2 (36.7)

There are several possible reasons why no difference among the teacher groups were found. First, it is possible that no real differences exist in teachers' attitude toward nutrition. Secondly, it is possible that the task of responding to the instrument was difficult or frustrating, leading to indiscriminate responses. Comments on some returned forms indicate that it was difficult to complete. In addition, the response rate obtained for this form was low. Thirdly, it is possible, but not likely, that the instrument itself does not measure precisely.

The third possibility will be discussed first. The methodology has been documented as being more precise than traditional attitude measurement methods in the field of communications (Gillham and Woelfel, 1977). In addition, using a very similar instrument to compare attitudes of nutrition and non-nutrition students, t-tests of differences between means for the concept pairs revealed significant differences between the two groups on several concepts. (Penner et al., 1980), however, when the instrument was explained verbally to respondents and questions regarding responses were answered. Thus, some of the difficulty in responding was alleviated for the students in the Penner study. Administration of the Nutrition Perceptions instrument to teachers in person may yield different results. On the other hand, if no differences in teacher nutrition attitudes exist, the type of administration would not affect the results obtained.

In summary, the distance estimates on 78 paired concepts obtained from teachers in the four subject groups were subjected to one-way analysis of variance followed by Scheffe's test for differences among means. The analysis of variance detected 9 concept pairs with significant F ratios. However, Scheffe's test detected no differences in mean distance estimations among the four groups of teachers of interest to this study. Combinations of teacher subject groups means yielded significant differences for 7 of the 9 paired concepts. While the means among the teacher groups often varied, the standard deviations also were large. For most of the concept pairs the standard deviations were larger than the means, indicating a great deal of fluctuation in response with each teacher group. Possible rationale for the lack of differences among teacher group means on the paired concepts was discussed.

In addition to performing analysis of variance among means for the paired concepts, the distance estimates from the 78 paired concepts were subjected to multidimensional scaling analysis using the GALILEO^{tm} program (Woelfel and Fink, 1980). However, the plots are not reported here since the analysis of variance detected no distinct differences among mean distance estimates of the four teacher subject groups. An additional GALILEO^{tm} analysis could be performed, rotating the distance estimates of each teacher group, simultaneously to a least squares best-fit solution. The rotation would orient the axes similarly and differences among the groups could be obtained from the analysis. However, this program routine was not available at MSU at the time. Further data analysis of the distance estimates was not performed.

Interest in Nutrition

On the Teacher Survey, teachers were asked to indicate whether they had a low, average or high intest in nutrition. Only 4 percent of all teachers reported low interest in nutrition. It is possible that other teachers with low levels of interest chose not to respond to the mail survey. Of all those who did respond, 52 percent indicated average interest and 44 percent indicated high interest. Of the subject groups, home economics teachers reported the largest percentage of high interest, 61 percent. No home economics teachers reported low interest. Social science teachers had the lowest percentage of high interest respondents, 36 percent.

The chi-square test was performed to test for differences in the distribution of nutrition interest level based on teacher subject area. The results indicated home economics teachers have a high probability of having a high interest in nutrition (Table 21).

In addition, female teachers were more likely than male teachers to have a high level of nutrition interest as determined by the chi-square test (Table 22).

The chi-square test found no differences in distribution of teachers' nutrition interest level based on pressure felt from colleagues to participate or to not participate in any school-related activities. In addition, no

TABLE 21: DISTRIBUTION OF TEACHER NUTRITION INTEREST LEVEL BY TEACHER SUBJECT GROUP

Teacher Subject Group	Nutrition Interest Level Low (n=22)	Average (n=257)	High (n=216)	Total Response (n=495)
	Number (Percentage)			
Health/ Physical Education	6(1)	58(12)	38(8)	102(21)
Home Economics	0(0)	55(11)	98(20)	153(31)
Science	4(1)	82(17)	52(10)	138(28)
Social Science	12(2)	62(12)	28(6)	102(21)

Chi-square = 54 (d.f. =6); p $\leq$ .001

TABLE 22: DISTRIBUTION OF TEACHER NUTRITION INTEREST LEVEL BY SEX OF TEACHER

Sex of Teacher	Nutrition Interest Level Low (n=22)	Average (n=259)	High (n=215)	Total Response (n=296)
	Number (Percentage)			
Female	4(1)	100(20)	132(27)	236(48)
Male	18(4)	159(32)	83(17)	260(52)

Chi-square = 32 (d.f. = 21); p $\leq$ .001

differences in distribution of teachers nutrition interest level based on teachers' dieting behavior in the past year.

In summary, only a small percentage of teachers reported low interest in nutrition. Over half of all teachers reported an average interest level and 44 percent reported a high level. Chi-square tests indicated that home economics teachers and females were more likely to have a high interest in nutrition than teachers of the other subject groups or males.

Summary

Teachers' attitudes toward teaching nutrition were assessed on a 14-statement Likert scale and on a 7-adjective semantic differential scale, "My Teaching Food and Nutrition". Home economics teachers had highest scores for the two scales. Analysis of variance due to subject taught and sex of teachers detected significant variation due to both variables on the Likert teaching scale and to subject taught on the semantic differential scale. One-way analysis of variance resulted in significant mean attitude score differences among all four teacher groups for the Likert scale and significant differences among home economics, social science and health/ physical education-science groups.

Personal nutrition attitudes were assessed on a 5-adjective pair semantic differential scale, "My Own Nutrition". Analysis of variance resulted in attitude score variation due to teacher group subject but not to sex of teachers. No distinct differences among the four teacher groups were found following one-way analysis of variance and Scheffe's test.

Coefficient alpha reliability estimates were determined for the Likert and two semantic differential scales. They were considered acceptable for this study.

From the Nutrition Perceptions instrument containing 78 paired comparisons from 13 concepts, 9 paired concept comparisons yielded significant variation among teacher subject groups. However, Scheffe's test detected no significant differences among the four teacher group means on any of the concepts due to large standard deviations for many of the paired comparisons.

Teachers' Practices

Teachers' practices regarding the teaching of food and nutrition in the classroom were assessed on the Teacher Survey by asking if teachers taught anything about food and nutrition in any of their classes and by providing a list of topics for them to check. Teachers' personal nutrition and related practices were assessed by inquiring how often they ate the school lunch, whether they had been on a weight loss diet and how much physical activity or exercise they obtained. An additional question was asked regarding the amount of peer pressure felt from colleagues to participate or to not participate in school activities, since it was believed that felt pressure might influence teachers' inclusion of non-required topics, such as nutrition, in their classes.

Teaching Food/Nutrition in the Classroom

In response to a question asking if teachers taught anything about food and nutrition in their classes last year, 65 percent (336) said they did, 31 percent (163) indicated they did not teach anything about food and nutrition and 4 percent did not answer the question.

For each group of teachers, the percentage indicating they taught something about food/nutirtion were: health/ physical education, 64 percent; home economics, 95 percent; science, 62 percent; and social science, 29 percent.

The chi-square test yielded significant differences ($p \leq .001$) in the distribution of teachers who taught food/ nutrition compared with those who did not based on teachers' subject group (Table 23). That result was expected because many home economics courses are food/nutrition courses. For the other subject areas, food and nutrition are added at the teacher's discretion except for certain health education curricula where some nutrition is required.

Since it was determined earlier that there was a significant difference in the distribution of teachers in the four subject groups based on sex ($p \leq .001$), it was of interest to compare the distribution of teachers who did and who did not teach food/nutrition in their classes by sex. In addition,

TABLE 23: DISTRIBUTION OF TEACHERS WHO TAUGHT AND DID NOT TEACH FOOD/NUTRITION BY SUBJECT

Teacher Subject Group	Taught Food/ Nutrition (n=335)	Did Not Teach Food/Nutrition (n=162)	Total Response (n=497)
	Number (Percentage)		
Health/ Physical Education	65(13)	38(8)	103(21)
Home Economics	149(30)	8(2)	157(32)
Science	89(18)	47(9)	136(27)
Social Science	32(6)	69(14)	101(20)

Chi-square = 114 (d.f. = 3); $p \leq .001$

the distribution of those teachers who taught and those who did not teach food/nutrition was compared based on interest level because interest level was found to vary with teachers' subject. The two distributions are found in Tables 24 and 25.

Chi-square tests indicated there were significant differences in the distributions of teachers who taught something about food/nutrition compared with those who did not based on sex of teachers ($p \leq .001$) and level of nutrition interest ($p \leq .001$). Thus, females and those with high interest levels were more likely to teach something about food and nutrition than males or teachers with low interest.

No difference in distribution of teachers who taught or did not teach food/nutrition based on level of pressure felt from colleagues to participate in school-related activities or based on dieting behavior of teachers was found.

T-Test Comparisons - Teachers Who Taught Food/Nutrition vs. Those Who Did Not

Teachers who taught something about food/nutrition in their classes were compared with teachers who did not. T-tests of differences between the means for the two groups were computed for the number of food/nutrition courses taken in college, the hours of food/nutrition training received

TABLE 24 : DISTRIBUTION OF TEACHERS WHO TAUGHT AND DID NOT TEACH FOOD/NUTRITION BY SEX OF TEACHER

Sex Of Teacher	Taught Food/ Nutrition (n=328)	Did Not Teach Food/Nutrition (n=159)	Total Response (n=487)
	Number (Percentage)		
Female	194 (48)	40 (8)	234 (48)
Male	134 (27)	119 (24)	253 (52)

Chi-square = 48 (d.f. = 1); $p \leq .001$

TABLE 25 : DISTRIBUTION OF TEACHERS WHO TAUGHT AND DID NOT TEACH FOOD/NUTRITION BY NUTRITION INTEREST LEVEL

Nutrition Interest Level	Taught Food/ Nutrition (n=330)	Did Not Teach Food/Nutrition (n=158)	Total Response (n=448)
	Number (Percentage)		
Low Interest	5 (1)	17 (3)	22 (4)
Average Interest	149 (31)	104 (21)	253 (52)
High Interest	176 (36)	37 (8)	213 (44)

Chi-square = 51 (d.f. = 2); $p \leq .001$

after starting to teach, years of teaching experience, NKT score, the Likert teaching nutrition attitude score, "My Teaching Food and Nutrition" attitude score, and "My Own Nutrition" attitude score. The probabilities of T-test values of the seven variables are listed in Table 26 for each teacher group and for all teachers.

For health/physical education teachers significantly different means were found for number of food/nutrition courses taken ($p \leq .05$), NKT scores ($p \leq .05$), Likert ($p \leq .001$) and semantic differential teaching attitude scores ($p \leq .05$). In each case, means were higher for those who taught than for those who did not teach something about food/nutrition in their classes last year.

For home economics teachers, hours of food/nutrition training, NKT scores and Likert teaching nutrition score were the variables with significantly different means ($p \leq .001$). Again, means for each variable were higher for those who taught than for those who did not teach about food or nutrition.

Comparing science teachers who taught with those who did not teach about food or nutrition, significant differences were found in number of food/nutrition courses, NKT score, Likert and semantic differential teaching nutrition scores ($p \leq .001$). Means were higher for those teachers who taught about food or nutrition than for those who did not.

TABLE 26: T-TEST PROBABILITIES OF DIFFERENCES BETWEEN TEACHERS WHO TAUGHT AND TEACHERS WHO DID NOT TEACH SOMETHING ABOUT FOOD/NUTRITION FOR SELECTED VARIABLES

Teacher Subject Group	Variable	Probability
Health/ Physical Education	Food and Nutrition Courses	.037*
	Hours Food and Nutrition Training	.065
	Years Teaching	.429
	NKT score	.044*
	Likert Score-Teaching Nutrition	.000***
	Semantic Differential Score-My Own Nutrition	.051
	Semantic Differential Score-My Teaching Food/Nutrition	.020*
Home Economics	Food and Nutrition Courses	.089
	Hours Food and Nutrition Training	.000***
	Years Teaching	.180
	NKT Score	.001***
	Likert Score - Teaching Nutrition	.001***
	Semantic Differential Score-My Own Nutrition	.346
	Semantic Differential Score-My Teaching Food/Nutrition	.163
Science	Food and Nutrition Courses	.000***
	Hours Food and Nutrition Training	.248
	Years Teaching	.396
	NKT Scores	.001***
	Likert Score-Teaching Nutrition	.000***
	Semantic Differential Score-My Own Nutrition	.437

TABLE 26 (Cont)

Teacher Subject Group	Variable	Probability
Science	Semantic Differential Score- My Teaching Food/Nutrition	.000***
Social Science	Food and Nutrition Courses	.031*
	Hours Food and Nutrition Training	.463
	Years Teaching	.178
	NKT Score	.015*
	Likert Score - Teaching Nutrition	.042*
	Semantic Differential Score - My Own Nutrition	.238
	Semantic Differential Score - My Teaching Food/Nutrition	.002**
All Teachers	Food and Nutrition Courses	.000***
	Hours Food and Nutrition Training	.000***
	Years Teaching	.005**
	NKT Score	.000***
	Likert Score - Teaching Nutrition	.000
	Semantic Differential Score - My Own Nutrition	.001***
	Semantic Differential Score - My Teaching Food/Nutrition	.000***

* $p \leq .05$
** $p \leq .01$
***$p \leq .001$

Social science teachers' mean scores were significantly different for number of food/nutrition courses, NKT score, and the Likert attitude scores ($p \leq .05$) with those who taught about food or nutrition having higher means than teachers who did not teach food/nutrition.

When all teachers who taught about food or nutrition were compared with all who did not, significant differences were found between the means of all the variables. Means were higher for those who taught about food or nutrition for each variable except years of teaching experience. Those who taught about food/nutrition had fewer years of teaching experience. This is probably due to home economics teachers' greater amount of food/nutrition teaching and fewer years of experience.

The t-test results indicate the number of food/nutrition courses was greater for teachers who taught nutrition than for those who did not except for home economics teachers. While this is not causal evidence, it does support the idea that teachers should have preservice nutrition training if they are to be expected to teach nutrition. Cook et al., (1977) also indicated that coursework or in-service food/nutrition training was significantly related to a teacher's decision to teach nutrition. One reason no difference was found in number of food/nutrition courses for home economics teachers may be that a general home economics curriculum is followed for all home economics teachers in their undergraduate training. Therefore, clothing teachers may have the same number of food/nutrition courses as foods teachers except for additional elective courses.

Hours of food/nutrition training was significantly higher for those home economics teachers who taught food/ nutrition than for those who did not, indicating that the teachers who taught food/nutrition took advantage of in-service or other training opportunities. For the other teacher subject groups, hours of training was not different for those teachers who taught compared to those who did not teach food/nutrition.

Teachers' years of teaching experience was not different for those who taught food/nutrition compared with those who did not.

For each teacher subject group, those teachers who taught food/nutrition topics had significantly higher knowledge scores than those who did not. Since those teachers who taught nutrition also had significantly more food/nutrition courses (health/physical education, science and social science teachers) or significantly more hours of training after beginning to teach (home economics teachers), the higher NKT scores could be due, in part, to more training. Carver and Lewis (1979) reported increased knowledge levels were positively associated with the nutrition background of teachers. Secondary teachers who had studied nutrition also had higher knowledge scores than those who had not

(Gigliotti, 1976). However, Mutch (1980) detected no relationship for elementary teachers between NKT scores and food/nutrition training.

Significantly higher attitude scores on the Likert teaching nutrition scale were obtained by teachers in all subject groups who taught nutrition compared to those who did not. The Likert scale, then, may be useful for nutrition education studies in which comparisons are desired between teachers who do and do not teach nutrition. Some Likert scales reported by O'Connell et al., (1979) were not able to detect differences in attitudes between two such teacher groups. In addition, the higher attitude scores may be due, in part, to the higher training levels of teachers who taught food/nutrition.

The semantic differential scale, "My Own Nutrition" detected no differences between teachers who taught and those who did not teach food/nutrition. O'Connell et al., (1979) also noted that a scale designed to assess general attitude of the importance of nutrition yielded no differences between nutrition teachers and non-nutrition teachers. It was previously noted that the scale scores "My Own Nutrition" were significantly affected by teacher subject but that when Scheffe's test was applied, distinct differences among mean scores were not found. Thus, teachers appear to have similar attitude toward their own nutrition regardless of their subject and whether or not they teach nutrition.

T-tests indicated there were significant differences in attitude scores for each teacher subject group on the scale, "My Teaching Food and Nutrition". Therefore, this semantic differential scale in addition to the Likert teaching nutrition scale would be useful in studies designed to compare teachers who taught nutrition with those who did not.

Generally, teachers who taught something about food/ nutrition in their classes, had significantly more food/ nutrition coursework but not hours of training after beginning to teach, with the exception of home economics teachers for both types of training. Those teachers who taught food/nutrition also had higher NKT scores, Likert teaching nutrition scores and higher scores on the "My Teaching Food and Nutrition" scale. Years of teaching experience and scores on the scale "My Own Nutrition" were the same for teachers whether or not they taught food/ nutrition in their classes.

Topics Taught

Of those teachers who did teach food/nutrition, the topic checked most frequently as being taught was nutrition and general health, 57 percent (Table 27). Elsewhere this topic was reported as being taught most often by educators (Hoffman-LaRoche, 1978). In this study, the topic taught the least was maternal/child nutrition (25%). The topics taught

TABLE 27 : DISTRIBUTION OF FOOD/NUTRITION TOPICS TAUGHT BY ALL TEACHERS (n=518)

Topic Taught	Teachers	
	Number	Percentage
Nutrition and General Health	295	57
Consumer Information	263	51
Calories/Weight Control	258	50
Food Choices	260	50
Food Groups/Balanced Diet	252	50
Nutrient Function/Needs/Sources	256	49
Nutrition and Related Diseases	248	48
Digestion/Composition of Foods	221	43
Fitness/Athletic Training	219	42
Food Habits	206	40
Food Preparation	169	33
Maternal/Child Nutrition	131	25

less, i.e., food preparation and maternal/child nutrition, are usually taught in specialized courses, whereas those taught the most could be taught easily in many different courses. Table 27 indicates the percentages of all teachers who taught each topic.

Health/physical education teachers most frequently taught food/nutrition topics related to fitness and athletic training (Table 28). Over 90 percent of home economics teachers taught food groups and balanced diets. Science teachers most frequently taught digestion/food composition (56%) and social science teachers most often reported teaching consumer information (42%). Topics taught least often were food preparation, 12 percent; fitness/athletic training, 41 percent; food preparation, 9 percent; and digestion/composition, 6 percent by health/physical education, home economics, science and social science subject groups, respectively.

The chi-square test detected significant differences (p .001) in proportions of topics taught by the four teacher subject groups indicating that for every topic the distribution of teachers teaching it varied by subject group (Table 24). Thus, for example, home economics teachers were more likely to teach food groups/balanced diets than were social science teachers. Home economics teachers had the highest percentage of teachers teaching all of the topics except for fitness/athletic training which was highest for

TABLE 28: DISTRIBUTION OF FOOD/NUTRITION TOPICS TAUGHT BY EACH TEACHER SUBJECT GROUP

Food/Nutrition Topic Taught	Teacher Subject Group				Chi-Square
	Health/Physical Education	Home Economics	Science	Social Science	
	Number (Percentage)[1]				
Food Groups/Balanced Diet	50(47)	146(91)[2]	48(34)	8(7)	203.6***
Calories/Weight Control	55(51)	121(75)	66(47)	16(15)	97.1***
Consumer Information	37(35)	136(84)	44(31)	44(31)	111.9***
Digestion/Composition of Food	45(42)	91(57)	79(56)[2]	6(6)[3]	86.3***
Fitness/Athletic Training	80(75)[2]	66(41)[3]	42(30)	31(28)	62.6***
Food Choices	48(45)	138(86)	49(35)	25(23)	130.1***
Food Habits	29(27)	103(64)	34(24)	40(36)[2]	65.1***
Food Preparation	13(12)[3]	134(83)	12(8)[3]	10(9)	277.1***
Maternal/Child Nutrition	15(14)	82(51)	20(14)	14(13)	78.0***
Nutrient Function/Needs/Sources	37(35)	144(89)	62(44)	13(12)	183.5***
Nutrition & General Health	61(57)	138(86)	72(51)	24(22)	112.5***
Nutrition & Related Diseases	44(41)	121(75)	65(46)	18(16)	92.7***

[1] Percentages based on N in each teacher group

[2] Topic taught most often within the subject group

[3] Topic taught least often within the subject group

*** $p \leq .001$

health/physical education teachers. Gigliotti (1976) also found significant differences ($p \leq .001$) among five Delaware secondary teacher groups for specific nutrition-related activities, which included both methods and topics. Of the twenty-six topics tested, only one, dealing with philosophies of organic diets, yielded no difference in distribution across the five subjects. However, only a few teachers in the five samples taught the topic. Of the other topics, home economics teachers had highest percentages for the daily food guide, analysis of school lunches, costs in food markets, food habits and nutritional needs of the elderly, snack preparation, preparation and tasting of vegetables, main dishes and meat substitutes, weight control diets, food habits around the world, food processing and preservation, effect of advertising on food choices, diet during pregnancy, convenience foods vs. foods prepared from recipes, nutrient content of student menus, and vegetarian diets. Health teachers had highest topic frequencies for digestion and absorption of nutrients, comparison of health store food to supermarket food, eating habits in the cafeteria, and assessing students' caloric intake. Physical education teachers more frequently taught eating patterns for athletes and exercise for weight control or body building. Science teachers had the highest frequency for teaching about the use of chemical additives in foods.

The nutrition topics used by Gigliotti (1976) were more specific than the ones used in this study. She also divided health and physical education teachers into two groups. However, the results are similar.

In this study, health/physical education teachers generally taught nutrition topics related to fitness and athletic training, including weight control. Home economics teachers taught topics related to food groups, food preparation, nutrients, nutrition and general health, and consumer topics. Science teachers taught most often about digestion/food composition and nutrition and general health, and social science teaches taught about consumer interest topics and food habits.

Teachers' Participation in School Lunch

Nearly half the teachers, 49 percent, indicated they did not eat the school lunch even one day/week (Table 29). Twelve percent ate 1 day/week on the average and only 12 percent ate it every day of the week. Four percent did not answer the question.

TABLE 29: AVERAGE NUMBER OF SCHOOL LUNCHES EATEN PER WEEK BY EACH TEACHER SUBJECT GROUP

School Lunches Eaten by Teachers	All	Teacher Subject Group: Health/ Physical Education	Home Economics	Science	Social Science
	Number (Percentage)				
0	251(48)	33(31)	94(58)	75(54)	49(45)
1	63(12)	16(15)	24(15)	11(8)	12(11)
2	32(6)	11(10)	7(4)	7(5)	7(6)
3	45(9)	11(10)	11(7)	14(10)	9(8)
4	46(9)	14(13)	10(6)	12(9)	10(9)
5	50(12)	19(18)	10(6)	18(13)	13(12)
No Ans.	21(8)	3(3)	5(3)	3(2)	10(8)

Home economics teachers reported the largest percentage of non-participation in school lunch, 58 percent, followed by science teachers, 54 percent; social science teachers, 45 percent; and health/physical education teachers, 31 percent. In the mail Teacher Survey, teachers were not asked about alternatives to the school lunch. However, in the interview phase of this study, teachers who did not eat the school lunch generally brought sack lunches or skipped lunch. Perkins and coworkers (1980) reported similar results. They found that the largest percentage of teacher respondents ate the school lunch only once a month or never.

Weight Loss Diets

Fifty percent of teachers reported being on a diet to lose weight during the last year. Chi-square tests indicated females ($p \leq .001$) and home economics teachers ($p \leq .01$) were most likely to be on weight-loss diets (Tables 30 and 31).

TABLE 30: DISTRIBUTION OF TEACHERS ON A WEIGHT-LOSS DIET BY SEX OF TEACHERS

Sex of Teacher	On Diet (n=252)	Not on Diet (n=245)	Total Response (n=497)
	Number (Percentage)		
Female	143 (29)	95 (19)	238 (48)
Male	109 (22)	150 (30)	259 (52)

Chi-Square = 15 (d.f. = 1); $p \leq .001$

TABLE 31: DISTRIBUTION OF TEACHERS ON A WEIGHT-LOSS DIET BY TEACHER SUBJECT GROUP

Teacher Subject Group	On Diet (n=252)	Not on Diet (n=244)	Total Response (n=496)
	Number (Percentage)		
Health/ Physical Education	59 (12)	43 (3)	102 (21)
Home Economics	92 (18)	63 (13)	155 (31)
Science	58 (12)	80 (16)	138 (28)
Social Science	43 (9)	58 (12)	101 (20)

Chi-square = 14 (d.f. = 3); $p \leq .01$

Hours of Exercise/Activity of Teachers

Teachers were asked their average weekly hours of exercise or physical activity. The means and standard deviations for hours of activity are reported in Table 32. For all teachers, a mean of 9.2 hours of weekly exercise/ activity was obtained.

TABLE 32: MEANS AND STANDARD DEVIATIONS FOR HOURS OF WEEKLY EXERCISE BY TEACHER SUBJECT GROUP

Teacher Subject Group	Mean	Standard Deviation
Health/Physical Education	13.2	12.2
Home Economics	6.5	9.5
Science	10.1	11.6
Social Science	9.4	10.8
All	9.5	11.2

Health/physical education teachers reported the highest hours of exercise per week, 13.2 hours, and home economics teachers reported the lowest hours of exercise, 6.5 hours. The standard deviations indicate wide variability in response within each teacher group. Two-way analysis of variance to determine the effects of teacher subject group and sex on hours of activity resulted in significant joint effects ($p \leq .001$) and effects due to subject group ($p \leq .01$). There was no effect due to sex of teachers alone.

A one-way analysis of variance was performed to determine differences in teachers' mean hours of exercise by subject group. Scheffe's test resulted in two subsets with combinations of teacher subject groups. Thus, no distinct differences were found among the four teacher subjects for hours of exercise. This was not surprising since the standard deviations were almost always larger than the means (Table 32).

Pressure from Colleagues

Teachers were asked how much pressure they felt from their colleagues to participate or to not participate in school activities. Only 5 percent of all teachers reported feeling a high level of pressure.

TABLE 33: LEVEL OF PRESSURE FELT BY TEACHERS TO PARTICIPATE IN ACTIVITIES BY TEACHER SUBJECT GROUP

Level of Pressure	All	Health/ Physical Education	Home Economics	Science	Social Science
	Teacher Subject Group				
	Number (Percentage)				
Low	225(43)	44(41)	67(42)	73(52)	41(37)
Average	247(48)	53(50)	79(49)	59(42)	56(51)
High	28(5)	9(8)	10(6)	3(2)	6(6)
Not Answer	18(4)	1(1)	5(3)	5(4)	7(6)

Using cross tabulations and the chi-square test, no difference in distribution was found between pressure felt from colleagues to participate or to not participate in school activities based on teacher subject group. In addition, no difference in distribution of levels of pressure felt by teachers from colleagues based on sex of teachers, teachers' dieting behavior, teachers' level of interest in nutrition, or whether or not teachers taught food/nutrition in their classes were found.

Summary

Three nutrition-related personal behaviors of teachers were assessed: school lunch participation, dieting to lose weight, and hours of exercise/activity. Nearly half of all teachers never ate the school lunch. Thus, while the nutrition education programs often recommended the use of school lunchroom as a learning laboratory (White House

Conference on Food, Nutrition and Health, 1969), teachers may not even be familiar with the school lunch offered in their own schools. Teachers with the largest rate of non-participation in the school lunch were home economics teachers. Their low rate of participation may be due to the ready availability of food and refrigeration for sack lunches in their classrooms and/or to dieting behavior since it was found that home economics teachers were most likely to be on diets. Teachers on weight-loss diets were also likely be be females.

Health/physical education teachers had the largest mean hours of exericse, and home economics teachers had the smallest. Two-way analysis of variance resulted in significant joint effects of teachers' subject and sex and effects due to teachers' subject on hours of exercise. No effects were found for sex of teachers alone. No distinct differences among exercise hours were detected when the joint effects of subject taught and sex of teachers were tested using a one-way analysis of variance and Scheffe's test.

Only 5 percent of teachers reported feeling a high level of pressure from colleagues to participate or to not participate in school activities. Chi-square tests revealed no differences in levels of pressure based on teachers' subject group, sex, dieting behavior, nutrition interest level or on teaching food/nutrition in the classroom.

Relationships Between Variables

Pearson correlation coefficients were determined between knowledge and attitude scores and other variables for each teacher group and for all teachers together. The correlation coefficients are listed in Tables 34-38. Generally, when correlation coefficients were significant, they were also low in value. Thus, they indicated that while the existence of the relationships may not be totally based on chance, the relationships noted were weak.

Knowledge/Attitude Relationships

The highest correlations in each table were generally found between the two semantic differential scales. This may be due to teachers responding to a given style of item in a set way or to the proximity of items on the survey rather than to a strong relationship between the two variables being measured since it was determined previously by factor analysis that the two scales assessed were homogeneous and reflected the concepts in question. Thus, they were valid measures of the two separate concepts. In addition, the semantic differential teaching scale should correlate more strongly with the Likert teaching scale because they were designed to reflect similar attitudes. However, for all teachers combined, the correlation between the two scales assessing attitude twoard teaching nutrition was

TABLE 34: PEARSON CORRELATION COEFFICIENTS BETWEEN SCORES AND OTHER VARIABLES FOR ALL TEACHERS

Variables	Scores			
	NKT	Teaching Nutrition Scale	My Own Nutrition Scale	My Teaching Food/Nutrition Scale
	r	r	r	r
Likert-Teaching Nutrition Scale	.32***			
Semantic Differential-My Own Nutrition Scale	.21***	.13***		
Semantic Differential-My Teaching Food/Nutrition Scale	.35***	.33***	.71***	
Food and Nutrition Courses Taken	.40***	.35*	.09*	.25***
Hours Food and Nutrition Training Taken	.21	.15	.04	.11**
Years Teaching Experience	-.15***	-.19***	-.10	-.23***
Hours Exercise	-.13***	-.08*	-.01	-.01

*$p \leq .05$
**$p \leq .01$
***$p \leq .001$

TABLE 35: PEARSON CORRELATION COEFFICENTS BETWEEN SCORES AND OTHER VARIABLES FOR HEALTH/PHYSICAL EDUCATION TEACHERS

Variables	Scores			
	NKT	Teaching Nutrition Scale	My Own Nutrition Scale	My Teaching Food/Nutrition Scale
	r	r	r	r
Likert-Teaching Nutrition Scale	.16			
Semantic Differential-My Own Nutrition Scale	.16	.16		
Semantic Differential-My Teaching Food/Nutrition Scale	.31***	.33***	.65***	
Food and Nutrition Courses Taken	-.02	.10	.03	.01
Hours Food and Nutrition Training Taken	.13	.17*	.06	.04
Years Teaching Experience	.09	-.17*	-.04	-.13
Hours Exercise	-.03	.03	.13	-.01

*$p \leq .05$
**$p \leq .01$
***$p \leq .001$

TABLE 36: PEARSON CORRELATION COEFFICIENTS BETWEEN SCORES AND OTHER VARIABLES FOR HOME ECONOMICS TEACHERS

Variables	Scores: NKT	Scores: Teaching Nutrition Scale	Scores: My Own Nutrition Scale	Scores: My Teaching Food/Nutrition Scale
	r	r	r	r
Likert-Teaching Nutrition Scale	.17*			
Semantic Differential-My Own Nutrition Scale	.20**	.05		
Semantic Differential-My Teaching Food/Nutrition Scale	.22**	.04	.75***	
Food and Nutrition Courses Taken	.17*	.04	.06	.05
Hours Food and Nutrition Training Taken	.06	-.09	-.01	-.00
Years Teaching Experience	-.03	-.24***	.03	-.11
Hours Exercise	.03	-.21**	-.01	.05

*$p \leq .05$
**$p \leq .01$
***$p \leq .001$

TABLE 37: PEARSON CORRELATION COEFFICIENTS BETWEEN SCORES AND OTHER VARIABLES FOR SCIENCE TEACHERS

Variables	Scores NKT	Teaching Nutrition Scale	My Own Nutrition Scale	My Teaching Food/Nutrition Scale
	r	r	r	r
Likert-Teaching Nutrition Scale	.26***			
Semantic Differential-My Own Nutrition Scale	.24**	.16*		
Semantic Differential-My Teaching Food/Nutrition Scale	.28***	.41***	.81***	
Food and Nutrition Courses Taken	.08	.24**	.03	.11
Hours Food and Nutrition Training Taken	.08	.09	-.04	.01
Years Teaching Experience	-.14	-.02	-.08	-.09
Hours Exercise	-.08	.09	.00	.02

*p ≤ .05
**p ≤ .01
***p ≤ .001

TABLE 38: PEARSON CORRELATION COEFFICIENTS BETWEEN SCORES AND OTHER VARIABLES FOR SOCIAL SCIENCE TEACHERS

	Scores			
Variables	NKT	Teaching Nutrition Scale	My Own Nutrition Scale	My Teaching Food/Nutrition Scale
	r	r	r	r
Likert-Teaching Nutrition Scale	.06			
Semantic Differential-My Own Nutrition Scale	.03	.06		
Semantic Differential-My Teaching Food/Nutrition Scale	.00	.22*	.65***	
Food and Nutrition Courses Taken	.01	.15	-.02	.00
Hours Food and Nutrition Training Taken	-.03	-.01	.09	-.04
Years Teaching Experience	-.03	.05	-.21*	.29*
Hours Exercise	-.20*	-.07	.11	.13

*p ≤ .05
**p ≤ .01
***p ≤ .001

r=.33, ($p \leq .001$). The r value was r=.33 ($p \leq .001$), for health/physical education teachers, r =.41 ($p \leq .001$) for science teachers and r = .22 ($p \leq .05$) for social science teachers. However, for home economics teachers, the correlation between the two scales was negligible (r = .04) and not significant.

The low correlations indicate that while the two scales may both reflect something about teaching attitude they do not measure the same thing and one is not a valid replacement of the other. In other words, the Likert teaching scale would not be a substitute for the semantic differential teaching scale. Both scales should be used when attitude assessments regarding the teaching of nutrition are needed.

The relationship between knowledge score (NKT) and teaching attitude score was explored (Tables 34 to 38). For all teachers, the correlation between the NKT score and the Likert teaching score was r = .32 ($p \leq .001$) and between the NKT score and semantic differential score, r = .35 ($p \leq .001$) (Table 34, p. 151). These results indicate there was a direct relationship between teachers nutrition knowledge and teachers attitude toward teaching nutrition.

For each teacher group, the NKT score was more highly correlated with the semantic differential teaching scale than with the Likert teaching scale (Tables 35 to 38), with the exception of social science teachers, for whom the correlations were not significant.

Significant correlations between NKT score and the semantic differential scale "My Own Nutrition", score, was $r = .21$ ($p \leq .001$) for all teachers combined. For home economics teachers, $r = .20$ ($p \leq .01$) and for science teachers, $r = .24$, ($p \leq .01$). This indicates that teachers of home economics and of science who had higher NKT scores also had more favorable attitudes toward their own nutrition.

Generally, significant correlations were obtained for the teacher groups between the Likert teaching attitude scale and the semantic differential scale "My Teaching Food and Nutrition". However, the relationships were not strong enough to validate the use of one scale as a replacement for the other. Significant relationships were found between NKT scores and attitude scores. Generally, NKT scores were more highly correlated with the semantic differential scale, "My Teaching Food and Nutrition" than with the Likert teaching nutrition scale. For two teacher subject groups, relationships also were found between NKT score and "My Own Nutrition" scale score.

Knowledge and Other Variables

NKT score was related positively but moderately to the number of food/nutrition courses taken by teachers for all teachers combined ($r=.40, p \leq .001$) and for home economics teachers ($r = .17$, $p \leq .05$). No relationship was found between NKT score and number of courses for the other teacher groups probably because the other teachers had taken so few food/nutrition courses. Similarly, for all teachers, a weak positive relationship was found between NKT score and hours of food/nutrition training after beginning to teach, $r = .21$ ($p \leq .001$). However, no relationship was found for any of the other teacher groups.

Some investigators have concluded that teachers who have had preservice or inservice nutrition training have higher nutrition knowledge scores (Carver and Lewis, 1979; Gigliotti, 1976). That conclusion is partially consistent with the results of this study. Home economics teachers had the highest number of food/nutrition courses (Table 10, p.95), the highest number of inservice training hours (Table 11,p.97), and the highest NKT scores (Table 12, p.100). However, the correlation between the NKT score and the number of courses taken was $r = .17$ ($p \leq .05$) for home economics teachers and no relationship was found between the NKT score and hours of training taken. When data for all teachers was used, the correlations noted above were found. In any case, the relationship of preservice or inservice training to nutrition knowledge was not strong. Other investigators found no relationship between knowledge and training (Petersen and Kies, 1972; Mutch, 1980).

At this point, it is instructive to return to the t-test results obtained comparing teachers who taught food/nutrition with those who did not (Table 26, p.134). Teachers who taught food/nutrition, with the exception of home economics teachers, had taken significantly more food/nutrition courses than those who did not. Therefore, the taking of food/nutrition courses may not result in a higher knowledge score in and of itself. It may, however, influence teachers decision to teach food/nutrition. As a result of that decision and subsequent involvement of teachers in preparing to teach, knowledge of nutrition might be expected to increase. In any case, nutrition educators are interested in getting teachers to incorporate more food/nutrition topics into their courses. The behavior of teaching food/nutrition is their ultimate goal, not the increase in knowledge alone. Increasing teachers' nutrition knowledge does little good if teachers do not make use of that knowledge in the classroom. Therefore, nutrition training for teachers should be encouraged because it may encourage teachers to teach food/nutrition in their classes.

A negative relationship between knowledge and years of teaching experience was found for all teachers; $r = -.15$ ($p \leq .001$). This result was consistent with findings for mothers and for nurses (Young et al., 1956; Vickstrom and Fox, 1976), but not for public health nurses (Schwartz, 1976). This result should not be construed to mean that older or more experienced teachers do not know enough to teach nutrition. Again, the t-test results (Table 26, p. 134) are instructive. No difference in years of teaching experience was found between teachers who taught food/nutrition and those who did not except when all teachers were combined. In addition, NKT scores of teachers who taught food/nutrition were higher than for those who did not. Thus, those teachers who taught food/nutrition had more knowledge but not any different amount of teaching experience than teachers who did not teach food/nutrition. The correlation obtained was probably influenced by home economics teachers having the highest NKT scores and the least amount of experience.

Teachers were asked how many hours of exercise they received, as a variable possibly related to nutrition knowledge/attitude/behavior. However, for all teachers, the relationship between nutrition knowledge and hours of exercise was weak and negative, $r=-.13$ ($p \leq .01$). For social science teachers, the relationship was also weak and negative, $r=-.20$ ($p \leq .05$). Thus, teachers who knew more about nutrition exercised less.

In summary, NKT score was related positively to the number of food/nutrition courses taken for all teachers combined and for home economics teachers. Hours of training was related to NKT score for all teachers combined but not for individual teacher subject groups. It was suggested that teacher training might influence teachers to incorporate nutrition into their teaching, leading to more involvement of the teacher in obtaining nutrition information, thereby increasing knowledge. The negative but very weak correlation noted for all teachers between NKT score and years of experience may have been due to the influence of home economics teachers higher NKT scores and lower years of teaching experience, and conversely, to low knowledge scores of social science teachers and high number of years of experience. Low, negative correlations were obtained between NKT scores and hours of exercise for all teachers and for social science teachers.

Attitudes and Other Variables

Correlation coefficients were determined between attitude scores and other variables (Tables 34 to 38, pp 151-155). The Likert and the semantic differential teaching attitude scores were related to the number of food/nutrition courses taken for all teachers, r= .35 ($p \leq .001$), and r = .25 ($p \leq .001$), respectively. The Likert scale was also related to the number of food/nutrition courses for science teachers, r = .24 ($p \leq .01$). Interestingly, the relationship was not found for home economics teachers.

For all teachers, both teaching attitude scores were negatively related to years of teaching experience, r = -.19 ($p \leq .001$) and r = -.23 ($p \leq .001$) for the Likert and semantic differential scales, respectively. Teachers who taught a longer time had less favorable attitudes toward teaching food/nutrition than less experienced teachers.

Low negative correlations for health/physical education teachers and for home economics teachers were found between years of experience and the Likert teaching score, r = -.17 ($p \leq .05$) and r = -.24 ($p \leq .001$), respectively.

Social science teachers' attitudes toward teaching food/ nutrition based on the semantic differential score was also negatively related to years of teaching experience $r = -.29$ ($p \leq .01$).

For all teachers and home economics teachers, hours of exercise was indirectly related to the Likert teaching nutrition attitude score, $r -.08$ ($p \leq .05$) and $r -.21$ ($p \leq .01$), respectively. The relationships were weak.

The semantic differential scale scores for "My Own Nutrition" related weakly to the number of food/nutrition courses, $r = .09$ ($p \leq .05$) for all teachers and negatively, $r = -.21$ ($p \leq .05$), for social science teachers.

Generally, only a few correlations were found between attitude scores and the other variables. When relationships were found the correlations were low. The number of food/ nutrition courses taken by teachers was directly related to attitude scores, but hours of food and nutrition training after beginning to teach was not. Years of teaching experience and hours of exercise were indirectly related to attitude scores.

Summary

Pearson correlation coefficients were determined between knowledge and attitude scores and other variables for each teacher group and for all teachers. Generally, significant direct relationships were found for the teacher groups between the Likert teaching attitude scale scores and scores on the scale "My Teaching Food and Nutrition." Significant relationships were found between knowledge and attitude scores, but knowledge was more highly correlated with the semantic differential scale "My Teaching Food and Nutrition" than with the Likert teaching nutrition scale. For two teacher groups, relationships were found between NKT scores and scale scores for "My Own Nutrition".

NKT score was related positively to the number of food/nutrition courses for all teachers and for home economics teachers. A weak, indirect relationship was found between knowledge and years of teaching experience and between knowledge and hours of exercise.

Attitudes scores on both the Likert teaching nutrition scale and the semantic differential teaching nutrition scale were directly related to the number of food/nutrition courses taken. Years of teaching experience and hours of exercise were indirectly related to attitudes toward teaching nutrition.

Generally, when correlations were significant, they were also low in value indicating that relationships between variables were not strong.

SUMMARY AND CONCLUSIONS

General Summary

The purpose of this study was to develop attitude scales for assessing teachers' attitudes toward nutrition and to assess the nutrition knowledge, attitudes and practices of secondary teachers in four subject areas: health/physical education, home economics, science and social science. Interviews of 32 teachers were used to obtain ideas and statements for developing attitude scales and to obtain preliminary practices data. From the interview data, the Teacher Survey questionnaire was developed containing statements for two Likert-type scales, one to assess attitude toward teaching nutrition, one to assess personal nutrition attitude. Two semantic differential scale, "My Teaching Food and Nutrition" and "My Own Nutrition" were included in the questionnaire. Nutrition attitude also was assessed multidimensionally using the Galileo system, on the Nutrition Perceptions instrument. Nutrition Knowledge was assessed using the 40-item MSU Nutrition Knowledge Test (NKT). Teaching nutrition practices and personal nutrition-related practices were assessed with questions on the Teacher Survey. Some demographic data also were obtained.

The Teacher Survey and NKT were mailed to 1191 teachers in the mail survey phase of this study. The Nutrition Perceptions instrument was mailed to only half the teachers. A significantly lower percentage of teachers responded when the Nutrition Perceptions instrument was included with the other two instruments in the mailing ($p \leq .01$). An overall response rate of 47 percent was attained, 52 percent for those teachers receiving only the Teacher Survey and the NKT, 44 percent for teachers also receiving the Nutrition Perceptions instrument. Forty-four percent of all the instruments were useable.

<u>The Sample</u>

Five hundred eighteen teachers completed the Teacher Survey. Nearly one-third were home economics teachers. Significant differences in distributions of teachers by sex were found across the four teacher subject groups ($p \leq .001$). Home economics teachers were predominately female, science and social science teachers were mostly male and health/physical education teachers were nearly equally distribution by sex. Teachers averaged 13.5 years of teaching experience. Years of teaching experience varied significantly across subject groups ($p \leq .001$) with social science teachers having highest years of teaching experience; home economics teachers the lowest. Differences were also due to the joint effects of subject taught and sex of teachers ($p \leq .001$). Teachers' mean number of food/nutrition courses was 1.9. Significant differences in the number of courses taken were based on teachers' subject ($p \leq .001$), sex ($p \leq .01$), to joint effects ($p \leq .001$) and to interaction of subjects taught and sex of teacher ($p \leq .001$). Home economics teachers had significantly more courses than the other teacher groups. Sixty-five percent of teachers had received no hours of food/nutrition training after they started to teach. The mean hours of training for all teachers was 4.6. Significant differences in number of hours of training were due to the effects of teachers' subject ($p \leq .001$) and to the joint effects of teachers' sex and subject ($p \leq .001$). Home economics teachers had significantly more hours of training than teachers in the other subjects.

Teachers' Nutrition Knowledge

Teachers' knowledge was assessed on the 40-item MSU Nutrition Knowledge test. NKT scores, item analysis and reliability coefficients were determined. Home economics teachers' mean score was 28, the highest of the teacher groups. Science teachers scored 23; health/physical education teachers, 21; and social science teachers, 19. The overall mean correct score was 23. Significant differences in scores were due to teachers' subject group ($p \leq .001$) and sex ($p \leq .001$), and joint effects ($p \leq .001$). In addition, significant interaction effects were noted ($p \leq .001$), making results difficult to interpret. One-way analysis of variance resulted in three subsets, with home economics teachers having higher scores than the other two subsets.

NKT score item analysis yielded the lowest item difficulty indices for home economics teachers. The easiest items for teachers were items dealing with carbohydrates and with sodium function. They tested a subconcept of White House Conference (WHC) concept 2, pertaining to functions of nutrients. The most difficult items were one requiring a definition of the RDA and one related to nutrition during pregnancy, both testing for WHC concept 4, nutrient needs throughout the lifespan. The mean item difficulty for all teachers was 42.

Mean item discriminations for each teacher subject group were all below 40, indicating they could be improved. The overall mean discrimination index was 41. The most discriminating items varied for each teacher subject group. The most highly discriminating item for all teachers was a question asking the number of recommended servings of fruits and vegetables from the Daily Food Guide, testing a subconcept of WHC concept 4.

Kuder-Richardson 20 reliability coefficient were obtained from analysis of the NKT scores. The overall K-R 20 was .82, the same as that obtained for home economics teachers. The lowest K-R 20, .69, was obtained for social science teachers. All K-R 20 values were considered acceptable for this study.

Teachers' Attitudes

Teachers' attitudes toward teaching nutrition were assessed on a 14-statement Likert scale and on a 7-adjective pair semantic differential scale, "My Teaching Food and Nutrition". Attitude toward personal nutrition was assessed on a 5-adjective pair scale, "My Own Nutrition". Home economics teachers had the highest, i.e., most positive, scores on each of the three summed scale scores. Social science teachers had a slightly negative attitude toward, "My Teaching Food/Nutrition". Significant differences in attitudes toward teaching nutrition, assessed on the Likert scale, were due to teachers' subject ($p \leq .001$) and to sex of teachers ($p \leq .01$). Significant differences among mean scores were found among all four teacher groups ($p \leq .05$). On the semantic differential scale, "My Teaching Food and Nutrition", teachers' scores varied significantly by subject ($p \leq .001$) but not by sex. Significant differences in mean scores were found among three groups: home economics, social science and health/physical education-science combined. Teachers' subject also had a significant effect on the attitude "My Own Nutrition" ($p \leq .01$), however, a subsequent test of differences between means detected no distinct differences among the four teacher groups. Generally, teachers were more positive about "My Own Nutrition" than they were about the teaching of nutrition.

Coefficient alpha reliability coefficients were determined for the three attitude scales. The coefficient were highest for the two scales reflecting attitudes toward teaching nutrition. Coefficients for those two scales were all above .80. Alpha values ranged from .72 to .81 for the third attitude scale, "My Own Nutrition". The lower values obtained on the third scale reflect the lesser amount of score variation obtained.

The Nutrition Perceptions instrument, incorporating the Galileo measurement system, contained 78 paired concept comparisons among 13 concepts on which distance estimates were obtained. Nine of the paired concepts yielded significant variability due to teachers' subject ($p \leq .05$ or $p \leq .01$). However, subsequent tests for differences among the means detected no differences at all among the subject groups or no distinct differences because to subsets resulted. The lack of differences among means was attributed to the large standard deviations obtained. It was apparent that teachers had difficulty responding to the Nutrition Perceptions instrument, at least in a mailed administration.

Teachers were asked to indicate their level of nutrition interest, high, average or low. Forty-four percent of all teachers reported a high level of interest, and 52 percent reported an average level of interest. Home economics teachers had the highest percentage of high interest respondents, social science teachers the lowest. The chi-square test indicated there were significant differences in interest based on teachers' subject ($p \leq .001$) and sex ($p \leq .001$) with females having higher interest than males.

Teachers' Practices

Teachers were asked if they taught anything about food/nutrition and to check topics they taught. Sixty-five percent of all teachers reported teaching something about food/nutrition in their classes. For each teacher group, the percentages indicating they taught something about food/nutrition were: health/physical education, 64 percent; home economics, 95 percent; science, 62 percent; and social science, 29 percent. Significant differences in the distribution of teachers who taught food/nutrition were due to teachers' subject ($p \leq .001$), sex ($p \leq .001$) and level of nutrition interest ($p \leq .001$). Home economics teachers, females and teachers with high interest taught food/nutrition with greater frequency. T-tests were performed on several variables comparing teachers who taught with those who did not teach something about food/nutrition in their classes. Teachers, except home economics teachers, who taught something about food/nutrition in their classes generally had taken more food/nutrition courses but not hours of training after starting to teach. Those who taught food/nutrition also had higher NKT scores and more favorable attitudes toward teaching nutrition, on both the Likert and the semantic differential scale. Years of teaching experience and attitude twoard "My Own Nutrition" were the same for teachers who taught food/nutrition as for those who did not teach food/nutrition.

Teachers were asked to check food/nutrition topics they taught in their classes. The most frequently taught topic for all teachers was nutrition and general health. The topic taught least was maternal/child nutrition. For each topic, significant differences in proportions of teachers teaching it, by subject group, were found ($p \leq .001$). Health/physical education teachers most frequently taught nutrition topics related to physical fitness, athletic training and weight control. Home economics teachers taught topics related to food groups, food preparation, nutrients and consumer information. Science teachers taught most frequently about digestion/food consumption and social science teachers taught most frequently about consumer information and food habits.

Three nutrition-related personal behaviors of teachers were assessed: school lunch participation, dieting to lose weight and hours of exercise/activity obtained. Slightly over half of all teachers reported they ate the school lunch from one to five times per week (51%). Thus, many teachers may not even be familiar with the school lunch programs in their buildings. Home economics teachers had the lowest rate of participation in the lunch program. Lack of home economics teachers' participation may be due, in part, to dieting behavior since female ($p \leq .001$) and home economics teachers ($p \leq .01$) were more likely to be on weight-loss diets than males or teachers in the other subject groups. Health/physical education teachers had the highest mean hours of weekly exercise; home economics teachers had the smallest. Significant variation in hours of exercise was attributed to teachers' subject group ($p \leq .01$) and to joint effects of teachers' subject and sex. No distinct differences in hours of exercise were detected among subject groups. Level of pressure felt from colleagues to participate in school-related activities did not vary by teachers' subject group, sex, dieting behavior, nutrition interest level or teaching food/ nutrition in the classroom.

Relationships Among Variables

Pearson correlation coefficients were determined between knowledge and attitude scores and other variables. Generally, when correlations were significant, they were also low. Significant correlations were obtained for the teacher groups between scores on the Likert teaching nutrition attitude scale and the semantic differential scale, "My Teaching Food and Nutrition". However, the correlation were not high enough for one scale to be a valid replacement of the other. Significant relationships were found between NKT scores and attitudes scores. Generally, higher correlations were found between knowledge and the semantic differential score for "My Teaching Food and Nutrition" than between knowledge and the Likert teaching nutrition attitude score. The NKT score and "My Own Nutrition" score yielded significant correlations for only two groups.

The NKT score was related positively to the number of food/nutrition courses taken for all teachers and home economics teachers. Hours of training was related to the NKT score only for all teachers combined. It was suggested that teacher knowledge might be increased as a result of teaching food/nutrition rather than directly from training. However, the training might encourage teachers to teach food/nutrition. For all teachers, a weak, indirect relationship was found between NKT score and years of teaching experience, perhaps due to home economics teachers having fewer years experience and higher NKT scores and to social science teachers having more years and lower scores. No relationship was found between the two variables for either home economics teachers or social science teachers alone. Hours of exercise were indirectly related to NKT scores for all teachers and for social science teachers.

Only a few correlations were found between attitude scores and other variables. The number of food/nutrition courses taken was related directly to both the Likert and the semantic differential teaching attitude scores for all teachers. Years of teaching experience and hours of exercise were indirectly related to teaching nutrition attitude scores.

Implications and Recommendations

In this study, a Likert scale and a semantic differential scale to assess teachers' attitude toward teaching nutrition, a semantic differential scale to assess teachers' attitudes toward their own nutrition and a Nutrition Perceptions instrument to multidimensionally assess teachers attitudes toward nutrition were developed. The nutrition knowledge, attitudes and practices of teachers in four subject groups also were assessed.

Use of Attitude Scales

The Likert teaching nutrition scale and the semantic differential scale, "My Teaching Food and Nutrition" should be useful evaluation tools for other nutrition education studies of secondary teachers as in the evaluation of teacher attitude change in workshops or other training sessions. The scales detected differences in attitudes among the four teacher subject groups and were shown to be reliable measures of attitudes toward teaching nutrition. The correlations between the two scale scores were significant but not large, as validity coefficients should be. Therefore, both scales probably should be used together rather than alone since they seem to measure different aspects of attitude toward teaching nutrition.

The scale "My Own Nutrition" revealed that teachers held more positive attitudes about their own nutrition than they held about the teaching of nutrition since teachers obtained higher scores on that scale than on the other two scales. However, the "My Own Nutrition" scale detected no differences in scores among the four group means. In addition, teachers' scores were all high on that scale. Therefore, it would not be a useful measure for pre-posttest designs because the scale would leave little scoring range to show increased favorability of attitudes. There is probably little point in trying to develop a better scale to assess teachers' attitudes toward their own nutrition. This research and work by O'Connell et al., (1979) both indicate that teachers are positive about nutrition, in general, regardless of training or of whether or not they teach food/ nutrition.

The Nutrition Perceptions instrument was difficult for teachers as indicated by the significantly lower response rate for teachers and by comments on instruments returned. In addition, very large standard deviations occurred for the distance estimates on the paired concepts. This may further indicate the response was difficult and that teachers may have responded indiscriminately. Response on this instrument takes much more time and thought than typical survey forms or questionnaires. Since it was a difficult instrument to complete, it might be better to confine the use of the Nutrition Perceptions instrument to small teacher groups in training sessions or some other setting where the test administrator can be on hand to explain the procedures and to answer questions and where attitude change over time is being evaluated. The investigator would not recommend the further use of the instrument for mail surveys. There is one additional consideration. The instrument should probably also be confined to formal research projects having budgets for data analysis. Ten data cards are required per subject. Key punching and computer analysis are required. Furthermore, the GALILEO^{tm} program is not readily available at many institutions for analyzing the data. Thus, the use of this instrument may not be very practical for most nutrition education evaluation/research purposes. Its usefulness in the nutrition education field has not been demonstrated.

Use of Nutrition Knowledge Test Scores

The NKT scores of teachers in this study were all relatively low. The highest score of 70 percent for home economics teachers might not be considered a passing score for a classroom test. And, a large percentage of home economics teachers indicated they taught something about food/nutrition in the classroom. While home economics teachers emphasize food preparation more than they do nutrition, they should still receive high scores on tests of nutrition knowledge if they are to teach nutrition in the classroom.

The health curriculum in the State of Michigan mandates that nutrition be taught as a component of health education. The health/physical education teachers scored only

57 percent on the NKT. The teacher sample included physical education teachers in addition to health teachers so the low score may not reflect the knowledge level of health teachers. On the other hand, the scores may indicate that health educators do have low levels of nutrition knowledge, perhaps inadequate to teacher nutrition in their classes.

These data, and the scores of science and social science teachers indicate that the teachers in the samples are generally not knowledgeable about nutrition, and that teachers should receive some type of training if they are to teach nutrition to students.

Usefulness of Knowledge, Attitudes and Practices Data

Teachers' subject group affected scores or other values on several of the variables in this study including the differences in years of teaching experience, number of food/nutrition courses taken, NKT scores, teaching nutrition attitude score for the Likert scale and level of nutrition interest. In addition, differences in teachers' distribution across subjects was found for those who taught food/nutrition compared to those who did not and for those who dieted compared to those who did not. However, these variables were also all affected by the sex of the teacher. The subject group usually had the greater effect, however, for the NKT scores, significant interaction effects occurred making the results difficult to interpret. Home economics teachers and female teachers generally had higher scores than males or teachers in other subjects. Since female teachers tended to have higher interest in nutrition, more favorable attitudes and more knowledge of nutrition, perhaps nutrition education efforts outside of home economics at the secondary level should focus on female teachers.

The most frequently taught nutrition topic was nutrition and general health. The GALILEO^{tm} plots also indicated that teachers generally perceived the concept, "Good Health" close to themselves, that is, important to them. Nutrition education curriculum developers would be well-advised to orient nutrition teaching materials toward the relationship of nutrition to health, as well as toward other specific topics or concepts associated with each particular group of teachers.

Other results of this study suggest that teacher preservice courses might enhance a teachers' decision to teach food/nutrition in the classroom. Thus, training should be oriented to include teaching techniques and practical application and integration of nutrition information into the classroom, not just on increasing teachers' substantive knowledge of nutrition, even though nutrition knowledge scores generally were low.

Conclusion

A Likert scale and a semantic differential scale to assess secondary teachers' attitudes toward teaching nutrition were developed. The nutrition knowledge, attitudes and practices of secondary teachers of health/physical education, home economics, science and social science were assessed. Teachers' nutrition knowledge was generally low, with home economics teachers obtaining the highest score and social science teachers the lowest. Home economics teachers had the most positive attitudes toward teaching nutrition on both the Likert and the semantic differential teaching nutrition scale; social science teachers had the least positive attitudes. Those two scales could detect attitude differences among the teacher subject groups, however, scores on the two scales were only moderately related. Therefore, the scales do not measure the same component of teachers' attitudes toward teaching nutrition. Teachers' scores on the semantic differential personal nutrition scale were high and similar across subject groups. The majority of teachers reported that they taught something about food/nutrition during the past year. Topics taught by teachers differed significantly across subject groups.

APPENDIX A

INTERVIEW PHASE INSTRUMENTS AND FORMS

Code____________

M____F____

p. 1

TEACHER INTERVIEW SCHEDULE

Date____________

1. What ideas, thoughts or concepts come to mind when you think about nutrition?

2. Do you think the students in your classes eat properly? Y____N____What makes you think so?

3. What do you think causes some students to eat poorly?

4. What do you think students should eat to be eating properly?

5. Should students take vitamins or other supplements to improve their diets?
Y____N____ Sometimes____ When? What? Why or why not?

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6. Should students avoid snacking to improve their diets? Y____N____ Why or why not? ______________________________

____

____

____

7. In general, how do you feel about nutrition being taught in the schools? (If negative, where should it be taught and by whom? If positive, go on.)

____

____

____

____

8. In your __________ classes, do you teach anything about food or nutrition? Y____N____ If so, what topics do you teach and how? ______________________________

____

____

____

____

____

9. In most schools, some nutrition is taught within home economics or health subjects. If <u>more</u> nutrition were to be taught in the school setting, who should do it? Pick only one best answer. (Use probe card A)

a._____classroom teachers

b._____parent volunteers

c._____a special teacher, hired only to teach nutrition

d._____the school dietitian or other foodservice personnel

e._____other______________________________

10. What is the reason for your choice? ______________________________

____

____

____

11. If nutrition were taught in more subjects, in which subjects could nutrition be taught the most effectively? (In which subjects could nutrition reach the largest number of students and have the biggest impact?)

12. What is the reason for your choice of subjects?

13. In your classes do you think you could have (have) any impact on student's eating habits? Y____N____ Explain why or why not.

14. How do you feel about school breakfast and school lunch programs as a means for nutrition education? (Is it feasible? Why or why not? Would there be any conflicts between teachers and foodservice personnel?)

15. What are the positive aspects of the school meals programs in your school?

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16. What are the negative aspects of school meals programs in your school?

17. What foods or beverages are available to students in vending machines or at snack counters?

18. What foods or beverages are available only to teachers?

19. Do you think any such snack foods should be banned from the school? Which foods?

20. Do you have any additional comments or concerns about nutrition education?

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21. (Use probe card B.) Which, if any, of the items on the card, do you think would keep more food or nutrition from being taught in schools. Pick as many as apply or name others you can think of.

a.____lack of interest by teachers

b.____lack of interest by students

c.____lack of administrative support

d.____lack of teacher training

e.____nutrition not in the curriculum

f.____teaching nutrition wouldn't make any difference in the way students eat

g.____teaching nutrition is not part of the contract

h.____there are too many other demands on time

i.____lack of resources/teaching materials

j.____other____

22. (Use same probe card B.) Which of the items on the card, or others you can think of, would keep you from including food or nutrition or teaching more food and nutrition in your ________ classes?

a.____lack of interest by teachers

b.____lack of interest by students

c.____lack of administrative support

d.____lack of teacher training

e.____nutrition not in the curriculum

f.____teaching nutrition wouldn't make any difference in the way students eat

g.____teaching nutrition is not part of the contract

h.____there are too many other demands on time

i.____lack of resources/teaching materials

j.____other____

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The following group of statements deal with nutrition beliefs and attitudes. I want to know if you agree or disagree with each statement, and why. (Note to interviewer: These items should be used to generate discussion and to elicit more such statements from subjects. Questions should be asked after each response and/or ask subjects to suggest another statement that fits their own attitudes better. (Use probe card C.)

23. (A) Most people should decrease the amount of salt in their diets to prevent high blood pressure. (Why or why not? Key word - prevent)
A DA

24. (B) Most people should do some form of regular exercise to be healthy. (Why or why not?)
A DA

25. (C) Generally, people should drink a lot of orange juice or take vitamin C pills in winter to prevent colds.
A DA

26. (D) Hyperactive children should be placed on a special diet to improve their condition.
A DA

27. (E) High fat intake should be controlled to avoid coronary heart disease.
A DA

28. (F) People should eat a lot of fiber in their food to reduce the likelihood of intestinal cancer.
    A DA

29. (G) Certain vitamins can be taken to improve looks, increase sex drive.
    A DA

30. (H) People should avoid eating highly refined carbohydrate foods such as candy bars and cakes to have better eating habits.
    A DA

31. (I) Natural vitamins, such as vitamin C from rose hips, are better for you than those made synthetically in a laboratory.
    A DA

32. (J) People should eat a wide variety of foods to get a well-balanced diet. (What if they don't? What should they do?)
    A DA

33. (K) Generally, foods purchased in a health food store are better for you than those bought in a supermarket?
    A DA

34. (L) People who are overweight should lose weight to be healthier.
A DA

35. (M) Overweight people should eat more meat and less bread and starchy foods to lose weight.
A DA

36. (N) People, generally, should increase the amount of complex carbohydrates (starch) and decrease the amount of fat in their diets to have better eating habits.
A DA

37. (O) Teachers and other adults should serve as role models for students to learn good eating habits.
A DA

38. Do you have any particular beliefs or attitudes about nutrition and how people should eat?

39. How would you describe your usual school day eating pattern? Explain.__________
<u>Time</u> <u>Place</u> <u>Types of Foods</u>

40. Which foods or beverages to you get from school vending machines?

____

____

41. How many times per week do you usually eat the school lunch? ______________

42. If you don't eat the school lunch, what and where do you eat? ______________

____

____

43. On the average, how many meals do you eat away from home each week, excluding workday lunches? __________________

44. How would you describe your usual eating pattern on the weekend? ____________

____

____

45. a) Do you drink alcoholic beverages? Y____N____

b) How many drinks per day______________or per week?__________

46. Do you exercise or do any physical activity? Y____N____ How often?________

What?____

47. In your opinion do you have a low, average or high interest in nutrition? (If high: What do you think has caused your high level of interest?)__________

____

____

____

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Code__________

Date__________

____

Teacher Background

48. What grade or grades do you teach? 49. What subjects?

Grade

7 ______________ ______________ ______________

8 ______________ ______________ ______________

9 ______________ ______________ ______________

10 ______________ ______________ ______________

11 ______________ ______________ ______________

12 ______________ ______________ ______________

50. Which subject do you teach most? ______________________________

51. What is your highest degree? ______________________________

How many hours beyond that degree do you have? ______________________

52. How many years, including this one, have you taught? ________________

53. a) In high school, did you learn anything about nutrition in any courses such as home economics, health, physical education, chemistry or social sciences? Y_____N_____
b) In which courses? ______________________________

54. What food or nutrition topics do you recall? ______________________

____

____

____

55. In college, did you take any food or nutrition courses? Y_____N_____ What was the name of the course? ________________ level? ________________

56. In college, did you learn anything about nutrition in any courses such as home economics, health or chemistry? Y_____N_____ What food or nutrition topics do you recall? ______________________________

____

____

57. Have you had any teacher inservice training in food or nutrition that was sponsored by your school or school district? Y_____N_____
What was covered in the training? ______________________________

____

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Code__________

How much time was involved? ____

58. Have you attended any food or nutrition classes, workshops or programs or any health classes, workshops, or programs that included nutrition?
Y_____N_____
What were they? ____

____

59. Considering what you know about food and nutrition, who or what would you identify as your primary source of that information? ____________________

____

60. If you wanted to know more about food and nutrition, where would you go for the information? ____

____

61. What particular person(s) would you contact? _________________________

____

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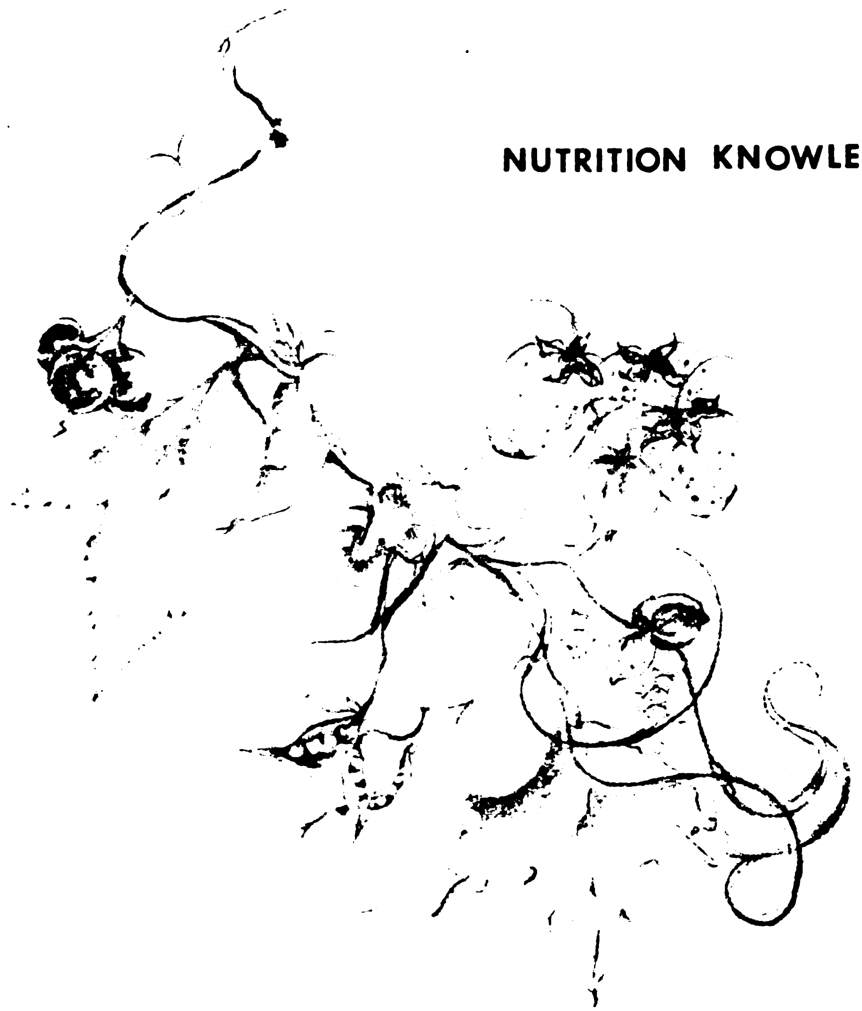
NKT



NUTRITION KNOWLEDGE TEST

Directions

This Booklet consists of True-False and Multiple Choice items. With a No. 2 pencil, blacken the circle immediately to the left of the response you choose. DO NOT USE ink, ballpoint or felt tip pens.

Items 1 - 12 are either true or false. If a statement is true, fill in the circle immediately to the left of "TRUE." If the statement is false, fill in the circle immediately to the left of "FALSE."

Items 13 - 40 are multiple choice. Choose the best answer from the alternatives provided. Fill in the circle immediately to the left of the answer you have selected.

IT IS IMPORTANT THAT YOU ANSWER ALL QUESTIONS EVEN IF YOU ARE NOT SURE OF YOUR ANSWERS.

Fill in circles completely and erase totally any answer you wish to change.

AGAIN, USE A NO. 2 LEAD PENCIL TO BLACKEN THE CIRCLE IMMEDIATELY TO THE LEFT OF THE RESPONSE YOU CHOOSE. DO NOT USE INK, BALLPOINT OR FELT-TIP PENS.

True-False

Answer the following questions by filling in the circle to the **left** of either "true" or "false."

1. All nutrients are chemicals.
   - ○ True ○ False

2. Vitamin E eaten or taken as a supplement beyond the body's requirements is stored in the body.
   - ○ True ○ False

3. An ounce of carbohydrate has more calories than an ounce of protein.
   - ○ True ○ False

4. Minerals provide the body with small amounts of calories.
   - ○ True ○ False

5. Some foods by themselves have all the nutrients in the amounts needed for adequate growth and health.
   - ○ True ○ False

6. The teenage habit of snacking can provide valuable nutrients.
   - ○ True ○ False

7. Pesticides and other pollutants are incidental food additives.
   - ○ True ○ False

8. Vitamin A is toxic when consumed in large quantities.
   - ○ True ○ False

9. As a person ages, generally, energy needs are reduced while nutrient needs remain the same.
   - ○ True ○ False

10. If a child refuses milk, an acceptable food to provide similar nutrients would be eggs.
    - ○ True ○ False

11. Nutrition labels are required on all canned goods.
    - ○ True ○ False

12. There are no known dietary cures for diseases such as diabetes and heart disease.
    - ○ True ○ False

Multiple Choice

Answer the following questions by filling in the circle to the **left** of the four answers.

13. Decreasing caloric intake by 500 calories per day would mean a loss of about one pound of body fat in
    - ○ 2 days ○ 10 days
    - ○ 7 days ○ 14 days

14. Which of the following is a vitamin?
    - ○ fluoride ○ fructose
    - ○ folacin ○ iron

15. The RDA's (Recommended Dietary Allowances) are nutrient levels
    - ○ used as guidelines for diet planning
    - ○ which insure good health for all individuals
    - ○ which represent minimum daily needs
    - ○ all of the above

SHEET NUMBER

0 1 2 3 4 5 6 7 8 9
0 1 2 3 4 5 6 7 8 9
0 1 2 3 4 5 6 7 8 9

16. Weight gain results, if at all, when calorie intake
- ◯ is from high fat foods
- ◯ is from high sugar content foods
- ◯ is more than calorie expenditure
- ◯ all of the above

17. Of the following, the best food source of both vitamin A and vitamin C is
- ◯ apple ◯ broccoli
- ◯ apricot ◯ carrot

18. Which of the following is the best food source of calcium?
- ◯ butter ◯ tomato juice
- ◯ kelp ◯ yogurt

19. The most concentrated source of calories is
- ◯ fat ◯ starch
- ◯ protein ◯ sugar

20. One of the first symptoms of vitamin A deficiency is
- ◯ anemia ◯ night blindness
- ◯ jaundice ◯ scurvy

21. The fat soluble vitamins include
- ◯ A, B_1, B_{12} and D
- ◯ A, C, D, and E
- ◯ A, D, E and K
- ◯ B_1, B_6, B_{12}, and C

22. Vitamins are
- ◯ a source of energy
- ◯ indestructable
- ◯ inorganic compounds
- ◯ organic compounds

23. Which vitamin can be made in the body when sun rays contact the skin?
- ◯ A ◯ C
- ◯ B_{12} ◯ D

24. The chief function of carbohydrate we eat is to
- ◯ maintain body fat
- ◯ provide energy
- ◯ provide essential amino acids
- ◯ transport vitamin A

25. Sodium, found in table salt and in food
- ◯ can be deactivated by chloride
- ◯ helps maintain water balance
- ◯ helps prevent scurvy
- ◯ is a non-essential nutrient

26. Enriched foods have nutrients
- ◯ added that were not originally present or not present in the quantity added
- ◯ replaced that were removed during processing
- ◯ that are chemically inferior to the natural ones present in the food
- ◯ that are chemically superior to the natural ones present in the food

27. If the cream is skimmed from milk, which nutrient will be reduced unless it is added back after processing?
- ◯ calcium ◯ vitamin B_{12}
- ◯ vitamin A ◯ vitamin C

SHEET NUMBER

0	0	0
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9

28. According to the Daily Food Guide it is recommended that children and adults have how many servings of fruit and/or vegetables per day?
   - ◯ 1
   - ◯ 3
   - ◯ 2
   - ◯ 4

29. People with hypertension may need to reduce their intake of
   - ◯ alcohol
   - ◯ sodium
   - ◯ potassium
   - ◯ sugar

30. Peanut butter belongs to which of the Daily Food Guide groups?
   - ◯ breads and cereals
   - ◯ meat
   - ◯ fruits and vegetables
   - ◯ milk and dairy products

31. Eggs belong to which of the Daily Food Guide groups?
   - ◯ breads and cereals
   - ◯ meat
   - ◯ fruits and vegetables
   - ◯ milk and dairy products

32. A child's lunch should supply how much of his nutritional needs for a day?
   - ◯ 25%
   - ◯ 45%
   - ◯ 33%
   - ◯ 50%

33. According to the Daily Food Guide, it is recommended that teenagers have how many servings from the milk group per day?
   - ◯ 2
   - ◯ 4
   - ◯ 3
   - ◯ 5

34. According to the Daily Food Guide it is recommended that children and adults have how many servings of meat or protein per day?
   - ◯ 1
   - ◯ 3
   - ◯ 2
   - ◯ 4

35. During pregnancy, most women (age 23 and above) should
   - ◯ increase their food intake by 300 calories per day
   - ◯ limit their weight gain to 15-20 pounds
   - ◯ restrict their sodium intake
   - ◯ take mega vitamin supplements

36. Which of the following food combinations would provide a complete protein?
   - ◯ beans and lentils
   - ◯ rice and beans
   - ◯ corn and wheat
   - ◯ rice and broccoli

37. Vegetarians who eat no animal products or fortified products may need to supplement their diets with
   - ◯ iron
   - ◯ vitamin A
   - ◯ magnesium
   - ◯ vitamin B_{12}

38. Labeling laws require that food product ingredients be listed on the container in descending order of their
   - ◯ calories
   - ◯ nutrients
   - ◯ cost
   - ◯ weight

39. Vitamin C found in an orange is chemically
   - ◯ identical but more nutritious than vitamin C made in a lab
   - ◯ identical to vitamin C made in a lab
   - ◯ inferior to vitamin C made in a lab
   - ◯ superior to vitamin C made in a lab

40. If a food additive is found to cause cancer in a laboratory rat, the FDA must, under the Delaney Clause of The Additive Amendment of 1958,
   - ◯ ban the use of that additive
   - ◯ establish an allowable level for food additives
   - ◯ order investigative hearings
   - ◯ order lab testing in humans

THANK YOU FOR COMPLETING THE NUTRITION KNOWLEDGE TEST

Nutrition Education and Training
Food Science and Human Nutrition
1979

Michigan State University Printing

EVALUATION OF CONCEPTS

DIRECTIONS

The attached sets of scales are used to evaluate the concepts: MY OWN NUTRITION and TEACHING NUTRITION. On each page, one concept is to be evaluated. You are to rate each concept on each of the scales below it. Please make your judgements on the basis of what these scales mean to you. Here is how you are to mark the scales.

If you feel that the concept at the top of the page is very closely related to one end of the scale, you should place your X as follows:

fair _X_:___:___:___:___:___:___ unfair

OR

fair ___:___:___:___:___:___:_X_ unfair

If the concept seems quite closely related to one or the other end of the scale (but not extremely), place your X as follows:

strong ___:_X_:___:___:___:___:___ weak

OR

strong ___:___:___:___:___:_X_:___ weak

If the concept seems only slightly related to one side as opposed to the other side (but is not really neutral) then place the X as follows:

active ___:___:_X_:___:___:___:___ passive

OR

active ___:___:___:___:_X_:___:___ passive

The direction toward which you check depends upon which of the two ends of the scale seems most characteristic of the concept you are judging.

If you consider the concept to be neutral on the scale, that is both sides of the scale are equally related to the concept or if the scale is completely irrelevant to the concept, place the X in the middle space.

safe ___:___:___:_X_:___:___:___ unsafe

IMPORTANT 1. Be sure your X is in the middle of a space, not on the boundary.

___:_X_:___:___X___:___:___
this not this

2. Be sure to put an X on each scale.
3. Put only 1 X on each scale.

KP
MSU
3/80

CODE______

MY OWN NUTRITION
(concept to be evaluated)

healthy	___:___:___:___:___:___:___	unhealthy
unimportant	___:___:___:___:___:___:___	important
bad	___:___:___:___:___:___:___	good
meaningful	___:___:___:___:___:___:___	meaningless
pleasurable	___:___:___:___:___:___:___	painful
positive	___:___:___:___:___:___:___	negative

KP
MSU
3/80

CODE_______

TEACHING NUTRITION
(concept to be evaluated)

healthy	___:___:___:___:___:___:___	unhealthy
unimportant	___:___:___:___:___:___:___	important
bad	___:___:___:___:___:___:___	good
• meaningful	___:___:___:___:___:___:___	meaningless
disreputable	___:___:___:___:___:___:___	reputable
untimely	___:___:___:___:___:___:___	timely
pleasurable	___:___:___:___:___:___:___	painful
positive	___:___:___:___:___:___:___	negative

KP
MSU
3/80

CONSENT FORM

Nutrition Education and Training
Department of Food Science and Human Nutrition
Michigan State University

I, ______________________________ the undersigned, willingly consent to participate in:

_____ a personal interview

to be used as part of a research project in Nutrition Education and Training sponsored by the Department of Food Science and Human Nutrition at Michigan State University and by the Nutrition Education and Training Program at the Michigan Department of Education.

I do so with the understanding that this will contribute to the project which has been explained to me. The project is being conducted by Karen Penner in cooperation with Michigan State University under direction of Drs. Kathryn Kolasa and Carolyn Lackey.

I am aware that I am under no obligation to stay in the project. I have been assured that my personal identity and the information about myself will remain confidential. With the above understanding, I agree that the information which I provide will be available for the investigator to use in a manuscript. I may also request a summary of the study.

I would like a copy of the project summary. _____Yes _____No

Address (if request summary):

______________________________ ______________________________
Participant

______________________________ ______________________________
Investigator

______________________________ ______________________________
Date

MICHIGAN STATE UNIVERSITY

DEPARTMENT OF FOOD SCIENCE AND HUMAN NUTRITION
HUMAN ECOLOGY BUILDING

EAST LANSING • MICHIGAN • 48824

Dear Teacher:

This is to introduce Karen Penner, a graduate student working on a research project entitled "Nutrition Knowledge, Attitudes and Practices of Secondary Teachers." The project is sponsored by the Department of Food Science and Human Nutrition at Michigan State University and by the State of Michigan Department of Education, Nutrition Education and Training Program.

Mrs. Penner would like to ask you some questions about nutrition. By answering her questions you will provide information to guide nutrition educators in the departments in program planning and implementation.

Thank you for your help on this project. Any information you share will be strictly confidential.

Sincerely,

Kathryn Kolasa, Ph.D., R.D.
Associate Professor
Dept. of Food Science and Human Nutrition
Michigan State University
East Lansing, MI 48824

(517)353-1669

Carolyn Lackey, Ph.D., R.D.
Assistant Professor
Dept. of Food Science & Human Nutrition
Michigan State University
East Lansing, MI 48824
(517)353-8658

Probe Cards:

A.

A. Classroom teacher

B. Parent volunteer

C. A special teacher hired
only to teach nutrition

D. The school dietitian or
other food service personnel

E. Other, such as___________

Probe cards:

B.

A. lack of interest by teachers'

B. lack of interest by students

C. lack of administrative support

D. lack of teacher training

E. nutrition is not in the curriculum

F. teaching nutrition wouldn't make any difference in the way students eat

B.

G. teaching nutrition is not part of the contract

H. there are too many other demands on time

I. lack of resources/teaching materials

J. other, such as ____________

Probe Cards:

WHAT DO YOU THINK?

A. MOST PEOPLE SHOULD DECREASE THE AMOUNT OF SALT IN THEIR DIETS TO PREVENT HIGH BLOOD PRESSURE.

B. MOST PEOPLE SHOULD DO SOME FORM OF REGULAR EXERCISE TO BE HEALTHY.

C. GENERALLY, PEOPLE SHOULD DRINK A LOT OF ORANGE JUICE OR TAKE VITAMIN C PILLS IN WINTER TO PREVENT COLDS.

D. HYPERACTIVE CHILDREN SHOULD BE PLACED ON A SPECIAL DIET TO IMPROVE THEIR CONDITION.

E. HIGH FAT INTAKE SHOULD BE CONTROLLED TO AVOID CORONARY HEART DISEASE.

F. PEOPLE SHOULD EAT A LOT OF FIBER IN THEIR FOOD TO REDUCE THE LIKLIHOOD OF INTESTINAL CANCER.

G. CERTAIN VITAMINS CAN BE TAKEN TO IMPROVE LOOKS, INCREASE SEX DRIVE.

H. HIGHLY REFINED CARBOHYDRATE FOODS SUCH AS CANDY BARS AND CAKES SHOULD BE AVOIDED TO HAVE BETTER EATING HABITS.

I. NATURAL VITAMINS, SUCH AS VITAMIN C FROM ROSE HIPS, ARE BETTER FOR YOU THAN THOSE MADE SYNTHETICALLY IN A LABORATORY.

J. PEOPLE SHOULD EAT A WIDE VARIETY OF FOODS TO GET A WELL-BALANCED DIET.

K. GENERALLY, FOODS PURCHASED IN A HEALTH FOOD STORE ARE BETTER FOR YOU THAN THOSE BOUGHT IN A SUPERMARKET.

L. PEOPLE WHO ARE OVERWEIGHT SHOULD LOSE WEIGHT TO BE HEALTHIER.

M. OVERWEIGHT PEOPLE SHOULD EAT MORE MEAT AND LESS BREAD AND STARCHY FOODS TO LOSE WEIGHT.

N. GENERALLY, PEOPLE SHOULD INCREASE THE AMOUNT OF COMPLEX CARBOHYDRATES (STARCH) AND DECREASE THE AMOUNT OF FAT IN THEIR DIETS TO IMPROVE THEIR EATING HABITS.

O. TEACHERS AND OTHER ADULTS SHOULD SERVE AS ROLE MODELS FOR STUDENTS TO LEARN GOOD EATING HABITS.

APPENDIX B

MAIL SURVEY PHASE INSTRUMENTS AND FORMS

TEACHER SURVEY

TEACHER SURVEY

Please mark boxes with a soft pencil. Do not use a pen.

How much do you agree or disagree with the following statements?	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
1. I should eat a wide variety of foods to get a well-balanced diet.					
2. It would be difficult to find accurate food and nutrition facts to use in my classes.					
3. Teaching about food and nutrition in the classroom has little influence on student eating behavior without support from parents.					
4. I believe diet is a major factor in maintaining health.					
5. Food and nutrition education belongs in the home instead of in the schools.					
6. Food and nutrition should be taught at all grade levels, K-12.					
7. I don't think teachers need to act as role models for students to learn good eating habits.					
8. I think food and nutrition are most appropriately taught in the elementary grades.					
9. I should read professional journals to find information about food and nutrition to teach in my classes.					
10. At a supermarket, I think I can get the same nutrition for less cost than at a health food store.					
11. I don't think I need to eat a wide variety of foods to get a well-balanced diet.					
12. I think it's difficult to get students to see the importance of food and nutrition.					
13. Teachers should acquire some accurate information and resources before teaching food and nutrition.					
14. Teachers should serve as role models for students to learn good eating habits.					
15. Students in my classes would probably be bored by discussions about food and nutrition.					
16. I think exercising would make me feel worse than not exercising.					
17. Teachers have enough to do without spending time teaching about food and nutrition.					
18. Nutrition labels should be required on most food products.					
19. I know how to teach, so I could teach food and nutrition topics if I chose.					
20. I don't think my eating behavior at school has any effect on how students eat.					
21. Teachers should include food and nutrition topics in their teaching to help students evaluate the information they get from TV.					

TEACHER SURVEY

How much do you agree or disagree with the following statements?	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
22. Teaching food and nutrition won't make a difference in the way students respond to advertising.					
23. I don't think overweight people need to lose weight to be healthier.					
24. It would be interesting to learn more about food and nutrition for use in my classes.					
25. Students would find food and nutrition topics interesting if the topics were related to their concerns.					
26. In my classes, I don't think I have time to teach food and nutrition.					
27. Teachers don't need special training to teach about food and nutrition.					
28. It would be difficult to incorporate food and nutrition instruction into my subjects.					
29. I don't think the way I eat has much influence on my health.					
30. Pinto beans in a health food store should be more nutritious than pinto beans in a supermarket.					
31. Teachers' eating behavior at school should provide positive examples for students.					
32. People who are overweight should lose weight to be healthier.					
33. I should exercise regularly to be healthy.					
34. To lose weight, I think I should eat a variety of foods but in smaller amounts.					
35. It would be difficult to find resource materials to use in preparing a lesson on food and nutrition.					
36. Food and nutrition should be integrated into a variety of subjects.					
37. My students would enjoy an interesting lesson on food and nutrition.					
38. I don't think I need to exercise if my weight is ideal.					
39. Food and nutrition should be important topics for discussion in my classroom.					
40. It would be easy to find good audiovisuals for teaching about food and nutrition.					
41. To lose weight, I should eliminate high carbohydrate foods from my diet.					
42. I wish I had more time to teach food and nutrition in my classes.					
43. Physical activity would make me feel healthier.					
44. Food and nutrition should be taught in the schools.					
45. I think teaching food and nutrition in my classes would be time well spent.					
46. Vitamins found in foods should be better for me than those made synthetically in a laboratory.					
47. It's not the job of the school to teach about food and nutrition.					
48. Food and nutrition education needs to involve parents as well as students to have an influence on student eating behavior.					

TEACHER SURVEY 1

Directions: Please mark the box by each of your answers with the pencil provided. Do not use pen.

49. For each pair of contrasting characteristics listed below, indicate the extent you think one characteristic is more descriptive of the concept "My Own Nutrition" than the other characteristic is.

MY OWN NUTRITION

	Definitely Applies	Applies Moderately	Applies Slightly	Applies Equally or Doesn't Apply	Applies Slightly	Applies Moderately	Definitely Applies	
Healthy	☐	☐	☐	☐	☐	☐	☐	Unhealthy
Unimportant	☐	☐	☐	☐	☐	☐	☐	Important
Bad	☐	☐	☐	☐	☐	☐	☐	Good
Pleasurable	☐	☐	☐	☐	☐	☐	☐	Painful
Positive	☐	☐	☐	☐	☐	☐	☐	Negative

50. For each pair of contrasting characteristics listed below, indicate the extent you think one characteristic is more descriptive of "My Teaching Food and Nutrition" than the other concept is.

MY TEACHING FOOD AND NUTRITION

	Definitely Applies	Applies Moderately	Applies Slightly	Applies Equally or Doesn't Apply	Applies Slightly	Applies Moderately	Definitely Applies	
Healthy	☐	☐	☐	☐	☐	☐	☐	Unhealthy
Unimportant	☐	☐	☐	☐	☐	☐	☐	Important
Bad	☐	☐	☐	☐	☐	☐	☐	Good
Meaningful	☐	☐	☐	☐	☐	☐	☐	Meaningless
Untimely	☐	☐	☐	☐	☐	☐	☐	Timely
Pleasurable	☐	☐	☐	☐	☐	☐	☐	Painful
Positive	☐	☐	☐	☐	☐	☐	☐	Negative

51. Consider last year. On the average how many times per week did you eat the school lunch?
MARK ONE
☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

52. Did you teach anything about food and nutrition in any of your classes last year?
MARK ONE
☐ YES ☐ NO

53. Did you teach:

	YES	NO
a. Basic food groups/balanced meals.....	☐	☐
b. Calories/weight control..............	☐	☐
c. Consumer information.................	☐	☐
d. Digestion/composition of foods.......	☐	☐
e. Fitness/ athletic training...........	☐	☐
f. Food choices.........................	☐	☐
g. Food habits/cultural differences.....	☐	☐
h. Food preparation.....................	☐	☐
i. Maternal/child nutrition.............	☐	☐
j. Nutrient function/needs/sources......	☐	☐
k. Nutrition and general health.........	☐	☐
l. Nutrition and related diseases.......	☐	☐

m. Other ______________________
(WRITE IN)

54. Subject area of greatest teaching responsibility:
MARK ONE
Health/Physical Education ☐ Natural Sciences.... ☐
Home Economics.......... ☐ Social Sciences..... ☐

TEACHER SURVEY 4

55. Grade(s) you teach:

☐ ☐ ☐ ☐ ☐ ☐ ☐

56. How many foods/nutrition courses did you have in college?
MARK ONE
☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 OR MORE

57. How many clock hours of food nutrition/content training have you had since you started teaching?

58. Years of teaching experience (excluding the current year):

59. Sex:

☐ Male ☐ Female

60. In your school, how much pressure do you feel from your colleagues to participate or to not participate in any school-related activities.
MARK ONE
☐ Low ☐ Average ☐ High

61. Are you now or were you at any time during the last year, on a diet to lose weight?
MARK ONE
☐ YES ☐ NO

62. Consider last month. On the average, how many hours per week did you participate in exercise or other physical activity?

63. In your opinion, do you have a low, average, or high interest in nutrition.

☐ Low ☐ Average ☐ High

64. Name the county you teach in: ______________________

Thank you for participating in this survey. When you have completed all the forms, please return them to us in the enclosed envelope. Mail to:

Teacher Survey
Department of Food Science & Human Nutrition
Human Ecology Building
Michigan State University
E. Lansing, MI 48824

If you would like a summary of the survey results, print your name and address here.

____
____
____

DO NOT WRITE BELOW THIS LINE

NUTRITION PERCEPTIONS

This questionnaire asks you to tell us how different (or in other words, "how far apart") certain words or concepts are from each other. Differences between these concepts can be measured in perceptual inches.

To help you know how big a perceptual inch is, think of "Dieting" and "Food Costs" as 100 perceptual inches apart.

We would like you to tell us how many perceptual inches apart the ideas listed are from each other. Remember, the more different they are from each other, the bigger the number of perceptual inches apart they are. On the following pages you will find pairs of ideas. If you think any of the pairs are more different than "Dieting" and "Food Costs" write a number bigger than 100(the number can be as large as you like). If you think that they are less different use a number smaller than 100. If you think there is no difference between the two items in the pair listed, write zero (0).

On the following pages you will find the lists of pairs such as those shown below. Please write a number in the blank after the pair which represents how different you feel the two items are. Ignore the column of numbers next to the blanks; they are for clerical use only. The two questions below are examples of the questions you will be asked.

IF "DIETING" AND "FOOD COSTS" ARE 100 PERCEPTUAL INCHES APART, HOW FAR APART ARE:

(09-17) 0102 Groceries & Shopping 10

Having written a 10 means I think these ideas are very much (but not totally) alike.

(18-26) 0203 Exercising & Drinking Water 50

Having written a 50 means I think these ideas are half as far apart as "Dieting" and "Food Costs" ($50 = \frac{1}{2} \times 100$)

If I write a 200 it means I think the ideas or concepts listed are twice as far apart as "Dieting" and "Food Costs" ($200 = 2 \times 100$)

Keep in mind that there is no one correct answer. All that we ask is that you give us honest and careful responses about how you feel. Please answer every question.

IF "DIETING AND "FOOD COSTS" ARE 100 PERCEPTUAL INCHES APART, HOW FAR APART ARE:

(Remember You Can Use <u>Any</u> Number)

1-6 Code _ _ _ _ _ _
7-8 Card 01

(09-17)	0102	Balanced Meals & Dieting	____
(18-26)	0103	Balanced Meals & Food Costs	____
(27-35)	0104	Balanced Meals & Food/Eating	____
(36-44)	0105	Balanced Meals & Food Preparation	____
(45-53)	0106	Balanced Meals & Good Health	____
(54-62)	0107	Balanced Meals & Malnutrition	____
(63-71)	0108	Balanced Meals & Maternal/ Child Food Needs	____
(72-80)	0109	Balanced Meals & Me	____

1-6 Duplicate
7-8 Card 02

(09-17)	0110	Balanced Meals & Nutrients	____
(18-26)	0111	Balanced Meals & Physical Fitness	____
(27-35)	0112	Balanced Meals & Sugar	____
(36-44)	0113	Balanced Meals & Teaching Food/Nutrition	____
(45-53)	0203	Dieting & Food Costs	____
(54-62)	0204	Dieting & Food/Eating	____
(63-71)	0205	Dieting & Food Preparation	____
(72-80)	0206	Dieting & Good Health	____

1-6 Duplicate
7-8 Card 03

(09-17)	0207	Dieting & Malnutrition	____
(18-26)	0208	Dieting & Maternal/Child Food Needs	____
(27-35)	0209	Dieting & Me	____
(36-44)	0210	Dieting & Nutrients	____
(45-53)	0211	Dieting & Physical Fitness	____
(54-62)	0212	Dieting & Sugar	____
(63-71)	0213	Dieting & Teaching Food/ Nutrition	____
(72-80)	0304	Food Costs & Food/Eating	____

1-6 Duplicate
7-8 Card 04

(09-17)	0305	Food Costs & Food Preparation	____
(18-26)	0306	Food Costs & Good Health	____
(27-35)	0307	Food Costs & Malnutrition	____
(36-44)	0308	Food Costs & Maternal/Child Food Needs	____
(45-53)	0309	Food Costs & Me	____
(54-62)	0310	Food Costs & Nutrients	____
(63-71)	0311	Food Costs & Physical Fitness	____
(72-80)	0312	Food Costs & Sugar	____

IF "DIETING" AND "FOOD COSTS" ARE 100 PERCEPTUAL INCHES APART, HOW FAR APART ARE:
(Remember You Can Use <u>Any</u> Number)

1-6 Duplicate
7-8 Card 05

(09-17)	0313	Food Costs & Teaching Food/Nutrition	_____
(18-26)	0405	Food/Eating & Food Preparation	_____
(27-35)	0406	Food/Eating & Good Health	_____
(36-44)	0407	Food/Eating & Malnutrition	_____
(45-53)	0408	Food/Eating & Maternal/Child Food Needs	_____
(54-62)	0409	Food/Eating & Me	_____
(63-71)	0410	Food/Eating & Nutrients	_____
(72-80)	0411	Food/Eating & Physical Fitness	_____

1-6 Duplicate
7-8 Card 06

(09-17)	0412	Food/Eating & Sugar	_____
(18-26)	0413	Food/Eating & Teaching Food/Nutrition	_____
(27-35)	0506	Food Preparation & Good Health	_____
(36-44)	0507	Food Preparation & Malnutrition	_____
(45-53)	0508	Food Preparation & Maternal/Child Food Needs	_____
(54-62)	0509	Food Preparation & Me	_____
(63-71)	0510	Food Preparation & Nutrients	_____
(72-80)	0511	Food Preparation & Physical Fitness	_____

1-6 Duplicate
7-8 Card 07

(09-17)	0512	Food Preparation & Sugar	_____
(18-26)	0513	Food Preparation & Teaching Food/Nutrition	_____
(27-35)	0607	Good Health & Malnutrition	_____
(36-44)	0608	Good Health & Maternal/Child Food Needs	_____
(45-53)	0609	Good Health & Me	_____
(54-62)	0610	Good Health & Nutrients	_____
(63-71)	0611	Good Health & Physical Fitness	_____
(72-80)	0612	Good Health & Sugar	_____

1-6 Duplicate
7-8 Card 08

(09-17)	0613	Good Health & Teaching Food/Nutrition	_____
(18-26)	0708	Malnutrition & Maternal/Child Food Needs	_____
(27-35)	0709	Malnutrition & Me	_____
(36-44)	0710	Malnutrition & Nutrients	_____
(45-53)	0711	Malnutrition & Physical Fitness	_____
(54-62)	0712	Malnutrition & Sugar	_____
(63-71)	0713	Malnutrition & Teaching Food/Nutrition	_____
(72-80)	0809	Maternal/Child Food Needs & Me	

IF "DIETING" AND "FOOD COSTS" ARE 100 PERCEPTUAL INCHES APART, HOW FAR APART ARE:
(Remember You Can Use Any Number)

1-6 Duplicate
7-8 Card 09

(09-17) 0810	Maternal/Child Food Needs & Nutrients	____
(18-26) 0811	Maternal/Child Food Needs & Physical Fitness	____
(27-35) 0812	Maternal/Child Food Needs & Sugar	____
(36-44) 0813	Maternal/Child Food Needs & Teaching Food/Nutrition	____
(45-53) 0910	Me & Nutrients	____
(54-62) 0911	Me & Physical Fitness	____
(63-71) 0912	Me & Sugar	____
(72-80) 0913	Me & Teaching Food/Nutrition	____

1-6 Duplicate
7-8 Card 10

(09-17) 1011	Nutrients & Physical Fitness	____
(18-26) 1012	Nutrients & Sugar	____
(27-35) 1013	Nutrients & Teaching Food/Nutrition	____
(36-44) 1112	Physical Fitness & Sugar	____
(45-53) 1113	Physical Fitness & Teaching Food/Nutrition	____
(54-62) 1213	Sugar & Teaching Food/Nutrition	____

THANK YOU FOR COMPLETING THIS FORM

MICHIGAN STATE UNIVERSITY

DEPARTMENT OF FOOD SCIENCE AND HUMAN NUTRITION EAST LANSING • MICHIGAN • 48824

Dear

As a teacher you have an interest in the well-being of your students, and either directly or indirectly, in their eating habits. You, as well as other teachers of health, home economics, science and social sciences, have been selected randomly to participate in a questionnaire study of nutrition knowledge, attitudes and practices of Michigan teachers.

The project is funded by the Department of Food Science and Human Nutrition at Michigan State University and by the State of Michigan Department of Education, Nutrition Education and Training Program (NET). The information you provide will be useful to the two departments in planning future directions and programs for nutrition education.

Please answer the questions using the enclosed pencil and return them in the stamped envelope provided, within 5 days. Your prompt response will be appreciated.

If you have any questions regarding this study, please call Kathryn Kolasa (517-353-1669), Carolyn Lackey (517-353-8658) or Karen Penner (517-355-2369), collect.

Thank you for helping us this way.

Sincerely,

Kathryn Kolasa

Kathryn Kolasa, Ph.D., R.D.
Associate Professor
Food Science and
Human Nutrition
Community Health Sciences
Michigan State University
East Lansing, MI 48824

Carolyn J. Lackey

Carolyn Lackey, Ph.D., R.D.
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Extension Specialist
Food Science and
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Michigan State University
East Lansing, MI 48824

Karen P. Penner, M.S., R.D.
Graduate Assistant
Food Science and
Human Nutrition
Michigan State University
East Lansing, MI 48824

APPENDIX C

LIKERT ATTITUDE STATEMENT DEVELOPMENT FOR MAIL SURVEY

Criteria for Selecting/Writing

Statements for Constructing on Attitude Scale

1. Avoid statements that refer to the past rather than to the present.[b]
2. Avoid statements that are factual or capable of being interpreted as factual.[ab]
3. Avoid statements that may be interpreted in more than one way.[b]
4. Avoid statements that are irrelevant to the psychological object under consideration.[b]
5. Avoid statements that are likely to be endorsed by almost everyone or by almost no one.[ab]
6. Select statements that are believed to cover the entire range of the affective scale of interest.[b]
7. Keep the language of the statements simple, clear, and direct.[ab]
8. Statements should be short, rarely exceeding 20 words.[b]
9. Each statement should contain only one complete thought.[b]
10. Statements containing universals such as <u>all</u>, <u>always</u>, <u>none</u>, and <u>never</u> often introduce ambiguity and should be avoided.[b]
11. Words such as <u>only</u>, <u>just</u>, <u>merely</u>, and others of a similar nature should be used with care and moderation in writing statements.[b]
12. Whenever possible, statements should be in the form of simple sentences rather than in the form of compound or complex sentences.[b]
13. Avoid the use of words that may not be understood by those who are to be given the completed scale.[b]
14. Avoid the use of double negatives.[ab]
15. To avoid space error or tendency to response set, different statements should be worded so about half of the desirable responses are strongly agree, half strongly disagree. Items should be distributed in a chance manner throughout the final instrument.[a]

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[a] from R. Likert, A technique for measurement of attitudes, <u>Arch Psych</u>, No. 140, 1932

[b] from A. Edwards, <u>Techniques of Attitude Scale Construction</u> NY:Appleton-Century-Crofts, Inc., 1957, pp. 13-14.

Specifications for Teaching Nutrition and Personal Nutrition Scales

Two Sets of Scales

Two sets of scales will be developed to assess teachers' attitudes toward teaching nutrition and toward their personal nutrition. The scales will be developed following procedures described by Likert (1) and Edwards (2). The scales, mailed to teachers in the fall (1980) will contain approximately 52 items (32 and 20 respectively) and "pretest" data will be obtained with which to reduce the number of items in the final scales.

Teaching Nutrition

One set of scales will focus on attitude twoard teaching nutrition . Eight categories have been identified from the NET attitude/behavior test development work in 1978-79, from teacher interview data obtained by Penner and from the work reported by O'Connell, et al., 1979.

The categories identified are listed below with item sources and identifying letters listed. The table also indicates whether a strongly agree or a strongly disagree response is most desirable.

Category	Source	Response Desired: Strongly Agree	Response Desired: Strongly Disagree
1. Time	(Q21,[a] Q22,NET[b])	ab	cd
2. Resources	(Q21, Q22,NET)	ef	gh
3. Responsibility	(Q 7, NET, O'C)	i,j,k,l	m,n
4. Student Interest	(Q20,Q21,Q22,Q7,NET)	o,p	q,.r,s
5. Subject grade where appropriate	(Q7,Q10-Q12,NET)	t,u,v,w,z,y/x,aa	
6. Teacher Preparation	(Q21,Q22,Q10,NET)	bb,cc,dd,ee,ff	

Category	Source	Response Desired Strongly Agree	Strongly Disagree
7. Effectiveness	(Q7,Q20,NET)	gg,hh	ii,jj
8. Role Model	(Q37, NET)	kk,ll	mm,nn

[a]items based on statements and responses by teachers in interviews, Spring, 1980.

[b]items based on 1978-1979 MSU NET work

[c]items based on O'Connell et al., 1979

Four items per category will be used for the pretest, two with strongly agree and two with strongly disagree as the desired response.

Personal Nutrition

A second set of scales will contain items reflecting attitudes toward personal nutrition. Categories selected were based on MSU NET-study 1978-79 (eating habits, general health, lifestyle, health habits, shopping, consumer interest, interest in food/cooking). In addition, interviews supported the idea that teachers are interested in nutrition because of personal/health and fitness (67%) including weight control.

The table below lists item categories, sources and desired response.

Category	Source	Items for Responses Desired Strongly Agree	Strongly Disagree
1 Weight Control	(Q34[a], Q35)	a,b	c,d,
2.Fitness/Exercise	(Q24,NET[b])	e,f,g,h	i,j
3.Health	(Q25, Q27,NET, O'C)[c]	k,l,m,n	o,p

Category	Source	Items for Response Desired: Strongly Agree	Strongly Disagree
4. Eating Habits	(Q30,Q32,Q36)	q,r,s	t,u
5. Shopping/Consumer Interest	(Q30,Q32,Q36)	v,w,x	y,z

[a]items based on statements and responses by teachers in interviews, Spring 1980

[b]items based on 1978-79 MSU Net work

[c]items based on O'Connell et al., 1979.

Item Criteria

Items will be selected (written) based on criteria outlined by Likert and by Edwards (See criteria list attached).

Sample

Twelve hundred teachers of science, social science, home economics and health/physical education will be sent questionnaires and attitude scales in September 1980. The teacher names were drawn randomly from an alphabetical microfiche listing of teachers who taught in the 1979-80 school year in Michigan.

Validity

Construct validity will be assumed when final scale items are selected based on factor loadings. That is, we will assume the items all measure the same underlying factor or construct. Instrument validity is not something that can be determined readily.

Reliability

Reliability will be estimated by calculating coefficient alpha, using SPSS subprogram Reliability. A reliability coefficient of at least .80 will be sought.

Item Review

Before pretest form is compiled, all items listed in the two tables will be reviewed by three Nutrition graduate students, BethAnn Pruitt, Barb Mutch and Janet Kiley, who have worked previously with NET attitude and knowledge items; and by two faculty, Kathryn Kolasa and Carolyn Lackey, Chr. and member of the researcher's dissertation committee.

Items will be rated against Likert's and Edward's criteria and for appropriateness of statements to the categories selected to comprise the two sets of scales.

Pretest/Final Scale Selection

The pretest can be handled by analyzing half the responses and then selecting final scales from that group. Then, the second half can be analyzed using only the selected items. This will depend somewhat on total number of questionnaires returned. Ideally, there should be at least 10 respondents per item, i.e., if 40 items are pretested, 400 responses should be analyzed initially, using all 40 items. Statements will be printed on precoded mark sense computer cards and analyzed using the SPSS reliability program and factor analysis. Those items with highest interitem correlations and factor loadings will be noted for possible inclusion in final scales.

SOURCE OF SUPPORTING DATA FOR LIKERT STATEMENTS: TEACHING NUTRITION

1. Time Strongly Agree (SA)[1]

a. I think teaching about nutrition in my classes would be time well spent.

b. I wish I had time to teach more about nutrition in my classes.

39% said time would keep more nutrition from being taught in schools - Q 21

35% said it would keep them from doing more - Q 22

Time - SD[1]

c. I already have too many other topics to cover to include nutrition, too.

d. Teachers have enough to do without having to teach about health and eating habits - NET[3]

Discrimination	Difficulty	Test Form	Subjects
61	64	ABC	Teachers
38	64	D	Total Sample

2. Resources - SA

e. I read professional journals looking specifically for new ways to teach the basics - NET

Discrimination	Difficulty	Test Form	Subjects
31	35	ABC	Teacher Total not Available

f. I think it would be easy to get ahold of good audio-visuals to use in teaching about food or nutrition.

35% said lack of resources/materials would keep more from being done in schools Q 21

52% said it would keep them from doing more Q22

Resources - SD

g. I think it would be difficult to find resource materials to use in preparing a lesson on nutrition.

h. I think it would be hard to find reliable nutrition background information.

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[1]SA means strongly agree response is desired. SD means strongly disagree response is desired.

[2]Q refers to question number on interview schedule

[3]NET refers to data from attitude items during the 1978-79 MSU project.

3. <u>Responsibility - SA[1]</u>

i) Nutrition should be taught in the schools. 63% said this Q[2] 7

j) Parents don't teach nutrition at home so schools should 18% Q 7

k) Nutrition should be taught often, in a variety of ways. 12% Q 7

l) Nutrition is an important topic for discussion in my classroom. NET[3]

Discrimination	Difficulty	Test Form	Subjects
48	46	ABC	Teachers
66	41	D	Total Sample

<u>Responsibility - SD[1]</u>

m) It's not the job of the school to teach nutrition. O'Connell et al., 1979 - factor loading for her scale - .40.

n) I think nutrition education belongs in the home. KP[4] - written as an opposite to idea that nutrition education belongs in schools.

4. <u>Student Interest - SA</u>

o) If I could present in an interesting way, students would enjoy it Q 20 10%.

p) Students would find nutrition interesting if it were applicable to their present concerns, Q 20 - 10%

<u>Student Interest - SD</u>

q) I think it's hard to get students to see the importance of nutrition. 12% Q 7

r) Students in my classes would probably be bored by nutrition KP

s) I think students are turned off by the basic four food groups. NET. From pretest - not tested again.

Discrimination	Difficulty
22	99

5. <u>Subject/grade where appropriate - SA</u>

t) Nutrition should be taught at all grade levels, K-12 19% Q7

u) Nutrition should be integrated into a variety of subjects 12% Q11 20% Q 12

v) Nutrition should be a good team teaching subject Q 10 3%

w) Nutrition should be taught in many classes to reach all students 20% Q 12

x) I think information about nutrition can be integrated into mathematics, social studies and geography classes. NET Test Form D total sample.

Discrimination	Difficulty
48	53

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[1]SA means strongly agree response is desired. SD means strongly disagree response is desired.

[2]Q refers to question number on interview schedule

[3]NET refers to data from attitude items during the 1978-79 MSU project

[4]KP refers to the investigator

Subject/Grade - SD[1]

y) I think it would be difficult to incorporate nutrition into my classes. KP[4] - written as opposite to positive aspect of integrating nutrition classes.

z) I think nutrition education is most appropriate in the elementary grades. Q 7 should start early 9%.

aa) I think teaching about food or nutrition belongs in home economics classes - KP

6. Teacher Preparation - SA[1]

bb) Teachers should have some subject matter training before trying to teach nutrition. Q 21 42% said lack of teacher training would keep more nutrition from being taught.
Q 22 - 29% said it would keep them
Q 10 - teachers who teach nutrition should be knowledgeable

cc) I think it would be interesting to learn more about nutrition so I could use it in my classes. KP-[4] written to express willingness of getting info/ training about nutrition.

dd) Teachers need a preservice course in nutrition NET[3]

Discrimination	Difficulty	Test Form	Subjects
52	61	ABC	Teachers
57	53	D	Total Sample

Teacher Prep - SD

ee) I know how to teach so I should be able to teach about nutrition if I chose to. 3% Q 10 (teachers don't know nutrition but know how to teach)

ff) I don't think teachers need special training to teach about food and eating habits.

7. Effectiveness - SA

gg) Nutrition education needs to involve parents as well as students to be effective. Q 7 20%

hh) Teachers should include nutrition in their teaching to help counteract the negative information students get from TV - NET

Discrimination	Difficulty	Test Form	Subjects
48	53	ABC	Teachers
42	63	D	Total Sample
28	75	D	MEA Teachers
13	72	D	DMC Teachers

Effectiveness - SD[1]

ii) I think it would be difficult to overcome the effects of advertising by teaching about nutrition in my classes. Q[2] 20-10% Q 7 - 3%

jj) I think there's little reason to teach about nutrition when students aren't fed properly at home.

Role Modeling

kk) Eating behavior of adults should provide positive examples for students to follow. NET[3]

Discrimination	Difficulty	Test Form	Subjects
48	68	ABC	Teachers
52	38	D	Total Sample
50	45	D	MEA Teachers
62	66	D	DCM Teachers

ll) Teachers and other adults should serve as role models for students to learn good eating habits. Q 37 (90.6% agreed. 6.3% disagreed; 3.1% didn't know).

Role Modeling

mm) KP[4]- I don't think my eating behavior would have any effect on how students eat.

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[1]SA means strongly agree response is desired. SD means strongly disagree response is desired.

[2]Q refers to question number on interview schedule

[3]NET refers to data from attitude items during the 1978-79 MSU project

[4]KP refers to the investigator

[5]MEA refers to teachers belonging to the Michigan Education Association, DCM refers to teachers on a mailing list of the Dairy Council of Michigan.

GENERAL PERSONAL NUTRITION

1. Wt. control - SA[1]

   a. People who are very overweight should lose weight to be healthier. Q 34 78.1% agreed 21.9% disagreed

   b. To lose weight, I should eat a variety of foods in moderation. Q 35 response

   c. To lose weight, I should cut out high carbohydrate foods from my diet. KP[4] written as a disagree response.

   d. I don't think overweight people in general need to lose weight to be healthy. Q 34.

2. Fitness/Exercise SA[1]

   e. I should exercise regularly to be healthy. Q 24 93.8% agreed. 6.3% disagreed.

   f. I think exercise is necessary to help me fit. NET [3]

Discrimination	Difficulty	Test Form	Subjects
44	41	ABC	Students
40	38	D	Teachers/SNE[5]
29	42	D	MEA[5] teachers
38	38	D	DCM[5] teachers

   g. I think exercise would be benefical to my heart. Q24

   h. I think I would enjoy some form of regular physical activity.

   i. I don't think I need to exercise if my weight is ideal. KP-idea for response to Q 24 - If I don't exercise, I may be out of shape but not unhealthy.

   j. I think exercising would make me feel worse than not exercising. (Very few disagreed with Q 24 - positive response: i.e. from my experience, you don't tire as easily).

3. General Health - SA

   k. I believe diet is a major controlling factor when it comes to maintaining health and controlling disease O'Connell, et al., 1979

   l. I think the best way to prevent colds is to dress sensibly and eat right Q 25

   m. People's eating habits in general need to be changed for better health.

Discrimination	Difficulty	Test Form	Subjects
52	49	ABC	Students
19	61	D	Teachers/SNE
18	63	D	MEA Teachers
25	56	D	DCM Teachers

n. I should control my intake of fat to decrease the risk of heart disease Q[2] 27. High fat should be controlled to avoid CHD. Agree - 87.5% disagree -6.3% Didn't Know -6.3%

General Health - SD[1]

o. I don't think I need to be concerned about the amount of fat I eat unless my doctor advises me otherwise Q 27

p. I should have a lot of vitamin C in winter to prevent colds Q 25 40%- agreed 43.8- disagreed - 15.6- didn't know.

Eating Habits - SA[1]

q. I should avoid foods with high sugar content to improve my eating habits. Q 30 59.4% agreed; 40.6% disagreed.

r. I should eat a wide variety of foods to get a well-balanced diet. Q 32 75% agreed; 18.8% disagreed

s. I should eat less fat to improve my eating habits. Q 36 43.8% agreed. 40.6% disagreed; 15.6% didn't know

Eating Habits - SD

t. I should'nt have to eat a wide variety of foods if I get all I need from a few foods Q 32

u. I think it would be better for me to eay honey instead of sugar Q 30

Shopping/Consumer - SA

v. I think I can get the same nutrition for less cost when buying food from a supermarket. Q 33 27% agreed and 16% said supermarket food is juiced up with additives.

w. Nutrition labels should be required on all food products. NET[3]

Discrimination	Difficulty	Test Form	Subjects
46	23	ABC	Teachers
6	43	D	Total Sample
37	29	D	MEA[5]
25	28	D	DCM[5]

Shopping/Consumer - SD

x. Health food store products are more nutritious than the same type of food found in a grocery store NET, Q 33

y. Foods that are in a more natural state are better for you than foods that are more processed. Q 33

z. Naturally occurring vitamins found in foods are better for you than those made synthetically in a laboratory Q 31 34.4% agreed, 56.3% disagreed, 9.4% didn't know

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[1]SA means strongly agree response is desired. SA means strongly disagree response is desired.

[2]Q refers to question number on interview schedule

[3]NET refers to data from attitude items during the 1978-79 MSU project

[4]KP refers to the investigator

[5]MEA refers to teachers belonging to the Michigan Education Association,DCM refers to teachers on a mailing list of the Dairy Council of Michigan

8/19/80

Likert Attitude

Reviewer____________________

Please read the following Likert-type attitude items and the attached specifications. Rate the items 1-5; 5 = fits criteria very well, very appropriate to category, 1 = fits criteria very poorly, very inappropriate to category.

In the spaces below items, write comments, rewordings, etc. Indicate if you find the statement confusing, ambiguous or hard to understand. Also, if you do not agree that the desired response is the one written in parentheses (SA = strongly agree, SD = strongly disagree) please indicate. Thanks for your help.

Attitude Items to Evaluate Related to Teaching Nutrition	Fits Criteria (see Criteria 1-15)	Appropriateness to Category (see Table attached)
a) I think teaching about nutrition in my classes would be time well spent. (SA)		
b) I wish I had time to teach more about nutrition in my classes (SA)		
c) I already have too many other topics to cover to include nutrition, too. (SD)		
d) Teachers have enough to do without having to teach about health and eating habits. (SD)		

	Fits Criteria (see Criteria 1-15)	Appropriateness to Category (see Table attached)
e) I should read professional journals to look for new ways to teach. (SA)		
f) I think it would be easy to get a hold of good audiovisuals for teaching about food or nutrition. (SA)		
g) I think it would be difficult to find resource materials to use in preparing a lesson on nutrition. (SD)		
h. I think it would be hard to find reliable nutrition background information. (SD)		
i. I think nutrition should be taught in the schools. (SA)		
j. Parents don't teach nutrition at home so schools should. (SA)		

	Fits Criteria (see Criteria 1-15)	Appropriateness to Category (see Table attached)
k) I think nutrition should be taught often, in a variety of ways. (SA)		
l) Nutrition should be an important topic for discussion in my classroom (SA)		
m. I don't think its the job of the school to teach nutrition. (SD)		
n. I think nutrition education belongs in the home. (SD)		
o. If I could present nutrition in an interesting way, students would enjoy it.(SA)		
p. Students would find nutrition interesting if it were applicable to the" present concerns. (SA)		
q. I think it's hard to get students to see the importance of nutrition. (SD)		

	Fits Criteria (see Criteria 1-15)	Appropriateness to Category (see Table attached)
r) Students in my classes would probably be bored by nutrition. (SD)		
s) I think students are turned off by the basic four food groups. (SD)		
t) Nutrition should be taught at all grade levels, K-12. (SA)		
u) Nutrition should be integrated into a variety of subjects. (SA)		
v) Nutrition should be a good team teaching subject. (SA)		
w) Nutrition should be taught in many classes to reach all students. (SA)		
x) I think information about nutrition can be integrated into mathematics, social studies, and geography classes. (SA)		

	Fits Criteria (see Criteria 1-15)	Appropriateness to Category (see Table attachment)
y) I think it would be difficult to incorporate nutrition into my classes. (SD)		
z) I think nutrition education is most appropriate in the elementary grades. (SD)		
aa) I think teaching about food or nutrition belongs in home economics classes. (SD)		
bb) Teachers should have some subject matter training before trying to teach nutrition. (SA)		
cc) I think it would be interesting to learn more about nutrition so I could use it in my classes. (SA)		
dd) Teachers need a preservice course in nutrition. (SA)		

	Fits Criteria (see Criteria 1-15)	Appropriateness to Category (see Table attachment)
ee) I know how to teach so I should be able to teach about nutrition if I chose. (SD)		
ff) I don't think teachers need special training to teach about food and eating habits. (SD)		
gg) Nutrition education needs to involve parents as well as students to be effective (SA)		
hh) Teachers should include nutrition topics in their teaching to help counteract the negative information students get from TV.(SA)		
ii) I think it would be difficult to overcome the negative effects of advertising by teaching about nutrition in my classes. (SD)		

	Fits Criteria (see Criteria 1-15)	Appropriateness to Category (see Table attachment)
jj) I think there's little reason to teach about nutrition when students aren't fed properly at home. (SD)		
kk) Eating behavior of adults should provide positive examples for students to follow. (SA)		
ll) Teachers and other adults should serve as role models for students to learn good eating habits. (SA)		
mm) I don't think my eating behavior would have any effect on how students eat.(SD)		
nn) I think students should follow their own wishes in choosing what they eat. (SD)		

Attitude Items Related to <u>Personal Nutrition</u>	Fits Criteria (See Criteria 1-15)	Appropriateness to Category (see Table attachment)
a) People who are overweight should lose weight to be healthier. (SA)		
b) To lose weight, I should eat a variety of foods in moderation. (SA)		
c) If I want to lose weight, I should cut out high carbohydrate foods from my diet. (SD)		
d) I don't think overweight people need to lose weight to be healthier. (SD)		
e) I should exercise regularly to be healthy. (SA)		
f) I think exercise is necessary to keep me fit. (SA)		
g) I think exercise would be beneficial to my heart. (SA)		

	Fit Criteria (see Criteria 1-15)	Appropriateness to Category (see Table attachment)
h) I think I would enjoy some form of regular physical activity. (SA)		
i) I don't think I need to exercise if my weight is ideal. (SD)		
j) I think exercising would make me feel worse than not exercising. (SD)		
k) I believe diet is a major controlling factor when it comes to maintaining health and controlling disease. (SA)		
l) I think the best way to prevent colds is to dress sensibly and eat right.(SA)		
m) Peoples eating habits in general need to be changed for better health. (SA)		
n) I should control my intake of fat to decrease the risk of heart disease. (SA)		

	Fit Criteria (see Criteria 1-15)	Appropriateness to Category (see Table attachment)
o) I don't think I need to be concerned about the amount of fat I eat unless my doctor advises me otherwise. (SD)		
p) I should have a lot of vitamin C in winter to prevent colds. (SD)		
q) I should avoid foods with high sugar content to improve my eating habits. (SA)		
r) I should eat a wide variety of foods to get a well-balanced diet. (SA)		
s) I should eat less fat to improve my eating habits. (SA)		
t) I shouldn't have to eat a wide variety of foods if I get all the nutrients I need from a few foods. (SD)		

	Fits Criteria (see Criteria 1-15)	Appropiateness to Category (see Table attachment)
u) I think it would be better for me to eat honey instead of sugar.(SD)		
v) I think I can get the same nutrition for less cost when buying food from a supermarket instead of a health food store. (SA)		
w) I think nutrition labels should be required on most food products. (SA)		
x) Health food store products are more nutritious than the same type of food found in a grocery store. (SD)		
y) Foods that are in a more natural state are better for me than foods that are more processed. (SA)		
z) Naturally occurring vitamins found in foods are better for me than those made synthetically in a laboratory. (SD)		

LIKERT STATEMENTS AFTER FIRST REVIEW

Likert Items - rewritten from suggestions and evaluations of Kolasa, Lackey, Mutch, Kiley and Pruitt.

ATTITUDE ITEMS RELATED TO TEACHING NUTRITION

Category		
Time	a.	I think teaching nutrition in my classes would be time well spent. (SA)
	b.	I wish I had more time to teach nutrition in my classes. (SA)
	c.	In my classes, I don't think I have time to teach nutrition. (SD)
	d.	Teachers have enough to do without spending time teaching about nutrition. (SD)
Resources	e.	I should read professional journals to look for food and nutrition information to teach in my classes. (SA)
	f.	I think it is easy to get good audiovisuals for teaching about food and nutrition. (SA)
	g.	I think it would be difficult to find resource materials to use in preparing a lesson on world food problems. (SD)
	h.	I think it would be difficult to find accurate nutrition facts to use in my classes. (SD)
Responsibility	i.	I think nutrition should be taught in the schools. (SA)
	1.	Nutrition should be an important topic for discussion in my classroom. (SA)

Responsibility (continued)	m.	I don't think it's the job of the school to teach nutrition. (SD)
	n.	I think nutrition education belongs in the home instead of the schools. (SD)
Student Interest	o.	I think my students would enjoy an interesting lesson on food or nutrition. (SA)
	p.	Students would find nutrition interesting if it were related to dieting or to athletic performance. (SA)
	q.	I think it's difficult to get students to see the importance of nutrition. (SD)
	r.	Students in my classes would probably be bored by nutrition. (SD)
Subject/ Grade	t.	Nutrition should be taught at all grade levels, K-12. (SA)
	u.	Nutrition should be integrated into a variety of subjects. (SA)
	y.	I think it would be difficult to incorporate nutrition into my classes. (SD)
	z.	I think nutrition education is most appropriate in the elementary grades. (SD)
Teacher Preparation	bb.	Teachers should acquire some accurate nutrition information and resources before trying to teach nutrition. (SA)

Teacher Preparation (continued)

cc. I think it would be interesting to learn more about food or nutrition for us in my classes. (SA)

ee. I know how to teach so I could teach about nutrition if I chose. (SD)

ff. I don't think teachers need special training to teach about food or nutrition. (SD)

Effectiveness

gg. Nutrition education should involve parents to have effect on students outside the school. (S-)

hh. Teachers should include nutrition topics in their teaching to help students evaluate the information they get from TV. (SA)

ii. I think it would be difficult to overcome the effects of advertising by teaching nutrition in my classes. (SD)

jj. I think teaching nutrition in the classroom has little effect without support from parents. (SD)

Role Model

kk. Eating behavior of teachers at school should provide positive examples for students to follow. (SA)

ll. Teachers should serve as role models for students to learn good eating habits. (SA)

mm. I don't think my eating behavior at school has any effect on how students eat. (SD)

nn. I don't think students need teachers to show them what to eat. (SD)

<u>Likert items</u> revised after review by Kolasa, Lackey, Mutch, Pruitt, Kiley

ATTITUDE ITEMS RELATED TO PERSONAL NUTRITION

<u>Category</u>

Weight Control

a. People who are overweight should lose weight to be healthier. (SA)

b. To lose weight, I think I should eat a variety of foods in smaller amounts. (SA)

c. To lose weight, I should eliminate high carbohydrate foods from my diet. (SD)

d. I don't think overweight people need to lose weight to be healthier. (SD)

e. I think I should exercise regularly to be healthy. (SA)

h. I think physical activity would make me feel good. (SA)

i. I don't think I need to exercise if my weight is ideal. (SD)

j. I think exercising would make me feel worse than not exercising. (SD)

HEALTH & HEALTH-Related Eating Habits

k. I believe diet is a major factor when it comes to maintaining health. (SA)

r. I should eat a wide variety of foods to get a well-balanced diet. (SA) aa. I don't think the way I eat has much influence on my health.

t. I don't think I need to eat a wide variety of foods to get a well-balanced diet. (SD)

Shopping/ Consumer Interest

v. At a supermarket, I think I can get the same nutrition for less cost than at a health food store. (SA)

w. Nutrition labels should be required on most food products. (SA)

x. Health food store products should be more nutritious than the same products found in a grocery store. (SD)

z. Naturally occurring vitamins found in foods should be better for me than those made synthetically in a laboratory. (SD)

LIKERT STATEMENTS AFTER SECOND REVIEW

Likert items - rewritten from suggestions and discussion with Kolasa

ATTITUDE ITEMS RELATED TO TEACHING FOOD AND NUTRITION

Category

Time

a. I think teaching food and nutrition in my classes would be time well spent. (SA)

b. I wish I had more time to teach food and nutrition in my classes. (SA)

c. In my classes, I don't think I have time to teach food and nutrition.(SD)

d. Teachers have enough to do without spending time teaching about food and nutrition. (SD)

Resources

e. I should read professional journals to find information about food and nutrition to teach in my classes. (SA)

f. It would be easy to find good audiovisuals for teaching about food and nutrition. (SA)

g. It would be difficult to find resource materials to use in preparing a lesson on food and nutrition. (SD)

h. It would be difficult to find accurate food and nutrition facts to use in my classes. (SD)

Responsibility

i. Food and nutrition should be taught in the schools. (SA)

1. Food and nutrition should be important topics for discussion in my classroom. (SA)

m. It's not the job of the school to teach about food and nutrition. (SD)

n. Food and nutrition education belongs in the home instead of in the schools. (SD)

Student Interest

o. My students would enjoy an interesting lesson on food or nutrition. (SA)

p. Students would find food and nutrition topics interesting if the topics were related to student interests. (SA)

q. I think it's difficult to get students to see the importance of food and nutrition. (SD)

r. Students in my classes would probably be bored by discussions about food and nutrition. (SD)

Subj/Grade

t. Food and nutrition should be taught at all grade levels, K-12. (SA)

u. Food and nutrition should be integrated into a variety of subjects. (SA)

y. It would be difficult to incorporate food and nutrition instruction into my subject(s). (SD)

z. I think food and nutrition in most appropriately taught in the elementary grades. (SD).

Teacher Preparation

bb. Teachers should acquire some accurate food and nutrition information and resources before trying to teach those topics. (SA)

OR

Teachers should acquire some accurate information and resources before trying to teach food and nutrition. (SA) cc. It would be interesting to learn more about food or nutrition for use in my classes. (SA)

ee. I know how to teach so I could teach about food and nutrition if I chose. (SD)

ff. Teachers don't need special training to teach about food and nutrition. (SD)

Influence of Teaching on Student Behavior	gg.	Food and nutrition education n eeds to involve parents as well as students to have an influence on student eating behavior. (SA)
	hh.	Teachers should include food and nutrition topics in their teaching to help students evaluate the information they get from TV. (SA)
	ii.	Teaching food and nutrition won't make a difference in the way students respond to advertising. (SD)
	jj.	Teaching about food and nutrition in the classroom has little influence on student eating behavior without support from parents. (SD)
Role Model	kk.	Teachers eating behavior at school should provide positive examples for students. (SA)
	ll.	Teachers should serve as role models for students to learn good eating habits. (SA)
	mm.	I don't think my eating behavior at school has any effect on how students eat. (SD)
	nn.	I don't think students need teachers to act as role models for them to learn good eating habits(SD).

ATTITUDE ITEMS RELATED TO PERSONAL NUTRITION

category	
Weight control	a. People who are overweight should lose weight to be healthier. (SA)
	b. To lose weight, I think I should eat a variety of foods but in smaller amounts. (SA)
	c. To lose weight, I should eliminate high carbohydrate foods from my diet. (SD)
	d. I don't think overweight people need to lose weight to be healthier. (SD)
Exercise/ Fitness	e. I should exercise regularly to be healthy. (SA)
	h. Physical activity would make me feel healthier. (SA)
	i. I don't think I need to exercise if my weight is ideal. (SD)
	j. I think exercising would make me feel worse than not exercising. (SD)
Health and health-related eating habits.	k. I believe diet is a major factor in maintaining health. (SA)
	r. I should eat a wide variety of foods to get a well-balanced diet. (SA)

aa. I don't think the way I eat has much influence on my health. (SD)

t. I don't think I need to eat a wide variety of foods to get a well-balanced diet. (SD)

Shopping/ consumer interest

v. At a supermarket, I think I can get the same nutritious food for less cost than at a health food store. (SA)

w. Nutrition labels should be required on most food products. (SA)

x. Tomatoes in a health food store should be more nutritious than tomatoes in a supermarket. (SD)

z. Naturally occurring vitamins found in foods should be better for me than those made synthetically in a laboratory. (SD).

LIKERT ATTITUDE STATEMENTS USED ON

TEACHER SURVEY - TEACHING NUTRITION SCALE

1. It would be difficult to find accurate food and nutrition facts to use in my classes.
2. Teaching about food and nutrition in the classroom has little influence on student eating behavior without support from parents.
3. Food and nutrition education belongs in the home instead of in the schools.
4. Food and nutrition should be taught at all grade levels, K-12.
5. I don't think teachers need to act as role models for students to learn good eating habits
6. I think food and nutrition are most appropriately taught in the elementary grades.
7. I should read professional journals to find information about food and nutrition to teach in my classes.
8. I think it's difficult to get students to see the importance of food and nutrition.
9. Teachers should acquire some accurate information and resources before teaching food and nutrition.
10. Teachers should serve as role models for students to learn good eating habits.
11. Students in my class would probably be bored by discussions about food and nutrition.
12. Teachers have enough to do without spending time teaching about food and nutrition.

13. I know how to teach, so I could teach food and nutrition topics if I choose.
14. I don't think my eating behavior at school has any effect on how students eat.
15. Teachers should include food and nutrition topics in their teaching to help students evaluate the information they get from TV.
16. Teaching food and nutrition won't make a difference in the way students response to advertising.
17. It would be interesting to learn more about food and nutrition for use in my classes.
18. Students would find food and nutrition topics interesting if the topics were related to their concerns.
19. In my classes, I don't think I have time to teach food and nutrition.
20. Teachers don't need special training to teach about food and nutrition.
21. It would be difficult to incorporate food and nutrition instruction into my subjects.
22. Teachers' eating behavior at school should provide positive examples for students.
23. It would be difficult to find resource materials to use in preparing a lesson on food and nutrition.
24. Food and nutrition should be integrated into a variety of subjects.
25. My students would enjoy an interesting lesson on food and nutrition.

26. Food and nutrition should be important topics for discussion in my classroom.
27. It would be easy to find good audiovisuals for teaching about food and nutrition.
28. I wish I had more time to teach food and nutrition in my classes.
29. Food and nutrition should be taught in the schools.
30. I think teaching food and nutrition in my classes would be time well spent.
31. It's not the job of the school to teach about food and nutrition.
32. Food and nutrition education needs to involve parents as well as students to have an influence on student eating behavior.

LIKERT ATTITUDE STATEMENTS USED ON
TEACHER SURVEY - PERSONAL NUTRITION SCALE

1. I should eat a wide variety of foods to get a well-balanced diet.
2. I believe diet is a major factor in maintaining health.
3. At a supermarket, I think I can get the same nutrition for less cost than at a health food store.
4. I don't think I need to eat a wide variety of foods to get a well-balanced diet.
5. I think exercising would make me feel worse than not exercising.
6. Nutrition labels should be required on most food products.
7. I don't think overweight people need to lose weight to be healthier.
8. I don't think the way I eat has much influence on my health.
9. Pinto beans in a health food store should be more nutritious than pinto beans in a supermarket.
10. People who are overweight should lose weight to be healthier.
11. I should exercise regularly to be healthy.
12. To lose weight, I think I should eat a variety of foods but in smaller amounts.
13. I don't think I need to exercise if my weight is ideal.
14. To lose weight, I should eliminate high carbohydrate foods from my diet.

15. Physical activity would make my feel healthier.
16. Vitamins found in foods should be better for me than those made synthetically in a laboratory.

FINAL LIKERT SCALE TO ASSESS ATTITUDE TOWARD TEACHING NUTRITION

1. Food and nutrition education should be taught at all grade levels, K-12.
2. I should read professional journals to find information about food and nutrition to teach in my classes.
3. Students in my classes would probably be bored by discussions about food and nutrition.
4. Teachers have enough to do without spending time teaching about food and nutrition.
5. Teachers should include food and nutrition topics in their teaching to help students evaluate the information they got from T.V.
6. It would be interesting to learn more about food and nutrition for use in my classes.
7. Students would find food and nutrition topics interesting if the topics were related to their concerns.
8. In my classes, I don't think I have time to teach food and nutrition.
9. It would be difficult to incorporate food and nutrition instruction into my subjects.
10. Food and nutrition should be integrated into a variety of subjects.
11. My students would enjoy an interesting lesson on food and nutrition.

12. Food and nutrition should be important topics for discussion in my classroom.
13. I wish I had more time to teach food and nutrition in my classes.
14. I think teaching food and nutrition in my classes would be time well spent.

APPENDIX D

FINAL LIKERT AND SEMANTIC DIFFERENTIAL SCALE DEVELOPMENT DATA

TABLE D-1: VARIMAX ROTATED FACTOR MATRIX CONTAINING FACTOR LOADINGS FOR LIKERT SCALE-TEACHING NUTRITION

Item[1]	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7
2	.034	.082	.733	.081	-.018	.174	.120
3	.070	.065	.010	.489	-.091	.157	.008
5	.194	.031	.087	.271	.033	.446	-.099
6	.508	.267	.065	.030	.186	.239	.148
7	.243	.744	.078	.039	.119	.221	-.011
8	.277	.110	.067	.192	-.035	.131	-.062
9	.470	.132	.036	-.103	.133	.074	.109
12	-.058	-.038	.114	.535	-.218	.054	.096
13	.125	.061	.132	-.064	.438	.171	-.017
14	.244	.797	.115	-.039	.125	.136	.100
15	.426	.118	.081	.528	.028	.028	.036
17	.598	.210	.175	.109	.076	.272	-.037
19	.262	-.034	-.108	-.027	-.009	.044	-.416
20	.335	.569	.051	.271	.030	-.078	-.109
21	.591	.329	.091	.028	.163	.143	.207
22	.194	.168	.133	.402	.264	.060	-.040
24	.732	.157	-.052	.098	.186	.089	.086
25	.482	.043	.070	.136	.393	.002	.087
26	.832	.156	.235	.018	-.055	.106	-.179
27	.068	.129	.064	-.082	.436	.127	-.349
28	.767	.165	.187	.059	-.026	.057	-.109
31	.324	.637	.073	.149	.214	-.009	.000
35	.166	.099	.787	.090	.104	.041	-.085
36	.421	.151	.018	.173	.179	.085	.169
37	.640	.109	-.007	.392	.236	.025	.050
39	.791	.254	.058	.088	.034	.124	.061
40	.060	.037	.507	.059	.114	-.074	.034
42	.410	.092	-.146	.076	.163	.012	.199
44	.384	.197	.043	.157	.304	.394	.044
45	.815	.154	.088	.152	.121	.190	.107
47	.266	.144	-.017	.139	.220	.505	-.020
48	.080	.166	.033	-.191	.382	-.016	.107

[1] Item number on Teacher Survey

TABLE D-2: VARIMAX ROTATED FACTOR MATRIX CONTAINING FACTOR LOADING FOR LIKERT SCALE - PERSONAL NUTRITION

Item [1]	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
1	.063	.864	.017	-.180	.027
4	.159	.226	.130	.070	-.008
10	.080	.093	-.063	.568	-.027
11	.105	.730	.060	.001	.054
16	.463	.010	.079	.032	.306
18	.300	.102	.076	.054	-.237
23	.177	.822	.831	.040	.102
29	.309	.093	.228	.072	-.015
30	.060	.157	.165	.719	-.007
32	.267	.071	.456	-.043	-.183
33	.819	.114	.105	-.041	.025
34	.277	.298	.071	.139	.080
38	.571	.074	.160	.071	.058
41	.017	.081	-.011	.058	.395
43	.613	.141	.100	-.046	-.170
46	-.036	-.104	-.127	.374	.101

[1] Item number on Teacher Survey

TABLE D-3: FACTOR LOADINGS FOR THE SEMANTIC DIFFERENTIAL SCALE - MY OWN NUTRITION

Adjective Pair	Factor 1 [1]
Health/ Unhealthy	.689
Important/Unimportant	.406
Good/Bad	.751
Pleasurable/Painful	.579
Positive/Negative	.800

[1]Only 1 factor was extracted

TABLE D-4: FACTOR LOADINGS FOR THE SEMANTIC DIFFERENTIAL SCALE - MY TEACHING FOOD AND NUTRITION

Adjective Pair	Factor 1 [1]
Health/Unhealthy	.812
Important/Unimportant	.839
Good/Bad	.853
Meaningful/Meaningless	.850
Timely/Untimely	.792
Pleasureable/Painful	.791
Positive/Negative	.893

[1]Only 1 factor was extracted

TABLE D.-5 : ANALYSIS OF VARIANCE AMONG THE FOUR TEACHER SUBJECT GROUPS ON LIKERT SCALE ITEMS -TEACHING NUTRITION

Item[1]	F Ratio	F. Probability	Significance
2	10.2	.000	***
3	6.6	.324	ns
5	2.6	.049	*
6	35.0	.000	***
7	18.4	.000	***
8	3.5	.016	*
9	24.9	.000	***
12	1.7	.173	ns
13	6.8	.000	***
14	17.0	.000	***
15	4.8	.003	**
17	43.7	.000	***
19	10.2	.000	***
20	8.6	.000	***
21	36.5	.000	***
22	6.6	.000	***
24	28.8	.000	***
25	19.8	.000	***
26	69.9	.000	***
27	11.6	.000	***
28	61.2	.000	***
31	14.2	.000	***
35	15.5	.000	***
36	10.5	.000	***
37	19.7	.000	***
39	57.3	.000	***
40	2.5	.056	ns
42	7.0	.000	***
44	20.3	.000	***
45	50.9	.000	***
47	11.0	.000	***
48	1.9	.118	ns

[1] Number on Teacher Survey
* p .05
** p .01
***p .001

TABLE D-6 : ANALYSIS OF VARIANCE AMONG THE FOUR TEACHER SUBJECT GROUPS ON LIKERT SCALE ITEMS -PERSONAL NUTRITION

Item [1]	F Ratio	F Prob	Sign
1	9.8	.000	***
4	6.6	.000	***
10	9.7	.000	***
11	15.2	.000	***
16	3.2	.024	*
18	1.9	.124	ns
23	4.0	.007	**
29	4.7	.003	**
30	13.0	.000	***
32	2.5	.056	ns
33	3.1	.028	*
34	7.7	.000	***
38	5.1	.002	**
41	5.5	.001	***
43	1.8	.138	ns
46	5.9	.001	***

[1] Number on Teacher Survey

* p .05

** p .01

***p .001

TABLE D-7: ANALYSIS OF VARIANCE AMONG THE FOUR TEACHER SUBJECT GROUPS ON SEMANTIC DIFFERENTIAL SCALE PAIRS - MY OWN NUTRITION

Adjective Pair	F Ratio	F.Probability	Significance
Healthy/Unhealthy	.6	.640	ns
Important/Unimportant	1.6	.178	ns
Good/Bad	1.9	.124	ns
Pleasurable/Painful	.5	.692	ns
Positive/Negative	1.8	.138	ns

TABLE D-8: ANALYSIS OF VARIANCE AMONG THE FOUR TEACHER SUBJECT GROUPS ON THE SEMANTIC DIFFERENTIAL SCALE PAIRS - MY TEACHING FOOD AND NUTRITION

Adjective Pair	F Ratio	F. Probability	Significance
Healthy/Unhealthy	32.9	.000	***
Important/Unimportant	44.7	.000	***
Good/Bad	31.3	.000	***
Meaningful/Meaningless	25.5	.000	***
Timely/untimely	31.7	.000	***
Pleasurable/Painful	25.3	.000	***
Positive/Negative	32.4	.000	***

*** p .001

APPENDIX E

NUTRITION KNOWLEDGE TEST DATA

TABLE E-9: NKT SCORE FREQUENCY DISTRIBUTIONS FOR TEACHERS BY SUBJECT GROUP

Raw Score	Health/physical Education	Home Economics	Sciences	Social Sciences	All
	Teacher Subject Group				
38	1	0	1	0	2
37	0	4	0	0	4
36	0	8	0	0	8
35	0	7	1	0	8
34	0	12	0	0	12
33	2	10	1	0	13
32	2	10	3	1	16
31	1	13	2	1	17
30	1	7	4	3	15
29	2	16	6	1	27
28	3	5	7	2	17
27	6	12	7	1	26
26	2	11	11	3	27
25	7	5	7	6	25
24	6	10	11	3	30
23	3	11	11	6	31
22	13	3	12	7	45
21	9	4	12	5	30
20	2	3	11	7	23
19	9	1	7	6	23
18	4	2	11	8	25
17	5	1	1	9	16
16	6	1	4	11	22
15	5	1	0	8	14
14	3	0	2	7	12
13	5	1	3	6	15
12	0	2	5	3	10
11	2	1	0	2	5
10	1	1	0	2	4
9	2	0	1	0	3
8	0	1	0	2	3
7	0	0	0	0	0
6	0	0	0	0	0
5	1	0	0	0	1

TABLE E-10: NKT ITEM ANALYSIS SUMMARY FOR ALL TEACHERS

STANDARD FORM 40 ITEMS PERCENTAGES UPPER 27% MIDDLE 46% LOWER 27% 516 STUDENTS
STUDENTS PER GROUP 139 238 139

ITEM	KEY	1			2			3			4			5			OMIT			ERROR			DIFF	DISC
		U	M	L	U	M	L	U	M	L	U	M	L	U	M	L	U	M	L	U	M	L		
1	1	81	65	45	17	35	55	0	0	0	0	0	0	0	0	0	2	0	1	0	0	0	36	36
2	1	73	30	24	27	69	72	0	0	0	0	0	0	0	0	0	0	1	4	0	0	0	60	49
3	2	28	61	73	72	38	27	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	56	45
4	2	14	29	56	86	71	43	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	31	38
5	2	9	24	49	91	76	51	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	27	40
6	1	93	74	53	7	26	46	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	27	40
7	1	71	58	45	27	40	55	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	42	26
8	1	96	77	60	3	22	40	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	22	36
9	1	79	73	55	21	27	45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	24
10	2	19	26	43	81	73	55	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	30	26
11	2	29	46	53	71	52	45	0	0	0	0	0	0	0	0	0	1	0	2	0	0	0	45	26
12	1	76	56	35	24	44	63	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	44	40
13	2	4	6	15	84	63	49	3	11	17	8	18	17	0	0	0	1	1	1	0	0	0	35	35
14	2	1	0	1	95	85	37	2	6	6	2	7	54	0	0	0	0	2	1	0	0	0	25	58
15	1	19	6	3	1	0	1	27	40	33	51	51	60	0	0	0	1	1	2	0	0	0	91	16
16	3	0	0	1	1	0	1	82	66	45	16	33	53	0	0	0	0	1	1	0	0	0	36	37
17	3	1	11	17	12	15	29	77	37	27	9	32	35	0	0	0	1	2	0	0	0	0	55	50
18	4	2	11	16	9	13	22	1	3	7	88	72	53	0	0	0	0	1	2	0	0	0	29	35
19	1	89	55	22	2	5	6	1	8	27	7	32	42	0	0	0	0	0	1	0	0	0	45	67
20	3	1	12	35	4	3	10	95	81	41	0	4	13	0	0	0	0	0	1	0	0	0	26	54
21	3	7	20	29	2	13	21	88	42	17	3	20	29	0	0	0	1	5	5	0	0	0	53	63
22	4	1	9	35	0	2	1	19	25	27	79	64	35	0	0	0	1	1	2	0	0	0	40	44
23	4	1	3	12	0	2	14	0	13	32	99	80	42	0	0	0	0	1	0	0	0	0	25	57
24	2	1	2	14	99	92	65	0	5	19	0	0	0	0	0	0	0	0	2	0	0	0	12	30
25	2	0	4	4	99	84	75	1	0	3	0	11	17	0	0	0	0	1	1	0	0	0	16	18
26	2	37	57	63	59	39	25	1	2	6	1	2	4	0	0	0	1	0	1	0	0	0	59	34
27	2	6	23	50	87	45	29	4	26	20	1	5	3	0	0	0	2	3	3	0	0	0	49	63
28	4	1	10	19	6	26	27	9	16	41	84	45	12	0	0	0	0	1	2	0	0	0	53	72
29	3	1	2	4	1	2	8	82	69	46	15	26	40	0	0	0	1	0	2	0	0	0	34	36
30	3	1	6	11	2	11	23	94	75	53	0	3	13	0	0	0	2	3	3	0	0	0	26	44
31	3	0	2	1	1	1	6	88	50	20	11	43	75	0	0	0	0	0	4	0	0	0	45	68
32	2	12	16	22	79	66	45	9	16	14	3	0	16	0	0	0	2	2	2	0	0	0	40	29
33	3	1	8	17	15	36	53	83	52	26	1	2	4	0	0	0	0	1	1	0	0	0	47	59
34	2	1	11	21	91	66	44	5	17	28	3	3	4	0	0	0	0	1	3	0	0	0	33	47
35	1	27	11	6	42	53	60	18	25	26	8	11	7	0	0	0	4	1	3	0	0	0	36	21
36	3	45	70	53	1	3	9	50	21	17	2	3	19	0	0	0	1	2	1	0	0	0	72	33
37	4	41	36	45	4	7	7	5	14	15	49	42	27	0	0	0	1	2	5	0	0	0	60	22
38	4	0	3	12	0	0	0	9	57	51	90	40	35	0	0	0	1	1	3	0	0	0	39	55
39	2	0	19	27	86	62	39	1	3	[illegible]	9	15	27	0	0	0	0	0	2	0	0	0	38	47
40	1	47	45	33	26	34	35	22	21	29	2	2	0	0	0	0	3	0	4	0	0	0	59	17

TABLE E-11: NKT ITEM ANALYSIS SUMMARY FOR HEALTH/PHYSICAL EDUCATION TEACHERS

STANDARD FORM ... 40 ITEMS ... PERCENTAGES ... UPPER 27% MIDDLE 46% LOWER 27% ... 103 STUDENTS
STUDENTS PER GROUP 27 49 27

ITEM	KEY	1 U	1 M	1 L	2 U	2 M	2 L	3 U	3 M	3 L	4 U	4 M	4 L	5 U	5 M	5 L	OMIT U	OMIT M	OMIT L	ERROR U	ERROR M	ERROR L	DIFF	DISC
1	1	70	57	37	30	43	59	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	45	33
2	1	44	33	37	56	63	59	0	0	0	0	0	0	0	0	0	0	2	4	0	0	0	63	7
3	2	56	57	74	44	33	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	66	18
4	2	15	37	59	85	63	41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37	44
5	2	11	33	56	89	65	44	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	34	45
6	1	78	71	59	22	29	41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	19
7	1	63	55	33	37	43	67	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	49	30
8	1	89	73	59	11	27	41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26	30
9	1	74	73	70	26	27	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27	4
10	2	15	35	41	85	63	59	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	32	26
11	2	57	55	70	41	43	26	0	0	0	0	0	0	0	0	0	0	2	4	0	0	0	62	15
12	1	78	55	44	22	45	56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	42	34
13	2	7	10	15	70	71	48	4	8	22	15	10	11	0	0	0	4	0	4	0	0	0	35	22
14	2	0	0	0	78	73	11	11	12	7	11	10	81	0	0	0	0	4	0	0	0	0	42	67
15	1	11	10	4	0	0	4	33	47	22	56	41	70	0	0	0	0	2	0	0	0	0	91	7
16	3	0	2	0	0	0	0	78	67	30	19	31	70	0	0	0	4	0	0	0	0	0	40	48
17	3	7	6	7	19	24	19	59	20	26	15	45	48	0	0	0	0	4	0	0	0	0	66	33
18	4	4	12	19	11	20	19	0	2	15	85	59	44	0	0	0	0	6	4	0	0	0	38	41
19	1	81	27	26	7	0	4	0	27	11	11	41	59	0	0	0	0	0	0	0	0	0	59	55
20	3	7	14	37	0	2	15	93	78	41	0	6	7	0	0	0	0	0	0	0	0	0	28	52
21	3	19	18	30	0	13	26	70	35	11	4	22	26	0	0	0	7	6	7	0	0	0	62	59
22	4	7	20	45	0	2	0	11	29	30	81	49	19	0	0	0	0	0	4	0	0	0	50	62
23	4	4	0	11	0	0	15	7	24	26	89	67	48	0	0	0	0	2	0	0	0	0	32	41
24	2	0	4	11	100	83	63	0	8	26	0	0	0	0	0	0	0	0	0	0	0	0	16	37
25	2	0	6	11	96	82	67	0	2	0	4	10	19	0	0	0	0	0	4	0	0	0	18	29
26	2	48	55	48	48	41	30	4	2	11	0	2	4	0	0	0	0	0	7	0	0	0	60	18
27	2	15	37	56	74	37	19	11	24	19	0	4	4	0	0	0	0	0	4	0	0	0	57	55
28	4	0	10	11	7	20	33	22	27	37	70	41	15	0	0	0	0	2	4	0	0	0	58	55
29	3	0	4	7	0	2	4	85	61	33	15	33	48	0	0	0	0	0	7	0	0	0	40	52
30	3	0	4	15	0	20	15	96	73	41	4	2	22	0	0	0	0	0	7	0	0	0	29	55
31	3	0	0	0	0	0	0	89	39	22	11	59	70	0	0	0	0	2	7	0	0	0	52	67
32	2	19	16	15	81	47	41	0	27	19	0	8	22	0	0	0	0	0	4	0	0	0	46	40
33	3	0	10	15	22	27	56	70	61	22	4	2	4	0	0	0	4	0	4	0	0	0	47	48
34	2	4	12	15	56	63	33	33	20	41	7	4	7	0	0	0	0	0	4	0	0	0	47	23
35	1	22	4	0	44	59	81	26	31	15	4	6	0	0	0	0	4	0	4	0	0	0	92	22
36	3	70	55	37	4	6	22	26	31	19	0	6	19	0	0	0	0	2	4	0	0	0	74	7
37	4	17	41	41	11	4	7	4	14	19	67	39	26	0	0	0	0	2	7	0	0	0	57	41
38	4	0	4	19	0	0	0	22	49	52	78	47	26	0	0	0	0	0	4	0	0	0	50	52
39	2	15	22	26	74	37	26	0	0	0	11	33	44	0	0	0	0	0	4	0	0	0	56	48
40	1	44	51	33	22	24	41	33	20	19	0	4	0	0	0	0	0	0	7	0	0	0	55	11

TABLE E-12: NKT ITEM ANALYSIS SUMMARY FOR HOME ECONOMICS TEACHERS

STANDARD FORM   40 ITEMS   PERCENTAGES   UPPER 27% MIDDLE 46% LOWER 27%   162 STUDENTS
STUDENTS PER GROUP   43   76   43

ITEM	KEY	1 U	1 M	1 L	2 U	2 M	2 L	3 U	3 M	3 L	4 U	4 M	4 L	5 U	5 M	5 L	OMIT U	OMIT M	OMIT L	ERROR U	ERROR M	ERROR L	DIFF	DISC
1	1	81	64	47	16	32	53	0	0	0	0	0	0	0	0	0	2	4	0	0	0	0	36	34
2	1	88	72	23	12	28	74	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	36	65
3	2	9	39	65	91	61	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38	56
4	2	7	28	63	91	72	37	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	32	59
5	2	2	13	42	98	87	56	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	19	42
6	1	98	88	63	2	12	35	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	16	35
7	1	79	58	30	21	41	67	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	44	49
8	1	100	92	72	0	7	26	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	11	28
9	1	88	68	65	12	30	35	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	27	23
10	2	12	17	28	88	83	70	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	19	18
11	2	19	38	70	81	62	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	41	51
12	1	81	57	47	19	42	51	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	40	34
13	2	2	3	14	93	76	60	0	7	5	2	13	21	0	0	0	2	1	0	0	0	0	23	33
14	2	0	0	0	98	97	77	0	3	2	2	0	19	0	0	0	0	0	2	0	0	0	8	21
15	1	33	7	2	0	0	0	12	34	23	56	59	74	0	0	0	0	0	0	0	0	0	88	31
16	3	0	0	2	0	0	0	77	72	44	23	28	51	0	0	0	0	0	2	0	0	0	34	33
17	3	2	0	12	2	22	26	93	72	37	2	9	26	0	0	0	0	1	0	0	0	0	31	36
18	4	0	4	9	2	17	16	0	0	7	98	78	67	0	0	0	0	1	0	0	0	0	20	31
19	1	93	86	60	0	1	5	5	1	5	2	12	30	0	0	0	0	0	0	0	0	0	19	33
20	3	0	3	12	2	4	7	98	93	79	0	0	2	0	0	0	0	0	0	0	0	0	9	19
21	3	0	7	26	0	8	14	100	78	35	0	5	19	0	0	0	0	3	7	0	0	0	28	65
22	4	0	4	30	0	1	0	14	30	14	86	63	49	0	0	0	0	1	7	0	0	0	35	37
23	4	0	0	5	0	0	2	0	0	14	100	100	79	0	0	0	0	0	0	0	0	0	6	21
24	2	0	1	7	100	97	88	0	0	2	0	1	0	0	0	0	0	0	2	0	0	0	4	12
25	2	0	5	2	91	86	84	0	0	2	9	9	7	0	0	0	0	0	5	0	0	0	14	7
26	2	28	41	60	72	54	37	0	1	0	0	4	0	0	0	0	0	0	2	0	0	0	46	35
27	2	0	8	42	100	76	33	0	13	12	0	1	9	0	0	0	0	1	5	0	0	0	29	67
28	4	0	0	2	2	3	16	2	5	12	95	92	70	0	0	0	0	0	0	0	0	0	13	25
29	3	0	4	7	0	0	0	93	63	53	7	32	40	0	0	0	0	1	0	0	0	0	31	40
30	3	0	0	0	0	1	7	98	96	84	0	0	7	0	0	0	2	3	2	0	0	0	7	14
31	3	0	0	2	0	0	0	100	95	65	0	5	33	0	0	0	0	0	0	0	0	0	12	35
32	2	9	8	12	86	80	67	5	11	12	0	0	9	0	0	0	0	1	0	0	0	0	22	19
33	3	0	0	5	5	11	30	93	89	60	2	0	5	0	0	0	0	0	0	0	0	0	17	33
34	2	0	1	2	98	95	77	0	5	16	2	0	5	0	0	0	0	0	0	0	0	0	9	21
35	1	44	17	7	23	45	53	19	28	30	9	8	7	0	0	0	5	3	2	0	0	0	78	37
36	3	37	54	79	0	1	5	63	38	7	0	3	7	0	0	0	0	4	2	0	0	0	64	56
37	4	51	54	67	2	9	5	2	4	2	44	30	23	0	0	0	0	3	2	0	0	0	68	21
38	4	0	0	5	0	0	0	2	18	47	98	78	49	0	0	0	0	4	0	0	0	0	25	49
39	2	2	14	23	93	68	42	0	1	5	5	16	30	0	0	0	0	0	0	0	0	0	32	51
40	1	49	30	37	16	37	28	28	26	28	5	3	5	0	0	0	2	4	2	0	0	0	63	12

TABLE E-13 NKT ITEM ANALYSIS SUMMARY FOR SCIENCE TEACHERS

STANDARD FORM 40 ITEMS PERCENTAGES UPPER 27% MIDDLE 46% LOWER 27% 141 STUDENTS
STUDENTS PER GROUP 38 65 38

ITEM	KEY	1			2			3			4			5			OMIT			ERROR			DIFF	DISC
		U	M	L	U	M	L	U	M	L	U	M	L	U	M	L	U	M	L	U	M	L		
1	1	92	85	76	6	15	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	16
2	1	39	22	18	58	76	79	0	0	0	0	0	0	0	0	0	3	0	8	0	0	0	74	21
3	2	53	66	71	47	31	26	0	0	0	0	0	0	0	0	0	0	2	3	0	0	0	66	21
4	2	5	12	32	95	88	68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	27
5	2	16	18	45	84	82	55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	29
6	1	79	80	39	21	20	58	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	31	40
7	1	76	65	61	21	34	39	0	0	0	0	0	0	0	0	0	3	2	0	0	0	0	33	15
8	1	87	86	55	11	14	39	0	0	0	0	0	0	0	0	0	3	0	5	0	0	0	22	32
9	1	76	77	53	24	23	47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	23
10	2	26	31	47	74	69	50	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	35	24
11	2	21	40	58	76	63	39	0	0	0	0	0	0	0	0	0	3	0	3	0	0	0	41	37
12	1	74	55	39	26	45	58	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	44	35
13	2	5	6	13	74	52	47	8	18	18	13	23	16	0	0	0	0	0	5	0	0	0	43	27
14	2	0	0	0	92	89	50	3	2	8	5	9	37	0	0	0	0	0	5	0	0	0	21	42
15	1	21	11	3	5	2	0	32	38	34	42	49	55	0	0	0	0	0	8	0	0	0	89	18
16	3	0	0	0	0	0	0	87	66	47	13	34	50	0	0	0	0	0	3	0	0	0	33	40
17	3	8	14	11	11	14	18	53	31	42	29	37	29	0	0	0	0	5	0	0	0	0	60	11
18	4	5	14	20	5	6	29	3	3	3	87	77	42	0	0	0	0	0	0	0	0	0	30	45
19	1	84	58	20	3	5	13	0	8	26	13	29	32	0	0	0	0	0	3	0	0	0	43	58
20	3	3	8	24	0	9	11	97	80	50	0	3	16	0	0	0	0	0	0	0	0	0	23	47
21	3	11	18	26	11	12	5	66	43	18	11	25	42	0	0	0	3	2	8	0	0	0	57	48
22	4	0	2	11	0	5	3	16	14	29	84	80	58	0	0	0	0	0	0	0	0	0	25	26
23	4	3	8	5	0	5	11	3	12	32	95	74	53	0	0	0	0	2	0	0	0	0	26	42
24	2	0	3	5	97	94	89	3	3	3	0	0	0	0	0	0	0	0	3	0	0	0	6	8
25	2	0	2	0	95	92	87	0	0	3	5	6	11	0	0	0	0	0	0	0	0	0	9	8
26	2	34	68	79	61	28	13	3	2	3	0	3	5	0	0	0	3	0	0	0	0	0	67	48
27	2	3	23	53	82	35	18	11	35	21	3	3	3	0	0	0	3	3	5	0	0	0	57	64
28	4	8	20	29	24	42	16	21	17	45	47	20	8	0	0	0	0	2	3	0	0	0	76	39
29	3	0	0	3	3	3	13	89	71	50	8	26	29	0	0	0	0	0	5	0	0	0	30	39
30	3	3	15	13	8	14	21	87	63	50	3	3	11	0	0	0	0	5	5	0	0	0	34	37
31	3	0	0	0	3	3	0	66	43	18	32	52	76	0	0	0	0	2	5	0	0	0	57	48
32	2	21	26	24	47	42	42	13	15	13	11	14	18	0	0	0	3	2	3	0	0	0	57	5
33	3	5	11	13	45	62	58	50	20	24	0	2	3	0	0	0	0	0	3	0	0	0	68	26
34	2	0	17	26	79	46	45	13	28	21	0	6	5	0	0	0	0	3	3	0	0	0	45	34
35	1	18	9	11	58	57	61	11	25	16	11	9	11	0	0	0	3	2	3	0	0	0	88	7
36	3	53	74	61	3	3	3	37	20	18	8	2	16	0	0	0	0	2	3	0	0	0	76	13
37	4	13	40	26	3	8	13	11	5	21	74	42	29	0	0	0	0	2	11	0	0	0	53	45
38	4	0	6	13	0	0	0	24	31	45	74	63	39	0	0	0	3	0	3	0	0	0	40	35
39	2	8	18	18	87	80	58	3	2	8	3	0	13	0	0	0	0	0	3	0	0	0	24	29
40	1	63	40	34	21	37	29	13	22	29	3	2	3	0	0	0	0	0	5	0	0	0	55	29

PRINTED IN U.S.A.

TABLE E-14:NKT ITEM ANALYSIS SUMMARY FOR SOCIAL SCIENCE TEACHERS

STANDARD FORM 40 ITEMS PERCENTAGES UPPER 27% MIDDLE 46% LOWER 27% 110 STUDENTS
STUDENTS PER GROUP 29 52 29

ITEM	KEY	1 U	1 M	1 L	2 U	2 M	2 L	3 U	3 M	3 L	4 U	4 M	4 L	5 U	5 M	5 L	OMIT U	OMIT M	OMIT L	ERROR U	ERROR M	ERROR L	DIFF	DISC
1	1	66	50	14	34	50	86	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	55	52
2	1	41	27	14	59	73	86	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	73	27
3	2	45	65	66	55	35	34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60	21
4	2	24	50	55	76	50	45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	45	31
5	2	24	29	55	76	71	45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35	31
6	1	83	63	55	17	37	45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34	28
7	1	86	50	41	10	50	59	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	43	45
8	1	90	58	48	10	42	52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	36	42
9	1	79	56	59	21	44	41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37	20
10	2	31	25	59	69	75	41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35	28
11	2	41	38	41	59	62	59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	0
12	1	69	46	28	31	54	72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	55	41
13	2	3	4	24	69	62	41	3	17	21	25	17	14	0	0	0	0	0	0	0	0	0	42	28
14	2	3	2	3	90	56	31	7	6	7	0	35	59	0	0	0	0	2	0	0	0	0	42	59
15	1	3	6	0	0	0	3	45	44	48	48	48	48	0	0	0	3	2	0	0	0	0	96	3
16	3	0	0	0	0	0	3	90	63	34	10	37	62	0	0	0	0	0	0	0	0	0	37	55
17	3	7	25	24	10	23	10	48	25	21	34	27	45	0	0	0	0	0	0	0	0	0	70	27
18	4	14	6	10	10	15	21	0	12	3	76	65	66	0	0	0	0	2	0	0	0	0	32	10
19	1	55	25	14	3	8	0	10	21	34	28	44	52	0	0	0	3	2	0	0	0	0	70	41
20	3	21	35	52	3	6	0	76	42	31	0	15	17	0	0	0	0	2	0	0	0	0	52	45
21	3	21	33	38	7	19	28	48	21	10	17	23	24	0	0	0	7	4	0	0	0	0	75	38
22	4	3	15	55	0	2	0	28	35	24	69	44	21	0	0	0	0	4	0	0	0	0	55	48
23	4	0	12	21	0	4	24	14	35	24	86	46	31	0	0	0	0	2	0	0	0	0	46	55
24	2	3	13	21	83	71	55	14	12	21	0	0	0	0	0	0	0	4	0	0	0	0	28	27
25	2	0	0	7	69	53	55	3	0	7	28	13	31	0	0	0	0	4	0	0	0	0	28	14
26	2	59	53	55	41	35	21	0	2	17	0	0	7	0	0	0	0	0	0	0	0	0	67	20
27	2	21	29	45	52	38	21	24	23	28	3	4	7	0	0	0	0	6	0	0	0	0	63	31
28	4	3	13	24	31	25	38	24	44	31	41	15	7	0	0	0	0	2	0	0	0	0	80	34
29	3	0	0	7	0	5	7	86	67	34	14	25	52	0	0	0	0	0	0	0	0	0	36	52
30	3	14	13	10	17	21	28	69	62	41	0	2	21	0	0	0	0	2	0	0	0	0	42	28
31	3	0	0	0	0	0	0	48	33	7	52	65	93	0	0	0	0	2	0	0	0	0	70	41
32	2	3	27	10	69	58	55	21	12	14	3	2	21	0	0	0	3	2	0	0	0	0	40	14
33	3	7	19	28	38	46	45	55	31	21	0	2	7	0	0	0	0	2	0	0	0	0	65	34
34	2	10	13	31	79	52	52	7	27	14	3	2	3	0	0	0	0	6	0	0	0	0	41	27
35	1	14	12	7	62	40	66	14	27	21	10	19	7	0	0	0	0	2	0	0	0	0	89	7
36	3	55	67	52	3	2	10	38	17	17	3	13	21	0	0	0	0	0	0	0	0	0	77	21
37	4	26	37	55	0	6	7	17	17	10	55	37	28	0	0	0	0	4	0	0	0	0	61	27
38	4	0	6	3	0	0	0	10	48	62	90	42	31	0	0	0	0	2	3	0	0	0	48	59
39	2	10	17	52	79	56	28	0	6	0	10	19	21	0	0	0	0	2	0	0	0	0	45	51
40	1	45	37	28	45	33	38	7	25	31	3	2	3	0	0	0	0	2	0	0	0	0	64	17

APPENDIX F

TEACHER SURVEY LIKERT AND SEMANTIC DIFFERENTIAL SCORE SUMMARY DATA

TABLE F-15: SCORE FREQUENCIES, MEANS AND STANDARD DEVIATIONS FOR ALL TEACHERS ON ALL TEACHER SURVEY LIKERT ITEMS - TEACHING NUTRITION (n=518)

Item[1]	Score 1	2	3	4	5	Mean	Standard Deviation
2[2]	10	63	62	256	121	3.8	1.0
3[2]	86	229	59	116	15	2.5	1.1
5[2]	7	19	75	250	158	4.0	0.8
6[3]	7	29	43	226	208	4.2	0.9
7[2]	7	55	77	234	139	3.9	1.0
8[2]	19	105	165	194	31	3.2	1.0
9[3]	15	87	156	211	42	3.3	0.9
12[2]	45	280	57	122	9	2.5	1.0
13[3]	1	2	6	265	240	4.4	0.6
14[3]	9	39	90	269	107	3.8	0.9
15[2]	20	109	137	218	29	3.2	1.0
17[2]	15	32	100	223	143	3.9	1.0
19[2]	62	216	127	83	23	2.6	1.0
20[2]	38	105	101	211	58	3.3	1.1
21[3]	4	22	103	295	86	3.9	0.8
22[2]	3	32	74	348	56	3.8	0.7
24[3]	5	25	107	270	106	3.9	0.8
25[3]	2	7	32	322	148	4.2	0.6
26[2]	22	93	95	195	104	3.5	1.1
27[2]	3	31	64	301	111	3.9	0.8
28[2]	24	88	64	221	114	3.6	1.1
31[3]	8	21	121	257	101	3.8	0.8
35[2]	6	49	95	273	86	3.7	0.9
36[3]	5	36	101	304	66	3.8	0.8
37[3]	5	33	111	290	72	3.8	0.8
39[3]	8	51	119	243	87	3.7	0.9
40[3]	25	121	166	163	34	3.1	1.0
42[3]	14	82	239	140	34	3.2	0.9
44[3]	2	-	22	294	192	4.3	0.6
45[3]	6	36	101	244	122	3.9	0.9
47[2]	3	12	44	304	147	4.1	0.7
48[3]	-	10	26	291	182	4.3	0.6

[1] Item number corresponds to number on <u>Teacher Survey</u>

[2] A favorable response for this item would be strongly disagree (1) or disagree (2) but the score assigned was reversed when the scale score was computed i.e., strongly disagree = 5.

[3] For this item, strongly agree = 5, strongly disagree = 1.

TABLE F-16: SCORE FREQUENCIES, MEANS AND STANDARD DEVIATIONS FOR HEALTH/PHYSICAL EDUCATION TEACHERS ON ALL TEACHER SURVEY LIKERT ITEMS - TEACHING NUTRITION (n=107)

Item[1]	Score 1	2	3	4	5	Mean	Standard Deviation
2[2]	4	14	18	52	19	3.6	1.0
3[2]	19	48	12	23	4	2.4	1.1
5[2]	-	5	17	57	27	4.0	0.8
6	-	5	8	52	41	4.2	0.8
7[2]	3	13	16	48	27	3.8	1.0
8[2]	4	17	44	37	5	3.2	0.9
9[3]	1	9	30	56	10	3.6	0.8
12[2]	12	61	8	25	1	2.5	1.0
13[3]	1	-	1	62	43	4.4	0.6
14[3]	1	6	22	59	19	3.8	0.8
15[2]	4	18	34	48	3	3.2	0.9
17[2]	2	5	16	60	23	3.9	0.8
19[2]	11	53	27	15	1	2.5	0.9
20[2]	12	20	17	49	9	3.2	1.2
21[3]	-	2	18	72	15	3.8	0.6
22[2]	-	6	18	74	9	3.8	0.7
24[3]	1	3	15	66	22	4.0	0.7
25[3]	-	1	3	71	32	4.2	0.5
26[2]	4	17	20	51	15	3.5	1.0
27[2]	1	11	10	66	19	3.8	0.9
28[2]	1	20	11	56	19	3.7	1.0
31[3]	-	5	24	58	19	3.9	0.8
35[2]	3	12	20	62	9	3.6	0.9
36[3]	-	12	16	68	11	3.7	0.8
37[3]	-	9	17	66	15	3.8	0.8
39[3]	-	9	21	62	15	3.8	0.8
40[3]	6	29	35	31	6	3.0	1.0
42[3]	-	13	42	45	7	3.4	0.8
44[3]	-	-	2	59	46	4.4	0.5
45[3]	-	3	22	62	20	3.9	0.7
47[2]	2	5	11	58	31	4.0	0.9

[1] Item number corresponds to number on <u>Teacher Survey</u>

[2] A favorable response for this item would be strongly disagree (1) or disagree (2), but the score assigned was reversed when the scale score was computed, i.e. strongly disagree =5

[3] For this item, strongly agree = 5, strongly disagree = 1.

TABLE F-17 SCORE FREQUENCIES, MEANS AND STANDARD DEVIATIONS FOR HOME ECONOMICS TEACHERS ON ALL TEACHER SURVEY LIKERT ITEMS -TEACHING NUTRITION (n=161)

Item[1]	Score 1	2	3	4	5	Mean	Standard Deviation
2[2]	-	12	8	79	60	4.2	0.8
3[2]	21	74	23	36	4	2.5	1.1
5[2]	4	5	23	53	74	4.2	1.0
6[3]	2	-	4	39	114	4.6	0.7
7[2]	1	4	14	63	76	4.3	0.8
8[2]	7	20	46	71	15	3.4	1.0
9[3]	2	17	31	83	25	3.7	0.9
12[2]	20	85	15	36	3	2.5	1.0
13[3]	-	-	2	59	98	4.6	0.5
14[3]	1	3	16	79	60	4.2	0.7
15[2]	1	28	42	75	12	3.4	0.9
17[2]	2	1	5	62	89	4.5	0.7
19[2]	30	68	36	17	7	2.4	1.0
20[2]	4	23	31	67	34	3.6	1.0
21[3]	-	2	11	91	54	4.2	0.6
22[2]	-	4	15	111	27	4.0	0.6
24[3]	-	-	20	78	59	4.2	0.7
25[3]	1	-	4	76	75	4.4	0.6
26[2]	1	4	9	67	76	4.4	0.8
27[2]	1	1	15	83	56	4.2	0.7
28[2]	2	5	7	63	80	4.4	0.8
31[3]	1	2	24	73	55	4.1	0.8
35[2]	1	7	17	75	57	4.1	0.8
36[3]	3	6	16	92	40	4.0	0.8
37[3]	-	5	14	96	41	4.1	0.7
39[3]	-	3	8	87	57	4.2	0.6
40[3]	8	34	34	59	20	3.3	1.1
42[3]	5	19	78	35	17	3.3	0.9
44[3]	-	-	3	60	92	4.6	0.5
45[3]	-	2	5	75	73	4.4	0.6
47[2]	1	1	7	73	73	4.4	0.7
48[3]	-	2	4	83	65	4.4	0.6

[1]Item number corresponds to number on Teacher Survey

[2]A favorable response for this item would be strongly disagree (1) or disagree (2), but the score assigned was reversed when the scale score was computed, i.e. strongly disagree = 5.

[3]For this item, strongly agree = 5, strongly disagree = 1.

TABLE F-18: SCORE FREQUENCIES, MEANS AND STANDARD DEVIATIONS FOR SCIENCE TEACHERS ON ALL TEACHER SURVEY LIKERT ITEMS - TEACHING NUTRITION (n=140)

Item[1]	Score 1	2	3	4	5	Mean	Standard Deviation
2[2]	3	21	17	72	26	3.7	1.0
3[2]	30	60	10	33	4	2.4	1.2
5[2]	1	4	21	77	37	4.0	0.8
6[3]	3	11	19	73	34	3.9	0.9
7[2]	1	21	25	72	20	3.6	0.9
8[2]	3	37	39	56	5	3.2	0.9
9[3]	5	32	52	49	2	3.1	0.9
12[2]	9	81	15	32	3	2.6	1.0
13[3]	-	1	1	83	55	4.4	0.5
14[3]	4	15	28	74	19	3.6	0.9
15[2]	10	28	32	60	10	3.2	1.1
17[2]	5	15	34	72	24	3.6	1.0
19[2]	14	62	36	23	3	2.6	1.0
20[2]	14	32	28	58	7	3.1	1.1
21[3]	1	6	32	87	12	3.7	0.7
22[2]	3	11	18	99	9	3.7	0.8
24[3]	-	12	29	82	17	3.7	0.8
25[3]	-	3	11	97	29	4.1	0.6
26[2]	5	31	35	60	9	3.3	1.0
27[2]	1	13	23	89	14	3.7	0.8
28[2]	6	24	24	74	11	3.4	1.0
31[3]	2	7	42	76	13	3.6	0.8
35[2]	2	12	32	80	13	3.6	0.8
36[3]	1	7	37	86	9	3.7	0.7
37[3]	1	8	43	77	11	3.6	0.7
39[3]	3	13	42	72	10	3.5	0.8
40[3]	8	31	53	42	5	3.0	0.9
42[3]	2	25	67	40	6	3.2	0.8
44[3]	2	-	7	100	21	4.1	0.6
45[3]	2	11	32	73	22	3.7	0.9
47[2]	-	4	13	100	23	4.0	0.6
48[3]	-	3	7	82	48	4.2	0.6

[1]Item number corresponds to number on Teacher Survey

[2]A favorable response for this item would be strongly disagree(1) or disagree(2), but the score assigned was reversed when the scale score was computed, i.e. strongly disagree = 5.

[3]For this item, strongly agree = 5, strongly disagree = 1

TABLE F-19: SCORE FREQUENCIES, MEANS AND STANDARD DEVIATIONS FOR SOCIAL SCIENCE TEACHERS ON ALL TEACHER SURVEY LIKERT ITEMS - TEACHING NUTRITION (n=110)

Item[1]	Score 1	2	3	4	5	Mean	Standard Deviation
2[2]	3	16	19	53	16	3.6	1.0
3[2]	16	47	14	24	3	2.5	1.1
5[2]	2	5	14	63	20	3.9	0.8
6[3]	2	13	12	62	19	3.8	0.9
7[2]	2	17	22	51	16	3.6	1.0
8[2]	5	31	36	30	6	3.0	1.0
9[3]	7	29	43	23	5	2.9	1.0
12[2]	4	53	19	29	2	2.7	1.0
13[3]	-	1	2	61	44	4.4	0.6
14[3]	3	15	24	57	9	3.5	0.9
15[2]	5	35	29	35	4	3.0	1.0
17[2]	6	11	45	39	7	3.3	0.9
19[2]	7	33	28	28	12	3.0	1.1
20[2]	8	30	25	37	8	8.1	1.1
21[3]	3	12	42	45	5	3.3	0.8
22[2]	-	11	23	64	11	3.7	0.8
24[3]	4	10	43	44	8	3.4	0.9
25[3]	1	1	14	78	12	3.9	0.7
26[2]	12	41	31	20	4	2.7	1.0
27[2]	-	6	16	63	22	3.9	.8
28[2]	15	39	22	28	4	2.7	1.1
31[3]	5	7	31	50	14	3.6	1.0
35[2]	-	18	26	56	7	3.5	0.8
36[3]	1	11	32	58	6	3.5	0.8
37[3]	4	11	37	51	5	3.4	0.9
39[3]	5	26	48	22	5	3.0	0.9
40[3]	3	27	44	31	3	3.0	0.9
42[3]	7	25	52	20	4	2.9	0.9
44[3]	-	-	10	75	23	4.1	0.5
45[3]	4	20	42	34	7	3.2	0.9
47[2]	-	2	13	73	20	4.0	0.6
48[3]	-	2	6	73	27	4.2	0.6

[1]Item number corresponds to number on Teacher Survey

[2]A favorable response for this item would be strongly disagree (1) or disagree (2), but the score assigned was reversed when the scale score was computed, i.e., strongly disagree = 5.

[3]For this item, strongly agree = 5, strongly disagree = 1.

TABLE F-20: SCORE FREQUENCIES, MEANS AND STANDARD DEVIATIONS FOR ALL TEACHERS ON ALL TEACHER SURVEY LIKERT ITEMS-PERSONAL NUTRITION (n=518)

Item [1]	Score					Mean	Standard Deviation
	1	2	3	4	5		
1 [3]	1	26	29	186	271	4.4	0.8
4 [3]	5	8	17	189	291	4.5	0.7
10 [3]	5	22	65	259	160	4.1	0.8
11 [2]	9	78	37	229	160	3.9	1.9
16 [2]	14	3	15	204	277	4.4	0.8
18 [3]	8	5	17	212	270	4.4	0.7
23 [2]	12	11	38	251	201	4.2	0.8
29 [2]	7	4	9	229	263	4.4	0.7
30 [2]	8	20	57	200	223	4.2	0.9
32 [3]	12	17	51	291	136	4.0	0.8
33 [3]	2	8	19	275	205	4.3	0.7
34 [3]	2	28	31	288	162	4.1	0.8
38 [2]	6	10	15	295	184	4.3	0.7
41 [2]	32	220	89	137	32	2.8	1.1
43 [3]	14	82	239	140	34	3.2	0.9
46 [2]	58	161	123	124	44	2.9	1.2

[1] Item number corresponds to number on <u>Teacher Survey</u>

[2] A Favorable response for this item would be strongly disagree (1) or disagree (2), but the score assigned was reversed when the scale score was computed, i.e. strongly disagree = 5.

[3] For this item, strongly agree = 5, strongly disagree = 1.

TABLE F-21: SCORE FREQUENCIES, MEANS AND STANDARD DEVIATIONS FOR HEALTH PHYSICAL EDUCATION TEACHERS ON ALL TEACHER SURVEY LIKERT ITEMS- PERSONAL NUTRITION (n=107)

Item[1]	Score 1	2	3	4	5	Mean	Standard Deviation
1[3]	-	6	10	43	48	4.2	0.8
4[3]	3	3	4	49	47	4.3	0.9
10[3]	-	4	16	62	25	4.0	0.7
11[2]	3	18	13	51	22	3.7	1.1
16[2]	3	1	-	35	68	4.5	0.8
18[3]	-	-	1	47	59	4.5	0.5
23[2]	3	3	7	47	47	4.2	0.9
29[2]	4	2	2	47	51	4.3	0.9
30[2]	4	10	14	43	36	3.9	1.1
32[3]	2	4	6	64	31	4.1	0.8
33[3]	-	3	2	53	49	4.4	0.7
34[3]	-	9	14	58	26	3.9	0.8
38[2]	2	2	1	53	49	4.4	0.8
41[2]	6	63	10	26	2	2.6	1.0
43[2]	-	3	5	57	42	4.3	0.7
46[2]	15	43	30	17	2	2.5	1.0

[1]Item number corresponds to number on Teacher Survey

[2]A favorable response for this item would be strongly disagree (1) or disagree (2), but the score assigned was reversed when the scale score was computed, i.e. strongly disagree = 5.

[3]For this item, strongly agree = 5, strongly disagree = 1.

TABLE F-22: SCORE FREQUENCIES, MEANS AND STANDARD DEVIATIONS FOR HOME ECONOMICS TEACHERS ON ALL TEACHER SURVEY LIKERT ITEMS - PERSONAL NUTRITION (n=161)

Item[1]	Score 1	2	3	4	5	Mean	Standard Deviation
1[3]	-	4	-	44	110	4.6	0.6
4[3]	2	-	4	40	113	4.6	0.7
10[3]	1	3	11	70	74	4.3	0.7
11[2]	-	12	3	61	82	4.3	0.8
16[2]	4	-	2	57	95	4.5	0.8
18[3]	5	-	6	51	96	4.5	0.8
23[2]	3	-	9	73	72	4.3	0.8
29[2]	2	1	2	49	103	4.6	0.7
30[2]	2	2	10	46	96	4.5	0.8
32[3]	6	1	16	82	50	4.1	0.9
33[3]	-	1	6	81	69	4.4	0.6
34[3]	1	5	6	66	79	4.4	0.8
38[2]	-	1	6	80	68	4.4	0.6
41[2]	13	55	19	48	20	3.0	1.2
43[3]	-	2	8	88	57	4.3	0.6
46[2]	24	44	30	38	19	2.9	1.3

[1] Item number corresponds to number on Teacher Survey

[2] A favorable response for this item would be strongly disagree (1) or disagree (2), but the score assigned was reversed when the scale score was computed, i.e. strongly disagree = 5

[3] For this item, strongly agree = 5, strongly disagree = 1

TABLE F-23: SCORE FREUQENCIES, MEANS AND STANDARD DEVIATIONS FOR SCIENCE TEACHERS ON ALL TEACHER SURVEY LIKERT ITEMS-PERSONAL NUTRITION (n=140)

Item[1]	Score 1	2	3	4	5	Mean	Standard Deviation
1[3]	-	9	7	56	68	4.3	0.8
4[3]	-	1	4	56	78	4.5	0.6
10[3]	3	6	26	67	37	3.9	0.9
11[2]	1	29	12	63	35	3.7	1.1
16[2]	4	-	11	62	63	4.3	0.8
18[3]	1	4	4	64	66	4.4	0.7
23[2]	5	6	14	68	47	4.0	1.0
29[2]	1	-	4	78	57	4.4	0.6
30[2]	1	3	14	63	58	4.2	0.8
32[3]	2	10	19	79	30	3.9	0.9
33[3]	2	2	9	83	44	4.2	0.7
34[3]	1	5	3	98	33	4.1	0.7
38[2]	2	5	6	89	38	4.1	0.8
41[2]	7	54	33	39	7	2.9	1.0
43[3]	-	3	10	93	34	4.1	0.6
46[2]	11	36	36	38	19	3.1	1.2

[1]Item number corresponds to number on Teacher Survey

[2]A favorable response for this item would be strongly disagree (1) or disagree (2) but the score assigned was reversed when the scale score was computed i.e. strongly disagree =5.

[3]For this item, strongly agree = 5, strongly disagree = 1.

TABLE F-24: SCORE FREQUENCIES, MEANS AND STANDARD DEVIATIONS FOR SOCIAL SCIENCE TEACHERS ON ALL TEACHER SURVEY LIKERT ITEMS - PERSONAL NUTRITION (n=110)

Item[1]	Score 1	2	3	4	5	Mean	Standard Deviation
1[3]	1	7	12	43	45	4.1	0.9
4[3]	-	4	5	44	53	4.4	0.7
10[c]	1	9	12	60	24	3.9	0.9
11[2]	5	19	9	54	21	3.6	1.1
16[2]	3	2	2	50	51	4.3	0.8
18[3]	2	1	6	50	49	4.3	0.8
23[2]	1	2	8	63	35	4.2	0.7
29[2]	-	1	-	55	52	4.5	0.6
30[2]	1	5	19	48	33	4.0	0.9
32[3]	2	2	10	66	25	4.0	0.8
33[3]	-	2	2	58	43	4.3	0.6
34[3]	-	9	8	66	24	4.0	0.8
38[2]	2	2	2	73	29	4.2	0.7
41[2]	6	48	27	24	3	2.7	1.0
43[3]	3	3	2	62	38	4.2	0.8
46[3]	8	38	27	31	4	2.9	1.0

[1]Item number corresponds to number on Teacher Survey

[2]A favorable response for this item would be strongly disagree (1) or disagree (2), but the score assigned was reversed when the scale score was computed, i.e., strongly disagree = 5.

[3]For this item, strongly agree = 5, strongly disagree = 1.

TABLE F-25 SCORE FREQUENCIES, MEANS AND STANDARD DEVIATIONS FOR ALL TEACHERS ON THE SEMANTIC DIFFERENTIAL SCALE - MY OWN NUTRITION (n =518)

Adjective Pair	Score[1] 1	2	3	4	5	6	7	Mean	Standard Deviation
Healthy/ Unhealthy	3	4	6	15	19	175	257	6.3	1.0
Important/ Unimportant	16	20	14	16	12	107	273	6.1	1.6
Good/Bad	6	16	24	37	32	147	192	5.8	1.5
Pleasurable/ Painful	-	14	17	44	44	171	165	5.8	1.3
Positive/ Negative	4	6	9	33	28	175	201	6.1	1.2

[1] Most positive response = 7, most negative response = 1.

TABLE F-26: SCORE FREQUENCIES, MEANS AND STANDARD DEVIATIONS FOR HEALTH/PHYSICAL EDUCATION TEACHERS ON THE SEMANTIC DIFFERENTIAL SCALE - MY OWN NUTRITION (n=107)

Adjective Pair	Score[1] 1	2	3	4	5	6	7	Mean	Standard Deviation
Healthy/ unhealthy	-	2	2	2	2	40	53	6.3	1.0
Important/ Unimportant	2	3	4	1	4	28	46	6.1	1.5
Good/Bad	-	4	4	8	8	35	29	5.7	1.4
Pleasurable/ Painful	-	2	4	11	6	42	21	5.7	1.2
Positive/ Negative	1	3	2	7	2	45	27	5.9	1.3

[1]Most positive response = 7, most negative = 1.

TABLE F-27: SCORE FREQUENCIES, MEANS AND STANDARD DEVIATIONS FOR HOME ECONOMICS TEACHERS ON THE SEMANTIC DIFFERENTIAL SCALE - MY OWN NUTRITION (n=161)

Adjective Pair	Score[1]							Mean	Standard Deviation
	1	2	3	4	5	6	7		
Healthy/ Unhealthy	2	-	1	5	2	52	89	6.4	1.0
Important/ Unimportant	6	5	1	7	-	21	110	6.3	1.6
Good/Bad	3	3	5	10	7	41	80	6.1	1.4
Pleasurable/ Painful	-	7	6	10	7	52	67	6.0	1.4
Positive/ Negative	2	1	5	6	5	47	82	6.2	1.2

[1] Most positive response = 7, most negative = 1.

TABLE F-28: SCORE FREQUENCIES, MEANS AND STANDARD DEVIATIONS FOR SCIENCE TEACHERS ON THE SEMANTIC DIFFERENTIAL SCALE - MY OWN NUTRITION (n=140)

Adjective Pair	Score[1]							Mean	Standard Deviation
	1	2	3	4	5	6	7		
Healthy/ Unhealthy	-	-	6	9	51	62		6.3	0.9
Important/ Unimportant	7	6	7	4	3	33	68	5.8	1.8
Good/Bad	1	3	10	10	12	44	46	5.7	1.4
Pleasurable/ Painful	-	3	3	14	17	45	44	5.8	1.2
Positive/ Negative	-	1	1	12	12	52	48	6.0	1.0

[1] Most Positive Response = 7; Most Negative = 1.

TABLE F-29: SCORE FREQUENCIES, MEANS AND STANDARD DEVIATIONS FOR SOCIAL SCIENCE TEACHERS ON THE SEMANTIC DIFFERENTIAL SCALE - MY OWN NUTRITION (n=110)

Adjective Pair	Score[1] 1	2	3	4	5	6	7	Mean	Standard Deviation
Healthy/ Unhealthy	1	2	1	2	6	32	53	6.3	1.1
Important/ Unimportant	1	6	2	4	5	25	49	6.0	1.5
Good/Bad	2	6	5	9	5	27	37	5.6	1.9
Pleasurable/ Painful	-	2	4	9	14	32	33	5.8	1.2
Positive/ Negative	1	1	1	8	9	31	44	6.1	1.2

[1]Most positive response = 7; most negative = 1

TABLE F-30: SCORE FREQUENCIES, MEANS AND STANDARD DEVIATIONS FOR ALL TEACHERS ON THE SEMANTIC DIFFERENTIAL SCALE - MY TEACHING FOOD AND NUTRITION (n -518)

Adjective Pair	Score[1] 1	2	3	4	5	6	7	Mean	Standard Deviation
Healthy/ Unhealthy	10	5	10	94	51	114	159	5.6	1.4
Important/ Unimportant	15	9	19	95	55	79	164	5.4	1.6
Good/Bad	9	13	12	117	56	112	110	5.3	1.5
Meaningful/ Meaningless	8	14	15	93	59	114	130	5.4	1.5
Timely/ Untimely	10	12	22	115	48	115	111	5.2	1.5
Pleasurable/ Painful	5	6	15	133	62	117	100	5.3	1.4
Positive/ Negative	6	5	8	108	52	128	125	5.5	1.4

[1] Most positive response = 7, most negative response = 1.

TABLE F-31: SCORE FREQUENCIES, MEANS AND STANDARD DEVIATIONS FOR HEALTH/PHYSICAL EDUCATION TEACHERS ON THE SEMANTIC DIFFERENTIAL SCALE - MY TEACHING FOOD AND NUTRITION (n=107)

Adjective Pair	Score[1] 1	2	3	4	5	6	7	Mean	Standard Deviation
Healthy/ Unhealthy	1	2	-	22	12	24	28	5.5	1.4
Important/ Unimportant	-	-	3	25	12	20	26	5.5	1.3
Good/Bad	1	3	3	24	13	21	19	5.9	1.4
Meaningful/ Meaningless	1	-	1	28	6	25	24	5.5	1.3
Timely/ Untimely	1	-	3	29	9	25	19	5.3	1.3
Pleasurable/ Painful	2	2	1	30	11	24	16	5.1	1.4
Positive/ Negative	1	1	1	25	11	27	20	5.4	1.3

[1] Most positive response = 7, most negative = 1

TABLE F-32: SCORE FREQUENCIES, MEANS, AND STANDARD DEVIATIONS FOR HOME ECONOMICS TEACHERS ON THE SEMANTIC DIFFERENTIAL SCALE - MY TEACHING FOOD AND NUTRITION (n=161)

Adjective Pair	Score[1] 1	2	3	4	5	6	7	Mean	Standard Deviation
Healthy/ Unhealthy	1	-	1	6	7	45	85	6.4	1.0
Important/ Unimportant	1	1	2	8	7	25	100	6.4	1.1
Good/Bad	2	-	2	14	6	53	65	6.1	1.2
Meaningful/ meaningless	-	5	3	6	13	45	70	6.1	1.2
Timely/ Untimely	3	1	3	14	7	48	68	6.0	1.3
Pleasurable/ Painful	-	1	3	14	17	54	55	6.0	1.1
Positive/ Negative	-	-	-	11	11	53	68	6.2	0.9

[1] Most positive response = 7, most negative = 1.

TABLE F-33: SCORE FREQUENCIES, MEANS AND STANDARD DEVIATIONS FOR SCIENCE TEACHERS ON THE SEMANTIC DIFFERENTIAL SCALE - MY TEACHING FOOD AND NUTRITION (n=140)

Adjective Pair	Score[1] 1	2	3	4	5	6	7	Mean	Standard Deviation
Healthy/ Unhealthy	4	-	7	28	21	32	33	5.3	1.5
Important/ Unimportant	4	6	9	30	24	23	29	5.0	1.6
Good/Bad	1	8	4	38	23	27	21	5.0	1.4
Meaningful/ Meaningless	2	3	7	26	30	31	26	5.2	1.4
Timely/ Untimely	1	5	9	37	20	31	19	5.0	1.4
Pleasurable/ Painful	1	1	9	42	24	25	22	5.0	1.3
Positive/ Negative	1	2	5	32	20	34	28	5.3	1.4

[1] Most positive response = 7, most negative = 1.

TABLE F-34: SCORE FREQUENCIES, MEANS AND STANDARD DEVIATIONS FOR SOCIAL SCIENCE TEACHERS ON THE SEMANTIC DIFFERENTIAL SCALE - MY TEACHING FOOD AND NUTRITION (n=110)

Adjective Pair	Score[1] 1	2	3	4	5	6	7	Mean	Standard Deviation
Healthy/ Unhealthy	4	3	2	38	11	13	13	4.7	1.5
Important/ Unimportant	10	2	5	32	12	11	9	4.3	1.7
Good/Bad	5	2	3	41	14	11	5	4.4	1.4
Meaningful/ Meaningless	5	6	4	33	10	13	10	4.4	1.6
Timely/ Untimely	5	6	7	35	12	11	5	4.2	1.5
Pleasurable/ Painful	2	2	2	47	10	14	7	4.6	1.3
Positive/ Negative	4	2	2	40	10	14	9	4.6	1.4

[1] Most positive response = 7; most negative = 1

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