

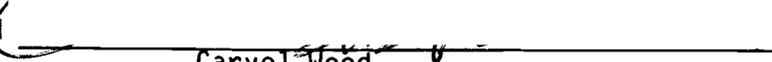
AN ABSTRACT OF THE THESIS OF

Joyce M. Marshall for the degree of Doctor of Philosophy in  
Education presented on April 29, 1986.

Title: A Comparative Study of Two Instructional Methods Employed  
in Teaching Nutrition Among Culturally Diverse Adolescents:  
Teacher-Oriented Lecture and Student-Oriented Instructional  
Design

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Abstract approved

  
Carvel Wood

The purpose of this study was to examine and compare the effectiveness of two approaches in nutrition education instruction among culturally diverse adolescents: the teacher-oriented lecture approach and the student-oriented instructional design approach. The study was designed to help culturally diverse students gain a basic understanding of practices that promote health and sound nutritional practices. The population consisted of junior and senior high-school students enrolled in a vocational technical institute in Florida. Each instructional approach consisted of two 1-1/2 hour presentations on nutritional concerns of adolescents. The teacher-oriented lecture presentation was organized around concepts taken from Ausubel (1968). It was designed to meet the academic and cultural needs of students by the lecture approach. The student-oriented instructional design

workshop was organized around concepts taken from Gagne (1974). It was designed to meet the academic and cultural needs of students by an instructional design approach. The study was organized as a pretest-posttest and experimental control group design. A nutrition knowledge questionnaire served as both the pretest and posttest. The four hypotheses were stated in the null and were treated by utilizing multiple regression analysis. The .05 level of significance was selected as the acceptable level of statistical significance. The study examined possible relationships between the posttest scores and the independent variables: pretest, group, gender, race, and occupation of the head of household. The results relative to the four hypotheses revealed that there was no significant difference in the adjusted mean knowledge scores of the nutrition questionnaire according to group, gender, race, or occupation of head of household. It was concluded that when the teacher-oriented lecture approach or the student-oriented instructional design approach of instruction is designed according to teaching factors conducive to learning for culturally diverse adolescents, both methods are equally effective.

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A Comparative Study of Two Instructional Methods Employed  
in Teaching Nutrition Among Culturally Diverse Adolescents:  
Teacher-Oriented Lecture and Student-Oriented Instructional Design

by

Joyce M. Marshall

A THESIS

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Date thesis is presented \_\_\_\_\_ April 29, 1986

Typed by Christina Pyle for \_\_\_\_\_ Joyce M. Marshall

To my parents, Beatrice and Louie Marshall,  
and my daughter, Kemi Lewis.

This thesis is dedicated in appreciation  
and love to the three people that have  
continually enriched my life with love,  
joy, respect, and inspiration.

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A Comparative Study of Two Instructional Methods Employed in  
Teaching Nutrition Among Culturally Diverse Adolescents:  
Teacher-Oriented Lecture and Student-Oriented Instructional Design

I. INTRODUCTION

Background of the Study

Since the 1920's, beginning with the influence of John Dewey, educators have been debating the most effective methods of teaching: teacher-oriented versus student-oriented (Anderson, 1959; Gayles, 1966; Oddi, 1983; Verner and Dickinson, 1967). These studies report that, in essence, neither approach is consistently better than nor different from the other.

Anderson (1959), Gage (1984), and McKeachie (1954) reported that the relationship between teaching methods and educational outcome has not been substantiated, due to low levels of empiricism and the false implications of statistically weak studies. Gage (1984) emphasized that in educational research

correlations or differences do not need to be large in order to be important. . . . The implication of research for practice depends not on the size of the effects but on the costs and benefits of any change in practice. (p. 90)

Within the last decade, however, there has been increasing evidence that teaching practices can and do have a major effect upon student achievement (Gage, 1984; Hannafin, 1983; Howe, 1983; Levine, Levine, and Eubanks, 1985; Stickney and Marcus, 1985). The results of recent reports involving student achievement in the inner city schools have been especially impressive. Research indicates that Title 1/Chapter 1 programs have been a major factor in improving the

academic achievement of disadvantaged youth (Bereiter, 1985; Hannafin, 1983; Levine, Levine, and Eubanks, 1985; Plunkett, 1985; Stickney and Marcus, 1985; Stickney and Plunkett, 1983).

The improved quality of education in many inner city schools is due directly to the allocation of federal funds to Title 1 of the Elementary and Secondary Education Act (ESEA) of 1965. Plunkett (1985) stated that the increase in academic achievement of students in inner city schools is directly related to the effectiveness of instructional practices sensitive to the special learning needs of inner city students. However, she warned that success does not mean that the achievement gap has been eliminated for disadvantaged children; it just means progress has been made towards narrowing it.

Howe (1983) noted that the success stories of Title 1/Chapter 1 programs are primarily at the elementary school level since more than 80 percent of ESEA funds are allocated for elementary schools. He is a strong advocate of increasing ESEA funds at the secondary level because the academic conditions of the inner city secondary schools are critical. Due to the rapid increase of Asians, Blacks, and Hispanics in the inner city schools, the current state of the urban secondary high schools in America requires immediate attention that includes "changes in course requirement, teaching practices, use of time, and the like to repair weaknesses in cognitive learning" (p. 171).

Many researchers have reported that disadvantaged and culturally diverse students have special learning needs (Anick, Carpenter, and Smith, 1981; Bennett, 1979; Gay, 1981). Instructors and

administrators in high-achieving disadvantaged schools report that their success is due in part to their "respect for minority cultures and . . . plenty of regard for students as individuals" (Bereiter, 1985, p. 541). Bruner (1966b) noted that if, in fact, cognitive achievement is a goal of education, then the curriculum must be sensitive to the needs of all students.

Identifying and meeting the needs of all students is a major goal of educational institutions. The achievement of this goal is difficult enough when one considers the various needs of traditional students in the classroom; it becomes an even greater challenge when educators consider and attempt to meet the special needs of culturally diverse students.

#### Need for the Study

Numerous studies, including the Ten-State Nutritional Survey (1972), report that the nutritional status of adolescents is a major public health concern. Because of their lifestyle, adolescents often eat away from home; therefore, they are generally responsible for their own food choices and diets. Their food choices are often nutritionally inadequate; their diets generally lack calcium, ascorbic acid, iron, and vitamin A (Hamilton and Whitney, 1979). Of special concern are the diets of Black, Hispanic, and low-income adolescents.

The effectiveness of instructional methods for adolescents, especially culturally diverse adolescents, is a concern among

researchers (Axelson and DelCampo, 1978). Research is needed to determine whether differences in instructional methods affect the nutritional knowledge of culturally diverse adolescents according to race, sex, and occupation of head of household.

### Purpose of the Study

The purpose of this study was to examine and compare the efficiency of two approaches in nutrition education among culturally diverse adolescents: the teacher-oriented lecture approach and the student-oriented instructional design approach.

It is obvious that one study cannot have a profound effect upon a large body of knowledge. However, this study should help clarify some of the confusion concerning the effectiveness of nutrition education teaching practices among culturally diverse adolescents. It may stimulate further studies concerning the relationship of teaching practices and culturally diverse students.

### Objectives of the Study

This study was concerned with the effectiveness of educational instruction among culturally diverse adolescents. The efficiency of instruction was determined by student response to a nutrition knowledge questionnaire developed by Passwater (1980). The objectives of this study were:

1. to determine if the demographic data of students who participated in this study affect student learning; and

2. to determine if there was a significant relationship between the students' knowledge score and the instructional teaching approach utilized.

### Hypotheses of the Study

1. There is no significant difference between the adjusted mean knowledge scores of students taught by the teacher-oriented lecture approach and students taught by a student-oriented instructional design approach.

2. There is no significant difference in the adjusted mean knowledge scores of students according to gender.

3. There is no significant difference in the adjusted mean knowledge scores of students according to race.

4. There is no significant difference in the adjusted mean knowledge scores of students according to occupation of head of household.

### Assumptions of the Study

The following assumptions were made before any generalizations or inferences were made:

1. The test instrument used to measure the objective responses of students concerning nutrition was sufficient to give a reliable indication of their nutritional knowledge.

2. The students involved in this study had never answered this particular nutritional questionnaire before the pretest.

3. The instructor was equally skilled in both the lecture and the instructional systems method of instruction.

4. The instructor treated all three groups equally.

5. The students were sincere in their willingness to participate in this study and answered the questionnaire to the best of their ability.

6. The time span of the experiment was adequate to allow for cognitive change involving the type of instruction received.

7. If no significant differences were found among co-variates for the treatment groups, differences in cognitive growth were due to the difference in treatment.

#### Limitations

1. An accurate measurement to ascertain the socioeconomic status of students was lacking.

2. The treatment was presented to Group A in the morning and Group B in the afternoon, so it was not possible to separate the effect of time of day from that of teaching method.

3. A major limitation of the study was the short time allocated for treatment.

4. Another major limitation was the position of the instructor as a visitor to the school. The instructor was not "part" of the school system.

### Definition of Terms

Adolescent: a teen-aged person. In this study the term referred to high school juniors and seniors.

Culturally diverse: a term pertaining to people of various racial groups.

Disadvantaged students: students whose advantages while growing up do not necessarily include the development of strong academic skills.

Educational instruction: two 1-1/2 hour presentations on nutrition and the adolescent. The presentation incorporated the following nutritional concerns of adolescents: weight control, sports and exercise, alcohol and drugs, acne, and pregnancy.

Instructional design approach: a student-oriented approach to instruction that meet the needs of students by determining (a) what must be learned, (b) what teaching procedures and resources will be used, and (c) how the instruction will be implemented and evaluated.

Lecture approach: a teacher-oriented approach to instruction. To help students achieve specific objectives, teachers motivate and modify student behavior by presenting material so logically that it is meaningful to the existing knowledge of the student. For this study, classroom teaching is based upon a verbal presentation and the use of a blackboard.

Pre-adult: a student enrolled in either high school or college classes.

Socioeconomic: a term referring to both the social and the economic

Socioeconomic: a term referring to both the social and the economic status of an individual.

Student-oriented instructional design approach:

1. instructor encourages suggestions from the class;
2. techniques and steps for activities come from the group;
3. the instructor encourages group consideration of individual problems;
4. students direct their attention to each other unless they need guidance or information from the instructor.

(DiVesta, 1954)

Teacher-oriented lecture approach:

1. suggestions are evaluated by an instructor who advises or leads class to correct conclusion;
2. techniques and steps for activities are given by the instructor;
3. the instructor considers and handles individual problems and questions; and
4. the instructor is the main focus of attention.

(DiVesta, 1954)

## II. REVIEW OF LITERATURE

### Educational Strategies

Proponents of the teacher-oriented lecture approach to instruction are primarily concerned with the product of instruction; whereas, proponents of the student-oriented instructional design approach to instruction are primarily concerned with the internal process of learning (Romiszowski, 1981; 1984). John Dewey (1916), Carl Rogers (1951), and Jerome Bruner (1966a; 1966b) were supporters of the latter. They were psychologists who viewed the internal process of learning as the primary function of education. On the other hand, B. F. Skinner (1968), B. S. Bloom (1979), and David P. Ausubel (1968) were psychologists who viewed the final product or mastery of subject matter as the primary goal of education. They supported the former approach. Gagne (1977) presented an instructional system approach, one which places a balance between product and process.

Dewey (1916) was a strong advocate of educational programs geared to the needs and desires of the individual student. His emphasis on progressive education spearheaded research for more effective teaching methods and promoted student-oriented instruction. For Dewey, student-oriented instruction was a means of bringing relevance to the act or process of instruction by having students take responsibility for their own learning (Wispe, 1953).

According to Rogers (1983), students want to learn because "young human beings are intrinsically motivated to a high degree" (p. 148).

The role of the teacher, therefore, is to facilitate learning. To help facilitate learning teachers should be good listeners, accept, trust, understand, and be empathic to the student (Rogers, 1983).

Rogers believed that the focus of student-oriented education

is primarily on fostering the continuing process of learning. The content of learning, while significant, falls into a secondary place. Thus, a course is successfully ended not when the student has "learned all she needs to know"; but when she has made significant progress in learning how to learn what she wants to know. (p. 189)

Bruner (1966a; 1966b) was a strong advocate for discovery learning. His major focus was upon the processes by which students learn and solve problems, rather than the outcome of specific products of subject matter. He viewed the internal thought processes as the primary function of education, and the final output or product of instruction as only of secondary importance (Romiszowski, 1981). According to Bruner, "There are too many particulars to teach and to master" (1966b, p. 38). The objective of education should be for training students to participate in the process of establishing knowledge by using their minds with "confidence, energy, honesty, and technique" (1966a, p. 121).

Skinner was concerned with the study of behavior. Learning, according to Skinner (1958), is an observable change in behavior. The internal process of thinking and learning is not as important as the final product or the desired behavior. To change behavior, and thereby promote learning, Skinner advocated that instructors must arrange the stimulus, observe the learner's response, and reinforce desirable learner responses. To produce a desired behavior or end

product, students need to be adequately reinforced for correct responses. However, the organizational structure of the conventional classroom is not designed for the teacher to adequately reinforce students. Therefore, "if the teacher is to take advantage of recent advances in the study of learning, she must have the help of mechanical devices" (Skinner, 1968, p. 22) or teaching machines (Skinner, 1958; 1968). With the use of teaching machines or programmed instruction, students are given immediate feedback or reinforcement after their response (behavior) to a stimulus (content) (Skinner, 1968). Students are then able to learn and complete assignments according to their individual needs.

For Ausubel (1968), the product of instruction--desired subject-matter knowledge--is much more important than the internal process of instruction. To guarantee the output or final product of instruction, an expository approach of instruction is used in which "the entire content of what is to be learned is presented to the learner in final form" (Ausubel, 1963, p. 16). Therefore, the main goal of education is the mastery of well-organized subject-matter (Romiszowski, 1981).

According to Ausubel (1963; 1968), it is the teacher's responsibility to organize and present subject matter in such a way that it is meaningful and relevant to the learner. As an aid to learning subject-matter knowledge, Ausubel developed a technique called an advanced organizer. When employing the use of an advanced organizer, the instructor gives students an introduction or overview of the main ideas to be presented (Ausubel, 1968). The advanced

organizer "provides patterns of anchors for the new information" (Gage and Berliner, 1984 p. 315). Thus, meaningful learning can take place because the instructor is able to relate new material to what the learner already knows (Ausubel, 1963; 1968).

Bloom is considered to be one of the top experts in the world on mastery learning (Travers, 1982). Mastery learning is comparable to mastery of learning objectives; the output or final product is equal to accomplishing 100 percent of the objectives (Romiszowski, 1981). According to Bloom (1979), the mastery approach to education is an individualized form of instruction which motivates students, provides them with immediate corrective feedback, and allows them the time they need to demonstrate competency in a given subject area. Mastery learning also allows the teacher the opportunity to "teach each child as though he/she were gifted" (p. 157). In addition, mastery learning helps to improve students' self-concept and attitude toward school and learning by giving them the opportunity to be successful academically.

Gagne's system for instructional design is based on an input/output approach (Romiszowski, 1981). The output or product includes objectives for learning defined in clear behavioral terms; that is, "the objectives of learning are defined, the structure of these objectives within each topic is determined, and the conditions for motivation are determined" (Gagne, 1965, p. 250). The input includes the learning conditions which can be predesigned or extemporaneously designed as long as the method is appropriate for each learning act. The internal process itself involves the

interaction of learning and memory. For learning to occur, the learner recalls from memory previously learned skills and then integrates them into a newly acquired form or product (Gagne, 1977; Gagne and Briggs, 1974). In sum, Gagne's (1977, pp. 39-40) system involves:

1. Student performance or the desired learning and observable behavior which is the final product.
2. Internal conditions or prerequisites that "must be present in order for the learning to occur. These consist of capabilities which are recalled from the learner's memory, and which then become integrated into the newly acquired capability."
3. The external conditions which provide stimulation to the learner. These may be visually present objects, symbols, pictures,

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the characteristics of the  
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the effectiveness of

ion on a given subject  
the purpose of instruction,  
or a method of teaching by discourse as opposed to conversation or

seminar" (Cashin, 1985, p. 1). Even though the lecture is often criticized, it is the most common form of instruction in secondary schools and colleges (Axelrod, 1973; Delaney, 1961; Gagne, 1965; Sweeney and Reigeluth, 1984). The fact that the lecture is used so extensively is an indication that it is a creditable instructional method (Gage and Berliner, 1984; Sweeney and Reigeluth, 1984).

The lecture is considered an effective method of instruction because:

1. It is very economical. The ratio of students to instructor can be very large (Gage and Berliner, 1984; Sweeney and Reigeleith, 1984).

2. It is very flexible and can be easily adapted to a new or unexpected situation, and to the characteristics, needs and interests of students (Darrell, 1942; Gage and Berliner, 1984).

3. It is a way of presenting the most recent and latest materials not widely available or in textbooks (Delaney, 1961; Gage and Berliner, 1984).

4. It is a means of presenting and clarifying large amounts of factual information (Ausubel, 1968; Gayles, 1966; Wispe, 1951).

5. The lecturer is in a position to motivate, stimulate, and inspire learning (Brown and Thorton, 1963; Gagne, 1965).

6. The lecture is teacher-oriented and permits maximum teacher control (Cashin, 1985).

The lecture is often criticized and considered to be ineffective because:

1. The learner is mentally passive, thereby opportunities for maximum learning to take place decrease (Bruner, 1966a; 1966b; McKeachie, 1978).

2. Since it is teacher-oriented, "it can become a vehicle for displaying the teacher's hobbies and pet interests rather than for fostering the achievement that students want and need" (Gage and Berliner, 1984 p. 482).

3. It does not provide the lecturer with immediate feedback in terms of student learning (Cashin, 1985; Gagne, 1965).

4. It is difficult to keep the full attention of students for long periods of time (Edmiston and Braddock, 1941).

5. Many instructors misuse and overuse the lecture to the exclusion of other methods which may be better suited to their instructional goals or objectives (Gage and Berliner, 1984).

When the advantages and disadvantages of the lecture method are taken into consideration, researchers (Ausubel, 1968; Delaney, 1961; Gage and Berliner, 1984; Sheffield; 1974) report that the criticism of the lecture approach to instruction is not of the lecture method itself, but of the behavior of the lecturer and the improper use of the lecture.

Behavior of lecturer. Not every teacher is a good lecturer (Gage and Berliner, 1984; McKeachie, 1978). An instructor is most effective as a lecturer when his/her personality is suited for lecturing, that is, when the lecturer's voice, eyes, style, mannerisms, and facial expressions communicate enthusiasm for the subject matter and thereby

promote student interest in learning (Gage and Berliner, 1984; McKeachie, 1978; Sheffield, 1974).

The following teaching characteristics of an effective instructor were listed by Sheffield (1974) after surveying 19 Canadian universities

1. has mastery of subject
2. lectures are well prepared and organized
3. relates subject to life and is practical
4. encourages students to ask questions and express their opinions
5. is enthusiastic about subject matter
6. is approachable and friendly
7. is concerned about student
8. has a sense of humor
9. is kind and sympathetic
10. uses teaching aids effectively.

Sheffield (1974) reported that studies conducted in other western countries, including the United States, show similar patterns.

From a survey involving 700 students, Weaver (1981) reported that a lecturer should possess the following six characteristics:

1. is knowledgeable about subject
2. has well-prepared and organized lecture
3. holds attention of students
4. is competent
5. is interesting
6. is enthusiastic.

These characteristics are very similar to the characteristics mentioned in the Sheffield survey.

McKeachie (1978) stated that even though personality traits are a major factor in being an effective lecturer, there are certain behaviors or techniques which an instructor can use to be a more efficient lecturer. McKeachie utilized a student committee to ascertain effective lecturing techniques. According to him, the following techniques are favored by students:

1. place an outline of the lecture on the blackboard
2. at the end of the lecture summarize the major points
3. use demonstrations or movies to break up class period
4. use practical examples from real life
5. have students break into small groups to discuss specific problems.

Effective use of the lecture. As an instructional method, the lecture can be used effectively and efficiently for the dissemination of information to large groups of students (Ausubel, 1968; McKeachie, 1978). Research indicates that the lecture as a teacher-oriented method of instruction is more effective than are instructional methods which are student-oriented, with:

1. less able students (Calvin, Hoffman, and Harden, 1957);  
Snow and Peterson, 1980; Ward, 1956; Wispe, 1951);
2. subject matter that is organized for a specific group of students (Costin, 1971; Verner and Dickinson, 1967);

3. material that should be remembered for only a short period of time (Bane, 1925; McLeish, 1968);
4. subjects which are more conducive to the lecture method such as chemistry and other sciences (Brown, Bakhtar, and Youngman, 1984; Delaney, 1961);
5. material that is meaningful and not too detailed, abstract, or complex (Ausubul, 1968; Verner and Dickinson, 1967).

The focus of attention in the lecture or teacher-oriented approach to instruction is upon the instructor, who talks to students, asks questions, assigns assignments, and evaluates students on their learning (DiVesta, 1954; Guetzkow, 1954; Haigh and Schmidt, 1956).

#### Characteristics of Instructional Design

The focus of attention for instructional design or student-oriented instruction is upon the learner, who is encouraged to express opinions, ask questions, and participate in setting cognitive and affective goals (Costin, 1971; McKeachie, 1954; Wispe, 1951).

The controversy over which teaching method, teacher-oriented or student-oriented, is the most effective began in the 1920's when John Dewey promoted student-oriented instruction over teacher-oriented instruction (Wispe, 1951). In 1959, Anderson published a critical review of educational studies comparing the effectiveness of teacher-oriented instruction to student-oriented instruction. He reported that the results from years of educational research comparing teacher-oriented and student-oriented methods of instruction were inconclusive and contradictory. He wrote,

Teacher-centered and learner-centered methods have been repetitiously investigated not because there were well conceived ideas as to how one would lead to superior learning, but merely to find out if one style was superior to the other. We were not fortunate enough to find that one method is consistently better than or even consistently different from the other; thus, we are now forced to explore new avenues. (pp. 211-212)

Whether in response to Anderson's request (1959), Sputnik and the educational task ahead (Bruner, 1966b; Plunkett, 1985), or the National Defense Educational Act of 1958, which emphasized an improvement in curriculum (Howe, 1983), educators in the 1960's began to develop a student-oriented curriculum utilizing an instructional design or systems approach to teaching (Kemp, 1977).

The systems approach originated in the field of systems engineering. It was applied to "the design of electronic, mechanical, military and space systems" (Romiszowski, 1981, p. 18) before being applied to education. In education, instructional design or the systems approach is viewed as a means of increasing the effectiveness and efficiency of instruction (Davis, 1981; Kemp, 1977). According to Logan (1982), a system in education consists of three parts: teachers, students, and curricula.

There are many proponents of an instructional design approach to education, and there are just as many models (Romiszowski, 1981). For the purpose of this review, three very different instructional design models (Kemp, 1977; Keller, 1968; Osterman, 1980) will briefly be discussed.

The Systems Approach. According to Kemp (1977), the systems approach is a process

based on the method of scientific inquiry, whereby a problem is recognized, a hypothesis is formed, experiments are conducted, and data are gathered from them that lead to a conclusion about the accuracy of the hypothesis. If it is correct, the results are used to produce or improve the products of technology. If not, new approaches are tried until success is realized. (pp. 6-7)

Kemp advocated an instructional design model that can be applied to an individual topic, a class unit, or a complete course of instruction. He cited three essential elements for developing an efficient and effective instructional plan:

1. To list specific objectives of what the student is expected to learn.
2. To determine what activities and resources will help the student meet learning objectives.
3. Continued evaluation of student progress toward meeting learning objective.

The Kemp model is simple, easy to apply, and very flexible. It is circular and contains eight steps:

1. Identify goals, select major topics and determine general purposes.
2. Ascertain characteristics of the group such as learning conditions and learning styles which may affect the academic achievement of the student.
3. Write clear and specific learning objectives; the students are aware of what they should know or be able to do when they are evaluated.
4. Determine subject content in terms of learner objectives.

5. Pre-assess students to determine if they have the necessary prerequisites or background preparation to study the topic.

6. Ascertain the most effective and efficient instructional methods and resources available so the student will accomplish the objectives.

7. Determine what support services are needed to implement the design plan and achieve objectives.

8. Provide evaluation--a means of measuring student achievement according to the objectives and a way to revise and reevaluate the instructional plan as needed.

The Keller Plan. The Keller Plan or Personalized System of Instruction (PSI) is an instructional design approach utilizing individualized instruction and principles of mastery instruction (Bloom, 1979; Keller, 1968; McKeachie, 1978; Romiszowski, 1981).

Keller (1968) described five features which distinguished his plan from the more traditional teaching procedures:

1. The go-at-your-own-pace feature, which permits a student to move through the course at a speed commensurate with his ability and other demands upon his time.
2. The unit-perfection requirement for advance, which lets the student go ahead to new material only after demonstrating mastery of that which preceded.
3. The use of lectures and demonstrations as vehicles of motivation, rather than sources of critical information.
4. The related stress upon the written word in teacher-student communication; and, finally:
5. The use of proctors, which permits repeated testing, immediate scoring, almost unavoidable tutoring, and a marked enhancement of the personal-social aspect of the education process." (p. 83)

The Keller Plan is popular among both educators and students. Instructors rate the Keller Plan high because it is very effective on the basis of content learning (McKeachie, 1978), especially among students who have weak academic backgrounds (Cross and Semb, 1975). Students generally rate the Keller Plan higher than the traditional lecture; they report that they find it more enjoyable than the lecture (Gage and Berliner, 1984; McKeachie, 1978). Students indicate that self-pacing and personal interaction with a tutor are the best features of the Keller Plan (Gage and Berliner, 1984; McKeachie, 1978).

Keller (1968) reported that an attractive feature of his plan is that "differences in social, economic, cultural, and ethnic backgrounds" are in essence nullified (p. 84). In actuality, the non-traditional or culturally diverse student can be assured of "at least a modicum of individual attention, approval, encouragement, and a chance to succeed" (p. 84).

The Feedback Lecture. The Feedback Lecture is a student-oriented teaching approach of the traditional teacher-oriented lecture. The approach was originated at Oregon State University in 1974 by Osterman (1980; 1984a). It is an instruction method utilizing "learning principles and improved conditions to the learning tasks delivered via the lecture" (Osterman, 1980, p. iii). Another aspect of the Feedback Lecture is that it actively involves students in the learning process.

Thus, this instructional design method views both process and product with equal importance.

The process of the Feedback Lecture involves the use of guided decision-making which involves students in small group discussions and problem-solving activities before, during, and after the lecture (Osterman, 1982; 1984 ). The product involves the transmission of information through the design and structure of the Feedback Lecture itself. Instructors using the Feedback Lecture Approach distribute a study guide to students before the lecture. The study guide contains a pretest, suggested study methods and procedures, instructional objectives, new terminology, visuals, and an introductory theme page that give students a preview of the lecture (Osterman, 1982; 1984b; Osterman, Christensen, and Coffey, 1985).

During class time, students are able to follow the lecture with a set of notes provided in the study guide. In a 50-minute class session, the instructor lectures for the first 20 minutes. For 5 to 8 minutes students meet in groups of two or three to discuss a question related to the reading or the first half of the lecture. Following that, the instructor provides the students with the correct answer to the discussion question and lectures for another 20 minutes. After the second lecture session, students complete activities listed in the study guide which are designed to serve as a "bridge" between lectures (Osterman, 1980; 1982; 1984b; Osterman et al., 1985). The Feedback Lecture is a compromise between the traditional teacher-oriented lecture and the use of student-centered techniques.

## Actual Studies

### Lecture Approach

Bane (1925) conducted a series of five scientifically controlled experiments over a three year period to compare the effectiveness of the lecture method with the class-discussion method of teaching. Five instructors and 510 students were involved in the study. Each instructor taught both a lecture and a discussion section. By controlling for student intelligence, the amount of teaching time, subject matter, assignments, and tests, the design of the study was constructed so that there was only one variable--the technique of instruction. To help determine the effectiveness of each instructional method, "immediate recall tests were given at intervals throughout the experiments, and delayed recall tests were given from one to six months after completion of the experiment proper" (p. 302). On the delayed recall tests, all of the class discussion sections scored significantly higher than the lecture sections. On the immediate recall test, three of the five lecture sections scored significantly higher than the discussion sections.

Bane concluded that:

1. The lecture and class-discussion methods are about equally effectively for immediate recall of subject material.
2. The class-discussion method is more effective than the lecture in delayed recall of content material.

3. "The lecture method is more suitable for the immediate recall of subject-matter than for its retention to a later period, while the reverse is true of the class-discussion method" (p. 302).

Spence (1928) referred to the debate on teaching methodology as the need to determine "the most effective kind of working relationship between student, instructor, and subject" (p. 454). He designed a study comparing the lecture method to class discussion. Students involved in this study were enrolled in two semesters of Educational Psychology. The students were divided into two large sections with a minimum of 120 students. The two instructors remained with their own section for the entire year. During the first semester, instructor B used the lecture method while instructor A used the discussion method; during the second semester, instructor B used the discussion method and instructor A used the lecture method. All students were given a pretest in September, a test at the end of the first semester, and a posttest at the end of the second semester. The results were significant in that the lecture method was more effective than the discussion method in terms of improved measurable results on examinations.

Edmiston and Braddock (1941) conducted a study at twelve secondary schools in Ohio to determine if attention of students varied with different teaching procedures and to ascertain the implications of any variations for improved teaching. After observing classes in the high schools, nine teaching methods or procedures were determined. They were: laboratory, demonstration, lecture, student reports, general discussion, teacher-dominated

general discussion, pupil-dominated general discussion, rapid-fire question-answer, and workbook. The scorers were well-trained and were strategically located in the classrooms. They charted approximately 150 hours in over 200 classes. The teaching procedures were ranked as follows: student reports, demonstration, student-dominated general discussion, workbook, lecture, rapid-fire question-answer, teacher-dominated general discussion, general discussion, and laboratory. Edmiston and Braddock reported that teaching methods which include the following traits should produce the best attention:

1. Appropriateness to the learning situation
2. Student participation
3. Thorough previous preparation
4. Definiteness and clearness of assignment to pupil
5. Combined visual and auditory learning. (p. 672)

Faw (1949), using nondirective teaching techniques developed by Carl Rogers, compared the effectiveness of teacher-oriented teaching methods to student-oriented teaching methods. His study focused upon comparing the intellectual and emotional growth of students in the student-oriented or nondirective discussion group, where the student assumed responsibility, to the intellectual and emotional growth of students in the teacher-oriented or directive discussion group, where the instructor assumed responsibility. The results of this experiment were:

1. There was a significantly greater amount of participation in the non-directive group than in the directive group.
2. The students in the nondirective group expressed their ideas in relation to their personal feelings and experiences, whereas

students in the directive group were more intellectual and less personal.

3. The majority of students preferred the nondirective techniques for their social and emotional value. However, approximately two-thirds of the group felt they gained more intellectually from the directive group.

4. Three objective examinations were administered to the students throughout the semester; the student-oriented group scored significantly higher than the teacher-oriented group.

The implications of this study indicate that the nondirective techniques enhance both the emotional and the intellectual growth of students.

The findings of Faw's study conflict with those of Asch's (1951). Asch compared the intellectual, social, and emotional effectiveness of nondirective (student-oriented) teaching to directive (teacher-oriented) teaching. Four general psychology classes were involved in the study. Asch taught all four sections. The experimental section consisted of 23 students who were taught by the nondirective method. The control group consisted of 101 students who were enrolled in the other three sections. These students were taught by the directive or teacher-oriented method. At the end of the course all four sections took an objective examination. Students in the nondirective section had already received their final grade before they took the examination. Asch reported that the teacher-oriented groups did significantly better on the final examination than the student-oriented group. However, information

from the supplementary evaluation data form, completed by both groups, "indicate that the nondirective students gained a greater knowledge of diversified subject matter and did more independent reading and thinking about psychology than did the control subjects" (p. 19). He reported that there was no significant difference in change of attitude between the two groups and that there was a significant difference toward favorable changes in the emotional adjustment of the nondirective group.

A study conducted by Wispe (1951) involved eight sections of an elementary course in Social Relations at Harvard University. Four sections were designed to be highly structured and teacher-oriented, and four sections were designed to be unstructured and student-oriented. Two observers, behind a one-way screen, used an interaction scoring instrument to categorize specific behaviors for all of the class meetings. At the end of the course, a final examination and a questionnaire were administered to all eight sections. Wispe found that, although the students enjoyed the unstructured sections, most of them preferred the teacher-oriented sections because they were more helpful in preparing for examinations. He also found that there was no statistically significant difference in scores on the final examination between the structured and unstructured sections. However, when the student-oriented and teacher-oriented methods were analyzed in relation to the "better students" and the "poorer students," the poorer students benefited more from the highly structured sections.

The implications of the study are:

1. When grades are a primary concern, students will generally prefer teacher-oriented instruction.
2. Poorer students benefit more from teacher-oriented instruction.
3. Instructors should consider emotional as well as intellectual needs of students.

In the previous study, by Wispe, teacher-oriented instruction was preferred over student-oriented instruction when grades were a major consideration. Therefore, Haigh and Schmidt (1956) conducted a study comparing the teacher-oriented method to the student-oriented method for mastery of subject matter when grades were not a factor. According to them, the importance of a good grade to American students is sufficient to motivate them to acquire knowledge regardless of the teaching method employed.

This experiment involved 110 students, two instructors, and two graduate assistants. The students were divided into three teacher-oriented groups and three student-oriented groups. The students were enrolled in the second and third quarters of a three-quarter sequence course in psychology. At the end of the third quarter, all of the students took an examination to measure their acquisition of knowledge. The examination did not influence their grade. The results indicated no statistically significant difference between the teacher-oriented classes and the student-oriented classes in acquiring knowledge of subject matter.

Although the literature may discuss certain characteristics of a good lecture (Edmiston and Braddock, 1941; Weaver, 1981; Wood and Rosbe, 1985), there is very little empirical research on the lecturing styles of instructors, especially in relation to subject area.

A study by Brown, Bakhtar, and Youngman (1984) analyzed lecturing styles of 258 English university lecturers in relation to subject area and years of teaching experience. The authors sent inventories to 400 lecturers at the Universities of Nottingham and Loughborough; 258 instructors completed and returned the inventories. The inventories contained a biographical section, a statement on lecturing and lecture preparation, a section of the respondents' likes and dislikes about the lecture, and an open-ended section concerning advice for a young lecturer.

The authors identified five distinctive pattern of lecturing styles:

1. Oral Lecturers. These instructors structure their lectures, but they do not utilize written objectives or tell students the objectives. They do not use the blackboard or overhead projector; instead, they depend on their verbal ability and skill.

2. Exemplary Lecturers. This group of instructors organize their lectures according to their objectives. They do not read from their notes or present too many details; they are logical and employ the use of visual aids to supplement their lectures.

3. Information Providers. These instructors are structured; however, they have a tendency to be too detailed and to read from

their notes. Even though they use visual aids, they are poor presenters.

4. Amorphous Lecturers. This group does not have well structured lectures, nor do they have objectives. Thus, their presentations are poor.

5. Self Doubters. These lecturers do not follow the content or structure of their notes, and, generally, they feel they do not meet their objectives.

The five lecturing styles were associated significantly with subject area. Oral Lecturers were primarily in the humanities and social sciences, Exemplary Lecturers were primarily in the biomedical sciences, Information Providers and Amorphous Lecturers were primarily in science and engineering, and Self Doubters were in all subject areas. However, there was no statistically significant association between lecturing style and years of experience. The authors determined that lecturing styles are associated with subject area and that experience is not a major factor in determining lecturing styles.

### Instructional Design Approach

Advocates of an instructional or systems approach to education are concerned with cognitive, physical and affective needs of the student (Romiszowski, 1981). According to Davis (1981), to be both efficient and effective in the classroom, instructors need to select instructional methods that not only aid in the mastery of subject matter, but also meet the needs of the students. Therefore, many

studies in the literature involving the principles of instructional design discuss the effectiveness and efficiency of teaching methods in relation to the student's attitude toward learning.

The following studies compare a traditional teacher-oriented method of instruction to a student-oriented or instructional design method of instruction.

MacNeil (1967) conducted a study at the University of Minnesota. One hundred thirty-two students enrolled in a lower division nutrition course were randomly assigned to either an experimental or a control group. The purpose of the study was to examine two methods of instruction, lecture-discussion and self-directed, in relation to effectiveness in meeting the course objectives, personality characteristics of the students, and the attitude of students toward the instructional method.

The control group was defined as the traditional lecture-discussion, teacher-oriented method of instruction. The experimental group was defined as a student-oriented, self-directed instructional design method of instruction. The same instructor taught both groups.

The lecture-discussion method consisted of lectures and other instructor-controlled activities. Students in this group met for the regular 45-minute class sessions, three times each week. Students in the self-directed method met for only one-fifth of the regular class sessions planned. These students were involved in individual work and student-initiated and student-controlled group discussions.

The results of the study indicated that students taught by the

lecture-discussion method showed statistically significantly greater gains in academic achievement than students in the self-directed group. Personality characteristics had a significant effect upon academic achievement. Students in the lecture-discussion group who had personality characteristics similar to those of students in the self-study group had a higher level of academic achievement. MacNeil reported that the students' attitudes toward method of instruction were not significant.

Kazerani in 1977 published a study comparing the effectiveness of the traditional teacher-oriented lecture to a student-oriented modular delivery system with a facilitator. The modular delivery system consisted of a set of student handbooks with predesigned modules, a facilitator's handbook with the same modules, and audio-visual materials. The modular delivery system was designed to provide inservice education to small isolated areas in Colorado while being cost effective to the University. Three test sites were selected. For test site 1, a professor from Colorado State University traveled off campus to teach the course via the traditional lecture method. The course content was equivalent to eight modules of the modular delivery system. This was the control group. Test site 2 was located on campus at the University of Northern Colorado. The first three modules were tested. Test site 3 was at the campus of Colorado State University; eight modules were utilized. The results indicated that students at test sites 2 and 3 (modular system used) had statistically higher knowledge scores than students at test site 1 (traditional lecture used).

Lee and McLean (1978) compared academic achievement and attitude of students toward "educational psychology" and "teaching" for three methods of instruction: the traditional lecture, a modified method of mastery learning, and a combination of the two instructional methods. The modified mastery method included elements of Bloom's Learning for Mastery model and Keller's Personalized System of Instruction model. The lecture method was very formal. The combined instructional method included both mastery and lecture techniques. Two hundred students enrolled in an Educational Psychology course were divided into eleven sections. There were two modified mastery learning sections, two traditional lecture sections, and seven combined instructional sections. A multiple-choice mid-term and final examination were used to ascertain academic achievement. A semantic differential method was utilized to determine student attitudes. The authors found that a statistically significant difference existed among the three teaching methods. Students in the modified mastery sections had higher achievement scores than students in either the traditional lecture group or the combined instructional group. On the other hand, the authors reported mixed findings concerning improved attitudes toward "educational psychology" and "teaching." Students in the modified mastery section improved their attitudes toward "educational psychology," but not toward "teaching."

In a recent study, Mishra (1984) examined the instructional effectiveness of high school teachers according to teaching methods and student attitudes. Two hundred fifty-three tenth grade high

school students from ten classrooms, and five teachers from five high schools were involved in this study. Each teacher taught a class using the lecture method and a class using the discussion method. The classes met twice a week for six weeks. At the end of the six-week period, students rated the instructors on 22 items, which included teacher preparation and organization, stimulation of student interest and student participation. The results of the study indicated no significant difference in the ratings of the instructors' classroom performance by students in terms of the students' attitude toward education and in terms of the teaching method employed.

Results concerning the superiority of an instructional design approach of instruction to the lecture approach are inconclusive. As was true with the lecture method, more empirical research is needed on how to make teaching more effective so that learning is more effective (Sheffield, 1974). According to Davis (1981) instructors must be both efficient and effective. They must be flexible. They must be willing to use either student-oriented or teacher-oriented instructional approaches, depending on the needs of the student.

Sheffield (1974) stated that:

As people, professors who are effective teachers differ greatly from one another. None is perfect, none a paragon.

Good teachers are competent in and enthusiastic about their fields.

They have respect for students; they think students are important; they care about their students.

However much individual professors differ in their personalities, their styles and their methods, the resulting general patterns of effective teaching are essentially similar in all settings.

There is no one way to be an effective teacher.

Attitudes toward students and teaching are more important than methods and techniques" (p. 215).

### Culturally Diverse Students

According to Wispe (1953), in order to maximize the learning process, instructors must utilize instructional practices which consider the students' needs. He stated that an effective teacher takes into consideration both classroom structure and individual needs and emphasizes the necessity of "making teaching methods commensurate with students' emotional-intellectual needs in order to make learning maximally effective" (p. 149).

For the purpose of this study, the review was restricted to two classroom factors which may affect the academic achievement of culturally diverse students: instructional method and teacher expectation of the student. To best serve the educational needs of culturally diverse students, teachers should utilize instructional strategies which take into consideration the cultural background and needs of each student. When instructors are sensitive to the cultural background of students, students are more motivated and achieve better academically (Snow and Peterson, 1980; Wang and Dwyer, 1975).

Historically, culturally diverse students "are products of many years of exposure to curricula that failed to meet their needs and develop their intellectual potential" (Fields, 1984, p. 35).

In general, researchers (Bruner, 1966b; Dunn and Dunn, 1979; Howe, 1983; McKeachie, 1978; Snow and Peterson, 1980) discuss the importance of recognizing and understanding the needs of students in order to develop effective and efficient curricula. In particular, researchers (Beane, 1985; Bennett, 1979; Gay, 1981) report the necessity of not only recognizing but accepting and understanding the background and cultural differences of ethnically diverse students.

According to Gay (1981), the attitude of many culturally diverse students about learning and education are incompatible with the normal and conventional expectations of the school system. Therefore, "a major challenge to classroom teachers of these students is to minimize, if not resolve, the points of incompatibility between school and ethnic orientations toward learning in order to maximize the academic payoff potential of their instructional efforts" (p.44). The need for teachers, administrators, and the "system" to accept and understand cultural differences becomes even more critical with the increasing enrollment of Black, Hispanic, and Asian students in the American public school system (Howe, 1983).

Educators who understand and address the academic and cultural needs of non-traditional students realize that weaknesses in the curriculum are related to both cognitive and noncognitive elements of instructional design (Howe, 1983; Pfeifer and Sedlacek, 1974). According to these researchers, the purpose of education is to

provide information and develop thinking skills as well as to help inspire, motivate and build positive self-concepts or confidence in non-traditional students.

Gage and Berliner (1984) reported that the academic problems of many members of minority groups in America relate to poor self-image.

To be different--whether Black, Native American, Chicano, Jewish, Italian, or Croatian--is likely to mean being "less than" the majority group. Consequently, students who belong to a minority group are especially likely to have negative self-concepts in at least some respects. Teachers should be aware of this problem. They should carefully monitor the student environment to guard against traumatic incidents that can harm self-concept. (p. 189.)

Brophy (1982) reported eight teacher characteristics which are associated with success in teaching culturally diverse students:

1. having expectations that students are capable of learning;
2. organizing classroom time so that students are "given more opportunity to learn";
3. organizing and managing the classroom to promote learning;
4. making the curriculum meaningful to students;
5. actively teaching vis-a-vis the traditional teacher's role;
6. teaching for mastery;
7. taking individual differences into consideration; and
8. providing "a supportive learning environment" (pp. 527-529).

In terms of instructional methods, Beane (1985) stated that there is no particular instructional method that is most effective in terms of minority student achievement. There are, however, certain instructional practices which are more effective than other

practices: utilizing a variety of learning styles; relating learning of concepts to students' environment; decreasing the amount of drill and memorization of facts; promoting a cooperative environment for learning; and utilizing "textbooks, audiovisuals and other materials which . . . represent the multicultural realities of the students' environment" (p. 18).

### Educational Strategies in Nutrition for Adolescents

Since the early 1900's, nutrition education has been included in the curriculum of the American school system (Whitehead, 1973). Nutrition education is defined "as any planned teaching of nutrition knowledge aimed at affecting the acquisition of nutrition knowledge, positive attitudes toward good nutrition, and eating of nutritious food" ("Nutrition Education's Future," 1985, p. s20).

The objective of nutrition education is to promote optimum health through food. . . . Sound nutrition education should enable each individual, throughout his life, to make wise decisions about his food choices wherever he may be. . . . Nutrition education in the schools can be effectively integrated into many curriculum areas, or nutrition can be taught separately." (White House Conference, 1970, p. 24)

Whitehead (1973) published a comprehensive review of the literature on nutrition education programs. She reported that the instructional methods utilized were primarily related to the dissemination of information. She stated that although sound, accurate nutritional knowledge is important, there is also a need in nutrition education for instructional methods that not only influence knowledge but also affect attitude and behavior as well.

The need for effective nutrition education programs is especially important among nutritionally high-risk groups such as adolescents. It is well-documented that the diets of American teenagers are often deficient in calcium, iron, and vitamin A (Lantz and Wood, 1958; Schorr, Sanjur, and Erickson, 1972; Ten State, 1972). Research also indicates that adolescents, especially Black and Hispanic adolescents, lack adequate nutritional knowledge (Bailey, 1970; Duyff, Sanjur, and Nelson, 1975; Dwyer, Feldman, and Mayer, 1970; Huenemann, Shapiro, Hampton and Mitchell, 1968; Lantz and Wood, 1958; Radke and Caso, 1948).

To help address the nutritional needs of adolescents vis-a-vis nutrition education in secondary schools, attendees at The White House Conference on Food, Nutrition and Health (1970) recommended:

1. That a comprehensive nutritional education program become a part of the curriculum of every school.
2. That certain basic nutritional concepts be included in nutrition educational curriculums.
3. That the curriculum and status of nutrition education in the schools are assessed and evaluated in terms of basic nutritional concepts.

In response to the above recommendations, educators have implemented nutritional educational programs at various levels in the high school curriculum (Skinner, Cunningham, Cagle, Miller, Teets, Andrews, and Andrews, 1985).

Empirical studies on the effectiveness of instructional methods (teacher-oriented versus student-oriented) for nutrition knowledge utilized in secondary schools, especially among culturally diverse students, is very limited (Axelson and DelCampo, 1978; Dwyer,

Feldman, and Mayer, 1970; Head, 1974; Radke and Caso, 1948; Spitze, 1973).

According to McKenzie and Mumford (1965), there is a lack of research on the effectiveness of methodology in nutrition education. They report that most research related to nutrition education involves testing the effectiveness of a combination of instructional strategies rather than measuring the effectiveness of a particular instructional method. Because the educational research on the effectiveness of various teaching methods has been inconclusive (McKeachie, 1978; Gage, 1984), nutrition educators "may have believed it is unproductive to compare the effectiveness of different instructional methods, especially when knowledge learned was the primary focus of the studies being conducted" ("Process of Nutrition Education," 1985, p. 56).

An analysis of nutrition curriculum guides by Cooper and Go (1976) determined that instructional programs used in schools were primarily teacher-oriented emphasizing knowledge and comprehension. They suggest that to be most effective, nutrition programs should:

1. be modified to be more student-oriented, including socially relevant nutrition concepts that are examined in terms of specific objectives;
2. include learning activities which offer students practice in accomplishing the objectives; and
3. use an evaluation process to measure attainment of the objectives.

This was supported by Gillespie and Yarbrough (1984).

McAfee (1976) recommended the following instructional guidelines for implementing nutrition education programs:

1. The program should be meaningful to students, emphasizing their interest and concerns;
2. The program should include multicultural and intracultural instructional materials;
3. The program should include a comprehensive evaluation component; and
4. The program should use a variety of instructional methods, depending on the needs of the school, students, and teachers.

#### Summary

In review, this chapter surveyed the literature in relation to learning theories and strategies; teacher-oriented and student-oriented instructional methods; the effectiveness of instructional methods among culturally diverse students; and nutritional education programs.

The survey of the literature indicated that there is some validity in all of the prominent learning theories and that the instructional method used should be determined by the needs of the students and the stated learning objectives. In some cases, exclusive use of the lecture or a variation of the lecture approach has been very effective depending on the objective(s). In other cases, an instructional design approach has been very effective.

Including the lecture as a part of the instructional design approach is also a viable option. In essence, nutrition education programs can be effective or ineffective in modifying food habits depending on the instructional method, the student population, the behavior of the instructor, and the personality of the instructor.

### III. METHODOLOGY

The major purpose of this study was to assess the effectiveness of instructional methods to increase nutritional knowledge among culturally diverse adolescents. The effectiveness of instruction was determined by student responses to a nutrition knowledge questionnaire.

This chapter presents information concerning the sample population and sampling method and describes the questionnaire, instructional techniques, the data collecting procedures, the dependent variable, and methods of analysis used in the study.

#### The Sample Population and Sampling Method

The population consisted of junior and senior high-school students enrolled at Robert Morgan Vocational Technical Institute, a Dade County (Florida) public school. Robert Morgan is located approximately 20 miles from downtown Miami. Juniors and seniors from surrounding high schools who wish to participate in a vocational curriculum are able to attend Robert Morgan on a half-day schedule. They spend one-half of the day at their home high school and one-half of the day at Robert Morgan. Vocational programs available are Trade and Industrial; Health Occupations; Home Economics; Public Service Education; and Business Education.

Robert Morgan was chosen for this study because of the diverse ethnic background of its student population. The racial composition of the sample was one-third Black, one-third Hispanic, and one-third

white. Clifton Lewis, assistant supervisor at Robert Morgan, selected the classrooms of students which participated in the study (Appendix A). The classrooms selected represented a cross-section of the high school according to race and gender. However, the students were given the option of attending the nutrition workshop.

### The Questionnaire

The questionnaire used in this study was the Nutrition Knowledge and Interest Questionnaire developed by Passwater (1980) (Appendix B). This questionnaire is designed for students in the 9th through 12th grade. The knowledge portion of the questionnaire consists of 50 five-option multiple-choice questions measuring six objectives (Appendix C). The interest portion of the questionnaire consists of six questions relating to the six objectives. A 5-point Likert-type scale was used to measure student interest toward the objectives. Students were asked to respond to all of the knowledge questions; their responses to the interest inventory was optional.

### Instructional Methods

The nutritional workshops used in this study were designed by the researcher in cooperation with two faculty members at Oregon State University, one from the Department of Foods and Nutrition and one from the Department of Media Education. Workshop A was designed to meet the academic and cultural needs of students by the teacher-oriented lecture approach. Workshop B was designed to

meet the academic and cultural needs of students by the student-oriented instructional design approach. Both workshop designs were revised and pretested three times over seven academic quarters.

### The Teacher-Oriented Lecture Workshop

The teacher-oriented lecture workshop utilized was organized around concepts taken from Ausubel (1968). For this workshop, the organizers included a modified version of lecture techniques suggested by McKeachie (1978). These techniques included: placing an outline of the lecture on the blackboard; summarizing key points at the end of each lecture session; having the students stand up and stretch half way through the lecture, and dividing the class into groups of 5 or 6 student to discuss a particular problem for 10 minutes and then having each group report its solution to the larger group. The main points of the solutions were written on the blackboard.

### Student-Oriented Instructional Design Workshop

The student-oriented instructional design workshop was organized around concepts presented by Gagne and Briggs (1974) concerning instructional design.

To incorporate Gagne's learning conditions, a modified version of Osterman's Feedback Lecture Model was utilized by: placing an outline for the workshop on the blackboard during the lecture; having students break into small discussion groups (two or three students) to solve specific problems; having large group discussions; and using

appropriate audiovisuals--games, posters, slide-tape programs, overheads, notes, and handouts.

### Comparison of Teaching Characteristics

Aside from the differences in curriculum characteristics, the two instructional methods differed in terms of the instructor's behavior and student participation. In the teacher-oriented method the instructor dominated the classroom; whereas, in the student-oriented method students were encouraged to actively participate. The checklist which follows was the teacher's guide for each class.

#### Teaching Characteristics

##### Teacher-Oriented:

Expressed confidence in student's ability

Encouraged group cooperation and cohesiveness

Primarily teacher participation

Primarily teacher-student interaction

Acted as a model, encouraged discussion on course materials

Related curriculum materials to teacher's life and personal interest

Did not encourage student reaction

##### Student-Oriented:

Encouraged student achievement

Encouraged learning through discovery

Encouraged student participation

Encouraged student-student interaction

Acted as a consultant, students' personal experience led to discussion of concepts

Kept focus on the facts and concepts of the curriculum material as well as on those of the students

Encouraged student reaction

Data Collection Procedures

Design Matrix

	Group 1	Group 2	Group 3
Pretest	41	44	44
Treatment	41	44	0
Posttest	41	44	44

Group 1 = Teacher-Oriented Lecture Approach

Group 2 = Student-Oriented Instructional Design Approach

Group 3 = Control Group

The investigator in this study meet with each group and administered the pretest a day prior to the instruction. Students were allowed as much time as necessary to complete the questionnaire. Classroom teachers administered the posttest during the week of May 12, 1985. Demographic data, and pretest and posttest scores were completed for a total of 129 students.

There were three groups of participants. The size of each group varied depending upon the number of students in attendance on a particular day. However, each group had a minimum of 75 students. Students included in this study completed both the pretest and posttest. Every student in each group was given a questionnaire as a pretest. Group 1 received instruction by the teacher-oriented lecture approach. Group 2 received instruction by the student-oriented instructional design approach. Group 3, the control

group, did not receive any instruction and met only for the pretest and posttest.

The instruction was two 1-1/2 hour presentations on nutritional concerns of adolescents. Seven weeks after the presentations, every student in each group was given the original questionnaire as a posttest.

Students were asked to put their name, gender, race, and the occupation of the head of their household on the answer sheet. The investigator coded the responses according to gender (female/male), race (Black/Hispanic/white), and occupation of head of household (professional/nonprofessional). The Two Factor Index of Social Positions by Hollingshead (1957) was used as an objective measure of determining occupation of head of household status as stated by the student.

#### Dependent Variable

The dependent variable in this study is the adjusted posttest scores on the instrument, which consists of 50 knowledge items.

#### Data Analysis

This study was designed to test the relative effectiveness of two instructional methods for nutrition education among culturally diverse adolescents: the teacher-oriented lecture approach (Group 1) and the student-oriented instructional design approach (Group 2), with Group 3 as the control.

A multiple regression analysis was performed to test the relationship between knowledge and the five hypothesized explanatory variables: pretest, group, gender, race, and occupation of head of household. Multiple regression was chosen because it is appropriate to the analysis of several independent variables and one dependent variable. Multiple regression provides the same kind of information as analysis of variance, but it also provides information about the relationship between independent variables and the dependent variable and the proportion of the variance in the dependent variable explained by the independent variables.

Since the purpose of this study was to examine the relative effectiveness of two instructional models for teaching a diverse group of students, multiple regression was appropriately chosen as the method of analysis.

#### Analysis of Variance for Testing Significance of Regression

Source of variation	Sum of squares	df	Mean square	p value
Regression	a	A	A/a	
Residual	b	B	B/b	
Total	a + b	C		

#### IV. RESULTS

The purpose of this study was to examine the influence of teaching methodology on the learning of nutritional information by culturally diverse adolescents. The study was conducted during Spring term of 1985 at Robert Morgan Vocational Institute, Miami, Florida.

Data are reported in four sections. The first section presents demographic data. The second section concerns the relationships between posttest scores and the independent variables. The third section discusses the testing of the research hypotheses. The fourth section provides a comparison of mean scores on the interest inventory.

##### Demographic Data

Tables 1, 2, and 3 present data on gender, race, and occupation of head of household, by group. The diversity of the students is demonstrated by the data.

##### Posttest Scores and the Independent Variables

To examine possible relationships between posttest scores and the independent variables of pretest, group, gender, race, and occupation of head of household, a multiple regression analysis was performed.

Table 1. Gender of students participating in nutrition education workshop, according to group.<sup>a</sup>

Group	Female n (%)	Male n (%)	Total n
1	15 (37)	26 (63)	41
2	25 (57)	19 (43)	44
3	15 (34)	29 (66)	44
Total	55 (43)	74 (57)	129

<sup>a</sup>Group 1 = Teacher-oriented lecture approach  
 Group 2 = Student-oriented instructional design approach  
 Group 3 = Control group

Table 2. Race of students participating in nutrition education workshop, according to group.<sup>a</sup>

Group	Black n (%)	Hispanic n (%)	White n (%)	Total n
1	12 (32)	12 (28)	17 (35)	41
2	11 (29)	17 (40)	16 (33)	44
3	15 (39)	14 (32)	15 (32)	44
Total	38 (29)	43 (34)	48 (37)	129

<sup>a</sup>Group 1 = Teacher-oriented lecture approach  
 Group 2 = Student-oriented instructional design approach  
 Group 3 = Control group

Table 3. Occupation of head of household of students who participated in nutrition education workshop according to group.<sup>a</sup>

Group	Professional n (%)	Nonprofessional n (%)	Total n
1	19 (44)	22 (56)	41
2	14 (32)	30 (68)	44
3	14 (32)	30 (68)	44
Total	47 (36)	82 (64)	129

\*Group 1 = Teacher-oriented lecture approach  
 Group 2 = Student-oriented instructional design approach  
 Group 3 = Control group

The pretest measurement on a 0-50 scale is designated by  $X_1$ . Gender is given by a dummy variable,  $X_2$ , and assigned  $X_2 = (0$  for female, 1 for male). Occupation is given by a dummy variable,  $X_3$ , and assigned  $X_3 = (0$  for professional, 1 for nonprofessional). Group is given by two dummy variables,  $X_4$  and  $X_5$ , and assigned  $X_4 = (1$  if person belongs to group 1, 0 if otherwise) and  $X_5 = (1$  if person belongs to group 2, 0 if otherwise). Race is given by two dummy variables,  $X_6$  and  $X_7$ , and assigned  $X_6 = (1$  if person is Black, 0 if otherwise) and  $X_7 = (1$  if person is Hispanic, 0 if otherwise).

The full multiple regression model is:

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_7 X_7 + \epsilon_i.$$

The full model is fit by a regression of  $Y$  on  $X_1, X_2, X_3, X_4, X_5, X_6,$  and  $X_7$ . The fitted model is:

$$\hat{Y} = 3.05539 + .8848X_1 - .6795X_2 - .1015X_3 + .5548X_4 + .7312X_5 + .7827X_6 - .1411X_7 \text{ (Tables 4 and 5).}$$

Table 4. Full model analysis of variance table in regression mode, with pretest, gender, occupation of head of household, group, and race as the variables.

Source of Variation	SS	df	MS
Regression	6069.00	7	867.00
Error	1714.26	121	14.17
Total	7783.26	128	60.80

Table 5. Results of regression coefficients for the full model with pretest, gender, occupation of head of household, group and race as the variables.

Variable <sup>a</sup>	Estimated Regression Coefficient	Estimated Standard Error	t	p value
X <sub>1</sub>	.8848	.0456	19.400	.00
X <sub>2</sub>	-.6795	.7084	-.959	.34
X <sub>3</sub>	-.1015	.7280	-.139	.89
X <sub>4</sub>	.5548	.8367	.663	.51
X <sub>5</sub>	.7312	.8407	.870	.39
X <sub>6</sub>	.7827	.8472	.924	.36
X <sub>7</sub>	.1411	.8018	-.176	.86

<sup>a</sup>X<sub>1</sub> = pretest measurement on a 0-50 scale;

X<sub>2</sub> = dummy variable for gender (0 = female, 1 = male);

X<sub>3</sub> = dummy variable for occupation of head of household (0 = professional, 1 = nonprofessional);

X<sub>4</sub> = dummy variable for group (1 = group 1, 0 = otherwise);

X<sub>5</sub> = dummy variable for group (1 = group 2, 0 = otherwise);

X<sub>6</sub> = dummy variable for race (1 = Black, 0 = otherwise);

X<sub>7</sub> = dummy variable for race (1 = Hispanic, 0 = otherwise).

The variables included were pretest score, gender, occupation of head of household, group, and race. The only variable that was found to be a significant predictor was the pretest score. In all models considered, pretest score was the only variable that was significant. Specifically, in the reduced model which considered the pretest score as a predictor of posttest score, the t value for the test of

significance for pretest variable is 20.90 and p value is .00

(Tables 6 and 7).

Table 6. Reduced model analysis of variance table in regression mode with the variable pretest as a predictor of posttest score.

Source of Variation	SS	df	MS
Regression	6030.73	1	6030.73
Error	1752.53	127	13.80
Total	7783.26	128	60.81

Table 7. Results of regression coefficients for the reduced model with pretest as a variable.

Variable	Estimated Regression Coefficient	Estimated Standard Error	t	p value
Constant	3.4145	.8633	3.95	.00
Pretest	.8808	.0421	20.90	.00

The diagram in Figure 1 demonstrates the relationships between pretest and posttest scores. The pretest and posttest means scores of the three groups in relation to gender, race, and occupation of head of household are reported in Table 8. The raw mean scores indicate the relationship between the pretest and the posttest.

Table 8. Results of the mean pretest and posttest scores on the nutrition knowledge questionnaire of students participating in the nutrition education workshop according to group,<sup>a</sup> gender, race, and occupation of head of household.

Group	Gender		Race			Occupation of Head of Household	
	Male	Female	Black	Hispanic	White	Profes- sional	Nonpro- fessional
Pretest (n = 129)							
1	19.03	20.53	16.74	23.17	19.12	20.73	18.80
2	18.21	23.12	19.63	18.47	24.63	23.14	20.00
3	15.65	17.60	17.06	14.36	17.40	15.30	16.74
Posttest (n = 129)							
1	21.30	20.07	20.00	23.66	19.47	21.90	19.95
2	18.63	24.72	21.54	19.64	25.06	23.50	21.43
3	17.31	17.73	17.73	15.35	19.13	16.69	17.77

<sup>a</sup>Group 1 = Teacher-oriented lecture approach  
 Group 2 = Student-oriented instructional design approach  
 Group 3 = Control group

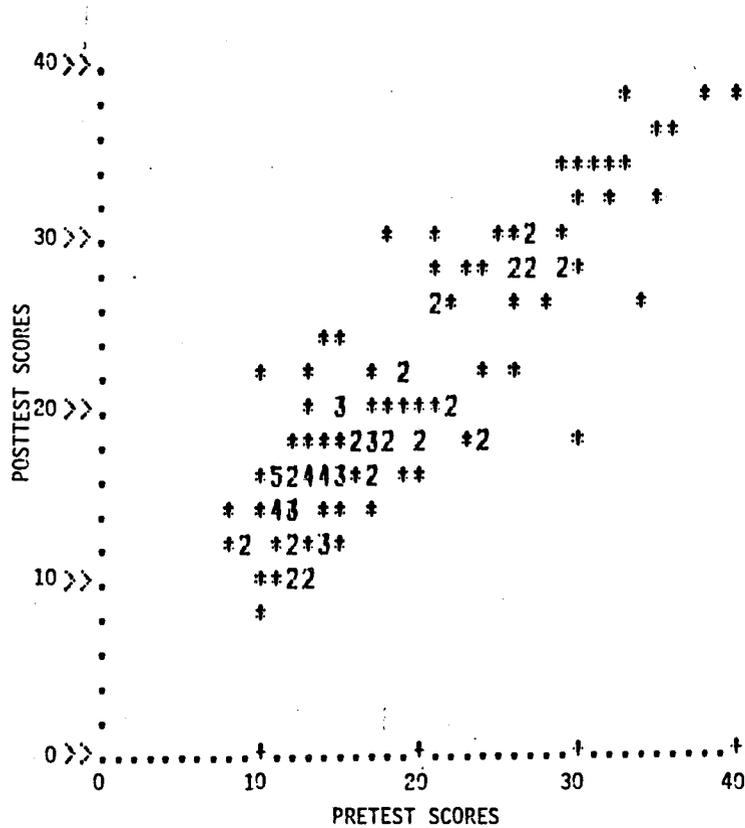


Figure 1. A diagram of pretest and posttest scores demonstrating the degree of association between pretest and posttest scores. An asterisk is equal to single observation. The numerical denotes the number of actual observations at that position.

### Testing the Hypotheses

The four research hypotheses of this study were tested to determine the relative effectiveness of two instructional methods for the acquiring of nutritional knowledge by culturally diverse adolescents. The effects of gender, race, and occupation of head of household were measured by a nutrition questionnaire given prior to instruction and seven weeks after instruction was given.

Hypothesis 1: There is no significant difference in the adjusted mean knowledge scores of students taught by the teacher-oriented lecture approach and students taught by a student-oriented instructional design approach.

$$H_0: \beta_4 = 0 \text{ and } \beta_5 = 0$$

$$H_1: \beta_4 \neq 0 \text{ and/or } \beta_5 \neq 0$$

The null hypothesis was tested by the multiple regression model using the pretest score as the covariate. For regression on group, two dummy variables were used to designate the three groups:

Regression of  $Y$  on  $X_1, X_4, X_5$

$$\hat{Y} = 3.2139 + .8726X_1 + .5266X_4 + .5506X_5$$

The .05 level of confidence was accepted as the significance level. Comparison of the posttest knowledge scores adjusted for pretest scores revealed no significant difference between groups (Table 9),  $F = .2837$ ,  $p \text{ value} = .75$ . Based on the reduced multiple regression model, the null hypothesis could not be rejected at the .05 significance level. There is no statistical evidence that method of instruction affected post-instruction knowledge scores.

Table 9. The mean and adjusted mean knowledge scores of students participating in the nutrition education workshop according to group.<sup>a</sup>

Group	Mean Score	Mean Adjusted Score <sup>b</sup>
1	20.86	20.28
2	22.10	20.31
3	17.37	19.60

<sup>a</sup>Group 1 = Teacher-oriented lecture approach  
 Group 2 = Student-oriented instructional design approach  
 Group 3 = Control group

<sup>b</sup>No significant difference at .05 level

Hypothesis 2: There is no significant difference in the adjusted mean knowledge scores of students by gender.

$$H_0: \beta_2 = 0$$

$$H_1: \beta_2 \neq 0$$

For regression on gender, one dummy variable was used to designate the two genders, female and male:

Regression of Y on  $X_1$ ,  $X_2$

$$\hat{Y} = 3.5009 + .8880X_1 - .5240X_2$$

Comparison of the posttest knowledge scores adjusted for pretest scores revealed no significant difference by gender (Table 10),  $t = .722$  and  $p$  value = .44. Hence, based on the reduced multiple regression model, the null hypothesis could not be rejected at the .05 significance level. Therefore, there is no statistical evidence that gender affected post-instruction knowledge scores.

Table 10. The mean and adjusted mean knowledge scores of students participating in the nutrition education workshop according to gender.

Gender	Mean Score	Mean Adjusted Score <sup>b</sup>
Female	20.06	19.26
Male	21.30	21.77

Hypothesis 3: There is no significant difference in the adjusted mean knowledge scores of students by race.

$$H_0: \beta_6 = 0 \text{ and } \beta_7 = 0$$

$$H_1: \beta_6 \neq 0 \text{ and/or } \beta_7 \neq 0$$

For regression on race, two dummy variables were used to designate the three races: Black, Hispanic, and white

Regression of Y on  $X_1$ ,  $X_6$ ,  $X_7$

$$\hat{Y} = 3.1622 + .8849X_1 + .7181X_6 - .1095X_7$$

Comparison of the posttest knowledge scores adjusted for pretest scores revealed no significant difference between groups (Tables 11),  $F = .5571$ ,  $p \text{ value} = .56$ . Based on the reduced multiple regression model, the null hypothesis could not be rejected at the .05 significance level. Therefore, there is no statistical evidence that race affected post-instruction knowledge scores.

Table 11. The mean and adjusted mean knowledge scores of students participating in the nutrition education workshop according to race.

Race	Mean Score	Mean Adjusted Score <sup>b</sup>
Black	20.00	22.50
Hispanic	23.66	20.54
White	19.47	19.90

<sup>b</sup>No significant difference at .05 level

Hypothesis 4: There is no significant difference in the adjusted mean knowledge scores of students by occupation of head of household.

$$H_0: \beta_3 = 0$$

$$H_1: \beta_3 \neq 0$$

For regression on occupation of head of household, one dummy variable was used to designate the two categories of occupation: professional and nonprofessional.

$$\begin{aligned} &\text{Regression of } Y \text{ on } X_1, X_3 \\ \hat{Y} &= 3.2475 + .8813X_1 + .09527X_3 \end{aligned}$$

Comparison of the posttest knowledge scores adjusted for pretest scores revealed no significant difference between groups (Table 12) p value = .89 and t = -.139. Based on the reduced multiple regression model, the null hypothesis could not be rejected. There was no statistical evidence that occupation of head of household affected post-instruction knowledge scores.

Table 12. The mean and adjusted mean knowledge scores of students participating in the nutrition education workshop according to occupation of head of household.

Occupation	Mean Score	Mean Adjusted Score <sup>b</sup>
Professional	21.89	20.93
Nonprofessional	19.95	20.78

<sup>b</sup>No significant difference at .05 level.

#### Comparing Mean Scores on the Interest Inventory

In an attempt to further investigate the effectiveness of the treatment, an additional statistic was computed to ascertain the mean scores on the interest inventory. The pretest and posttest scores of the three groups in relation to race, gender, and occupation of head of household are reported in Table 13. The raw mean scores indicate that there was no significant difference in the students' interest toward nutrition according to the pretest and posttest means.

Table 13. Results of the mean pretest and posttest scores on the interest inventory of students participating in the nutrition education workshop according to group,<sup>a</sup> gender, race, and occupation of head of household.

Group	Gender		Race			Occupation of Head of Household	
	Male	Female	Black	Hispanic	White	Profes- sional	Nonpro- fessional
Pretest (n = 107)							
1	2.40	2.53	2.38	2.05	2.65	2.51	2.31
2	2.34	2.49	2.80	2.07	2.44	2.65	2.31
3	2.46	2.48	2.22	2.41	2.76	2.44	2.49
Posttest (n = 123)							
1	2.07	2.57	2.68	2.21	2.30	2.58	2.21
2	2.30	2.55	2.52	2.56	2.30	2.61	2.37
3	2.21	2.73	2.02	2.41	3.23	2.61	2.51

<sup>a</sup>Group 1 = Teacher-oriented lecture approach

Group 2 = Student-oriented instructional design approach

Group 3 = Control group

## V. DISCUSSION

This study was initiated out of concern for culturally diverse adolescents and their eating habits. The Ten State Study (1972) and other studies (Lantz and Wood, 1958; Schorr, Sanjur, and Erickson, 1972; Spitze, 1976) identified that the diets of culturally diverse adolescents are often low in calcium, iron, vitamin C, and vitamin A. In an effort to help improve the eating habits and thus health of adolescents, nutrition education programs have been developed and implemented at various levels in the curriculum of secondary schools. Many of the nutrition education programs developed for secondary schools are primarily teacher-oriented (Cooper and Go, 1976). However, Spitze (1976) reported that high school students prefer to study nutrition through a variety of teaching techniques which are primarily student-oriented, such as games, versus the teacher-oriented lecture.

In the teacher-oriented lecture approach, the instructor organizes, interprets, and presents selected material to the class. The main focus of attention is upon the instructor and the desired outcome or final product. In the student-oriented instructional design approach, the instructor acts as a facilitator in a system that includes students and curricula. The process of learning and the final product are viewed with equal importance.

The data from this study indicate that there was no significant difference in nutrition knowledge between adolescents taught by the teacher-oriented lecture approach and those taught by the

student-oriented instructional design approach of instruction. Cox and Ramirez (1981) indicated that, on the average, minority students show a preference for a teacher-oriented approach to instruction which includes instructor demonstrations and modeling as well as being allowed to work together in groups to solve problems.

Gillespie and Yarbrough (1984) presented a nutrition education systems model which includes Gagne's concepts, suggesting that an input/output process model "is most applicable to short-term intervention or at least to programs that are limited in time and scope" (p. 6). Hannafin (1983) also suggested that an instructional systems approach may be most effective when the final product is not heavily dependent upon the students' previous skills.

To help maximize the effectiveness of nutrition education programs, educators working with culturally diverse students must acknowledge, understand and respect the cultural needs of the student.

A review of the literature relative to this study indicates that there are several factors related to learning and the acquisition of knowledge among culturally diverse students, including:

1. Previous school and community experiences. Culturally diverse students tend to perform better when the content is related to their experiences.
2. Instructional practices which emphasize both product and process--so students learn how to learn.

3. The type of language or communication system utilized, especially among Spanish-speaking students who are taught in English.

4. The learning styles of students or the way they prefer to receive and process information. Instructional methods should complement the learning styles of culturally diverse students.

5. Finally, teacher expectations and behavior toward students often influence the behavior of the student. When instructors perceive culturally diverse students as being low achievers, this perception is often communicated to and internalized by the culturally diverse students.

#### Trends of Data

Based on the results of the analysis, there was little evidence that either instructional method, the teacher-oriented lecture approach or the student-oriented instructional design approach, had a significant effect upon the achievement or knowledge score of students according to group, gender, race, or occupation of head of household. Likewise, interaction between the posttest score and the variables group, gender, race and occupation of head of household showed no significant difference.

It can therefore be extrapolated that when the teacher-oriented lecture approach or the student-oriented instructional design approach of instruction are developed according to teaching factors

conducive to learning for culturally diverse adolescents, both methods are equally effective. These results are consistent with the findings of Anderson (1959) and Verner and Dickinson (1967), who found that, in general, there was no difference between teacher-oriented and student-oriented methods of instruction.

### Implications

While significant changes did not occur in the adjusted posttest knowledge scores of the nutrition questionnaire, implications can be drawn from the review of past research and the extrapolations of this study. The following implications contribute to the development of nutrition education programs sensitive to the needs of culturally diverse adolescents.

As suggested by this study and past research, there is no difference in the effectiveness of instructional methods (teacher-oriented or student-oriented). However, as Gage and Berliner (1984) suggest, the personality of the instructor is a major consideration if the lecture method is to be effective. Sheffield (1974) reported that a good lecturer is enthusiastic about the subject, approachable, friendly, has a sense of humor, is warm, kind, sympathetic and concerned about students. According to Gage (1984), lecturing is an art which "requires improvisation, spontaneity, the handling of a vast array of considerations of form, style, pace, rhythm, and appropriateness in ways so complex that even computers must lose the way" (p. 88). The primary purpose of the lecture is

not to provide facts, textbooks can do that, but to inspire and demonstrate enthusiasm for learning.

Teachers who are not enthusiastic about teaching and/or whose personalities are not conducive to the lecture approach (Sheffield, 1974) should not lecture, but consider alternatives which are equally as effective. Such alternatives include competency-based instruction which considers the learning needs and styles of students (Kemp, 1977), such as Mastery Learning (Bloom, 1979), the Personalized System of Instruction (Keller, 1968), or the Feedback Lecture (Osterman, 1980).

In addition to enthusiasm, teacher expectation of student performance and behavior is another major factor affecting student self-concept and academic achievement. Effective teachers tend to view students in positive ways, such as being "dependable, friendly, and worthy people" (Combs, 1969, p. 73). It is well documented (Beane, 1985; Gay, 1975; Good, 1981) that the attitude and behavior of the instructor is a major factor influencing learning among culturally diverse students. When a teacher has certain expectations of student academic performance, the teacher will relate to the students in such a way that those expectations are usually fulfilled (Gay, 1975). When teacher expectations are high, students have a more positive self-concept and achieve higher grades. On the other hand, when teacher expectations are low, students have poorer self-concept and achieve lower grades. Teachers often have low expectations of nontraditional students because of unconscious preconceived concepts about culturally diverse students as being

poor, trouble-makers, and low-achievers (Gay, 1975; Good, 1981).

The concern of many educators is that since many instructors associate minorities (especially Blacks and Hispanics) with low achievers, their classroom behaviors toward minorities adversely affects student achievement (Beane, 1985; Gay, 1975; Good, 1981).

As the instructor for both workshops, this investigator expressed enthusiasm about content material as well as exhibited behaviors such as positive reinforcement, praise and encouragement toward the students in both workshops which may have had an equalizing effect upon the instructional methods utilized.

According to advocates of the Instructional Design Approach (Kemp, 1977), as well as advocates of the lecture approach (Gage, 1984), an effective and efficient teacher considers academic as well as social characteristics of students when planning a lesson in an attempt to meet their needs. For culturally diverse students, these characteristics include preference for working in a group, a language rich in imagery and symbolism; loyalty to peers; and responsiveness to adult modeling (Brophy, 1982; Cox and Ramirez, 1981). In order for nutrition educators to best serve the needs of culturally diverse students, they must be supportive of and sensitive to the cultural differences and needs of their students (Bailey, 1970).

Effective teachers who are supportive of and sensitive to the cultural needs and backgrounds of their students "are probably brighter and more dedicated than average. They are certainly better organized and more efficient classroom managers, better prepared and more thorough instructors" (Brophy, 1982, p. 529).

While significant changes in nutrition knowledge did not occur during the study, the impact on future changes resulting, in part, from the workshop is unknown. Nutritional knowledge and its effect upon eating habits is a dynamic process resulting from a variety of factors. According to Whitehead (1973), in order for a nutrition education program to be most effective in providing knowledge and developing positive nutritional attitudes and related behaviors, the program must be based on the nutritional needs and concerns of the students. These nutritional needs are determined by an assessment of the eating habits of the students. Instructors are then allowed sufficient time to not only provide information but to also motivate students to develop sound nutritional practices. The current status on the effectiveness of instructional methods to the relationship between nutritional knowledge and its effect on attitude and related behavior is nonconclusive ("Nutrition Education's Future," 1985). However, nutrition educators generally agree that since most food habits are formed prior to adolescence (Guarino, Wittsten, and Gallo, 1984), nutrition education programs designed for students in preschool and primary grades are more likely than high school programs to be effective in influencing knowledge and nutritional attitudes which will help establish sound food habits that will continue through adolescence into adulthood.

#### Recommendations

On the basis of the results obtained from this study, the following recommendations are made.

1. It is recommended that the study be repeated to determine the results from a larger sample from several schools over a longer period of time.

2. Research is recommended that would examine the relationship of teaching methodology to self-concept of culturally diverse students.

3. A study needs to be conducted in nutrition education that compares the effectiveness of different instructional methods that not only influence knowledge but also aid in promoting a positive change in nutrition-related attitude and behaviors of culturally diverse adolescents.

4. Research is recommended in nutrition education that will examine the relationship between instructional methodology and the preferred learning styles of culturally diverse students.

## VI. SUMMARY

The present study examined the effectiveness of two instructional methods, a teacher-oriented lecture approach and a student-oriented instructional design approach, for a nutritional workshop among culturally diverse adolescents in relation to gender, race, and occupation of head of household.

The purpose of this study was to examine and compare the efficiency of the teacher-oriented lecture approach, to that of the student-oriented instructional design approach in nutrition education instruction among culturally diverse adolescents at Robert Morgan Vocational High School in Dade County, Florida. In addition, the study was designed to help culturally diverse students gain a basic understanding of nutritional concepts and dietary practices that promotes health and sound nutritional practices.

The participants in this study were junior and senior high school students attending Robert Morgan on a half-day schedule. They were male and female Black, Hispanic and white students whose parents were either professionals or nonprofessionals.

Data for this study was collected spring term of 1985. All students were pretested and posttested using the Nutrition Questionnaire and Interest Inventory developed by Passwater (1980) to measure academic achievement or knowledge. The hypotheses were stated in the null and tested by utilizing multiple regression. The .05 level of confidence was selected as the acceptable level of statistical significance. The dependent variable was the adjusted posttest score on the nutrition questionnaire.

Two nutrition education workshops were developed as the treatment for this study. Group 1, an experimental group, attended workshop A and received instruction by the teacher-oriented lecture approach. Group 2, the second experimental group, attended workshop B and received instruction by the student-oriented instructional design approach. Group 3 was the control group and did not receive any instruction. Each workshop was composed of two 1-1/2 hour sessions on nutritional concerns of adolescents.

The results from this study indicate that there was no significant difference in the adjusted mean knowledge scores of students taught by the teacher-oriented lecture approach and students taught by the student-oriented instructional design approach in relation to gender, race, or occupation of head of household.

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## APPENDICES

**APPENDIX A**  
**CORRESPONDENCE**

February 19, 1985

Clifton Lewis  
Robert Morgan Vocational School  
18180 SW 122nd Avenue  
Miami, FL 33177

Dear Mr. Lewis:

I want to thank you for your willingness to have your high school participate in the research project for my doctoral dissertation.

The design of my study requires approximately 150 students. These students will be divided into three groups. Every student in each group will be give a nutrition knowledge questionnaire before the presentations and approximately six weeks after the presentations. I will conduct a three-hour presentation on nutrition for two of the three groups; the third group will be the control group. The three-hour presentation can be arranged in three one-hour blocks, two one-and-one-half-hour blocks, or whatever time frame is convenient for your school.

To facilitate my presentations, I will need a classroom or lecture room with a blackboard, an overhead projector, a slide projector, and a tape recorder or Wollensak.

Thank you again for you support of my research. Enclosed is a brief description of the project.

Sincerely,

Joyce Marshall

M E M O R A N D U M

March 20, 1985

TO: Ms. Jerlene Joseph  
Mr. Gerardo Suarez  
Mr. R. G. Palmer  
Mr. Cesar Lacaci

FROM: C.L. Clifton Lewis, Assistant Supervisor  
Robert Morgan Vocational Technical Institute

SUBJECT: NUTRITIONAL SURVEY

Your high school students have been selected to participate in the subject survey.

Please have them report to Room 11-128 on the following days:

Tuesday, March 26 - 12:00 Noon - 2:15 P.M.

Wednesday, March 27 - 12:00 Noon - 2:15 P.M.

Ms. Sandra Edgar is your contact person.

Your assistance is appreciated.

CL:eg

cc: John J. Levva  
Sandra Edgar

M E M O R A N D U M

March 20, 1985

TO: Mr. James Porter  
Mr. Charles Taylor  
Ms. Janice LaForte

FROM: C.L. Clifton Lewis, Assistant Supervisor  
Robert Morgan Vocational Technical Institute

SUBJECT: NUTRITIONAL SURVEY

Your high school students have been selected to participate in the subject survey.

Please have them report to Room 11-128 on the following days:

Tuesday, March 26 - 7:15 A.M. - 9:40 A.M.

Wednesday, March 27 - 7:15 A.M. - 9:40 A.M.

Ms. Sandra Edgar is your contact person.

Your assistance is appreciated.

CL:eg

cc: John J. Leyva  
Sandra Edgar

M E M O R A N D U M

March 20, 1985

TO: Mr. Arnold McKay  
Mr. Jesse W. Hill  
Ms. Mary Corredera  
Ms. Winifred Suarez  
Mr. John Bishop

FROM: C.L. Clifton Lewis, Assistant Supervisor  
Robert Morgan Vocational Technical Institute

SUBJECT: NUTRITIONAL SURVEY

Your high school students have been selected to participate in the subject survey.

Please have them report to Room 15-200 on the following day:

Wednesday, March 27 - 7:15 A.M. - 7:55 A.M.

Mr. Hill is your contact person.

CL:eg  
cc: John J. Leyva

Educational Opportunities  
Program  
Special Services Project



Corvallis, Oregon 97331 (503) 754-3620

July 23, 1985

Mr. Clifton Lewis  
Robert Morgan Vocational School  
18180 SW 122 Avenue  
Miami FL 33177

Dear Mr. Lewis:

I would like to take this opportunity to thank you for the assistance and participation of Robert Morgan Vocation High School in the research project for my doctoral dissertation during the weeks of March 24 and May 12, 1985.

Your cooperation permitting me to conduct a research study on Nutrition Education among culturally diverse adolescents at Robert Morgan High School is greatly appreciated.

Within the next few weeks, I hope to have a computer analysis of the questionnaires students at Robert Morgan completed for my study. I plan to have the results of the study analyzed and written up by early November.

After I defend my study and make the necessary revisions, I will send you a copy of the final results.

Thank you again, Mr. Lewis, for your help and support.

Sincerely,

Joyce Marshall  
Graduate Student

APPENDIX B  
QUESTIONNAIRE

# NUTRITION KNOWLEDGE AND INTEREST QUESTIONNAIRE

(Grade 9 and Above)

G. Darrell Passwater

*Health Department  
Oregon State University*

In the correct spaces provided on your answer sheet, fill in your:

1. age
2. grade
3. sex
4. school code number (optional)

## INSTRUCTIONS

There are 50 questions in Part I. For each question there are five possible choices. Read all of the choices before selecting the best answer. If you are not certain of an answer, select the one that *seems best* to you.

It is important that you:

1. Do your best on each question.
2. Select only one answer for each question.
3. Choose the best answer for each question.
4. Answer every question on the test.
5. Work independently.
6. Completely fill in your answer with a heavy black mark on the Test Answer Sheet.
7. Erase mistakes completely and neatly.
8. Do not bend or make unnecessary marks on the test or answer sheet.

Thank you and good luck.



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PART I  
NUTRITION KNOWLEDGE

1. Teenage girls of the same height, age, and diet most probably have different weights due to different:
  - a. vitamin intakes
  - b. eating speeds
  - c. daily eating times
  - d. sleeping patterns
  - e. activity levels
2. Which of the following is the *least* likely cause for a person to be underweight?
  - a. poverty
  - b. having parents who are thin
  - c. eating snacks that are high in calories
  - d. lack of appetite
  - e. eating a poorly balanced diet
3. The main reason teenage boys may have large appetites is due to their:
  - a. peer group influences
  - b. high interest in nutrition
  - c. low activity levels
  - d. rapid cell growth
  - e. childhood habits
4. Which of the following statements describes a *physical* factor that influences a person's eating pattern?
  - a. Eating is sometimes used to compensate for lack of love.
  - b. Anticipating an exciting event may interfere with eating practices.
  - c. Past experiences with foods can create a dislike for a given food.
  - d. Some foods are associated with hot or cold weather.
  - e. Body size and development affect the amount of food consumed.
5. How should a teenager's eating habits change if she becomes pregnant?
  - a. Calcium and other minerals should be decreased.
  - b. Animal fats should be eliminated from her diet.
  - c. There is no need to change her diet.
  - d. Each nutrient should be increased.
  - e. Only vitamins should be increased.
6. As one grows older the number of calories the body will need to maintain its weight will *decrease* because:
  - a. appetite decreases
  - b. energy-requiring body processes slow down
  - c. the body needs different nutrients
  - d. calories have little effect on older adults
  - e. the body has stored up all the needed calories
7. Which of the following statements about vitamins is *true*?
  - a. Food purchased from stores has insufficient vitamins.
  - b. Vitamin pills prolong life.
  - c. Vitamin pills taken daily help prevent colds.
  - d. Vitamin pills do not provide all the nutrients the body needs.
  - e. The more vitamins a person takes, the better he or she will feel.

8. What is the major *nutritional* difference between butter and vegetable margarine?
- Butter has more calories.
  - Butter has more saturated fats.
  - Margarine has more minerals.
  - Margarine has more vitamins.
  - Margarine has more cholesterol.
9. Protein in *excess* of what the body needs is:
- stored for future use
  - changed into fat
  - excreted in the urine
  - changed into minerals
  - used to fight off diseases
10. Which of the following foods contains the *most* calories?
- a medium-sized apple
  - a medium-sized baked potato
  - a medium-sized carrot
  - 8 ounces of whole milk
  - one slice of white bread
11. Which of the following statements about Vitamin C is *false*?
- Large doses of Vitamin C cure the common cold.
  - An excess of Vitamin C is excreted in the urine.
  - Vitamin C helps wounds to heal.
  - Many fresh, raw fruits are a good source of Vitamin C.
  - A person who greatly lacks Vitamin C will bruise easily.
12. Which of the following statements about food is *true*?
- Organically grown food has the same amount of vitamins as chemically grown food.
  - Brown eggs have more food value than white eggs.
  - Grapefruit burns up excess calories.
  - Raw milk has more nutrients than pasteurized milk.
  - Honey has less calories than white sugar.
13. Physicians consider a *safe* weekly weight loss for dieters to be:
- 1-2 pounds
  - 3-4 pounds
  - 5-6 pounds
  - 7-8 pounds
  - 9-10 pounds
14. To maintain adequate protein intake, a vegetarian diet that contains no animal-source protein should include:
- lecithin tablets
  - beans, nuts, and a source of Vitamin B<sub>12</sub>
  - iron tablets
  - raw fruit, vegetables, and mineral oils
  - Vitamins A, C, and D
15. These ingredients are listed in this order on the box of a certain product: wheat bran, raisins, sugar, salt, and vegetable oil. Which ingredient is in the *greatest* amount by weight in this product?
- raisins
  - vegetable oil
  - wheat bran
  - sugar
  - It is impossible to tell.

16. The standard term used for the amount of nutrients in nutrition labeling of foods is the:
- U.S. Recommended Daily Allowances (U.S. RDA)
  - Public Health Service Guidelines (PHSG)
  - U.S. Dietary Goals (USDG)
  - Minimum Daily Requirements (MDR)
  - Food and Drug Standards (FDS)
17. All of these are evidence of good nutritional practices *except*:
- longer life spans
  - greater work productivity
  - delayed physical maturity
  - greater mental alertness
  - lower infant death rates
18. Which is *not* a U.S. dietary goal proposed by the Senate Nutrition Subcommittee?
- reduce overall fat consumption
  - limit the intake of sodium
  - increase consumption of refined sugars
  - consume only as much energy (calories) as is expended
  - reduce cholesterol consumption
19. Fortified foods have:
- been heated to destroy harmful bacteria
  - been frozen to avoid spoilage
  - been produced without harmful chemicals
  - had protein added to resist molds
  - had nutrients added to increase food value
20. Which of the following agencies is responsible for inspecting eating establishments and food-processing plants?
- County Health Department
  - Food and Nutrition Board
  - American Dietetic Association
  - National Research Council
  - American Medical Association
21. Which of the following does *not* contribute to higher food costs?
- advertising campaigns
  - manufacturing processes
  - non-brand name products
  - transportation of products
  - food packaging
22. Which of these is *not* involved in food assistance programs?
- World Health Organization (WHO)
  - United Nations Children's Fund (UNICEF)
  - U.S. Department of Agriculture (USDA)
  - Women, Infants, Children (WIC)
  - Greenpeace (GP)
23. Which of the following statements about a balanced diet is *false*?
- It will probably make you feel good.
  - It contains a variety of foods.
  - It guarantees a disease-free body.
  - It has enough calories to maintain body weight.
  - It includes foods from all four food groups.

24. A balanced diet with all the necessary vitamins and minerals will help prevent all of the following *except*:
- rickets
  - beriberi
  - anemia
  - colds
  - scurvy
25. Which of the following statements about iodized salt is *true*?
- It should be taken immediately after strenuous activity.
  - It lowers the blood pressure.
  - It helps prevent goiters.
  - It lowers the cholesterol level.
  - It helps remove water from the body.
26. Which of the following minerals does *not* contribute to nutritional well-being?
- phosphorus
  - iron
  - iodine
  - calcium
  - lead
27. Which nutrient is of great value in protecting teeth from decay?
- sodium
  - chlorine
  - fluoride
  - potassium
  - sulfur
28. Which of the following would be *least* effective in preventing heart disease?
- cut intake of saturated fats
  - lower cholesterol levels
  - cut down excess calories
  - lower sodium intake
  - decrease Vitamin D intake
29. Lack of a nutritionally adequate diet will result in the *most* harm during the ages of:
- birth to 5 years
  - 5-10 years
  - 10-15 years
  - 15-20 years
  - over 20 years
30. A health problem that occurs from a *lack* of iron is:
- night blindness
  - deformed joints
  - mental retardation
  - anemia
  - diabetes
31. A person who eats a nutritionally balanced diet with *less* calories than his or her body needs will eventually:
- become anemic
  - develop vitamin deficiencies
  - develop skin disorders
  - become physically fit
  - lose weight

32. Which of these statements concerning breakfast is *false*?
- Eating breakfast helps keep blood sugar levels up.
  - A person should skip breakfast when watching calories.
  - Eating breakfast helps school performance.
  - Eating breakfast with protein helps postpone midday hunger pangs.
  - A person who skips breakfast may have difficulty keeping a nutritionally adequate diet.
33. Which of the following is the most effective and safe method for losing weight?
- follow a current popular diet
  - skip breakfasts
  - eliminate all fats from the diet
  - eat all you want, but eliminate carbohydrates
  - eat less, exercise more, and eat a balanced diet
34. The average American adult diet would benefit *most* from:
- an increase in protein
  - an increase in fats
  - an increase in carbohydrates
  - a decrease in calories
  - a decrease in fiber
35. Which of these statements about weight reduction methods is *false*?
- Appetite depressant drugs temporarily reduce appetite.
  - Fasting is a safe and effective method of weight reduction.
  - Eliminating water from the body is ineffective for permanent weight loss.
  - Liquid protein diets have been proven to be dangerous.
  - Salt-free diets are potentially hazardous.
36. To gain one pound, a person would have to consume how many calories over his or her energy needs?
- 100
  - 1,000
  - 3,500
  - 5,000
  - 10,000
37. Which of the following diets would be considered the *least* dangerous?
- salt-free diet
  - high protein diet
  - carbohydrate-free diet
  - liquid protein diet
  - calorie-restricted diet
38. An *excess* of calories is converted and stored in the body as:
- protein
  - minerals
  - carbohydrates
  - fat
  - vitamins
39. The amount of calories an average teenage girl should consume daily is approximately:
- under 1,000
  - 1,000-1,500
  - 1,500-2,000
  - 2,000-2,500
  - over 2,500

40. Which of the following *best* describes the basic four food groups?
- vitamins, minerals, water, and fats
  - proteins, minerals, water, and fats
  - carbohydrates, proteins, minerals, and water
  - meats, fruits and vegetables, dairy products, and cereals
  - fats, starches, grains, and meats
41. Which of the following *best* assures a balanced diet?
- gourmet cooking skills
  - eating large amounts of meat
  - eating a variety of foods
  - eating plenty of fresh fruits
  - eliminating fats and carbohydrates from your diet
42. The food group that is frequently enriched with iron, thiamin, riboflavin, and niacin is the:
- milk group
  - vegetable group
  - fruit group
  - meat group
  - bread and cereal group
43. If you cannot afford to eat meat every day, another good source of protein would be:
- eggs
  - potatoes
  - noodles
  - oranges
  - corn
44. The nutrients used primarily for growth and repair of body tissue are:
- starches
  - proteins
  - sugars
  - fats
  - minerals
45. Which of the following would be the *poorest* source of iron?
- butter
  - eggs
  - lettuce
  - tomato juice
  - beef pot roast
46. Which of the following would *not* be a good substitute for milk in the diet?
- peach yogurt
  - swiss cheese
  - strawberry jello
  - chocolate ice cream
  - small curd cottage cheese
47. Which of the following would be the *poorest* source of protein?
- veal
  - eggs
  - fish
  - beans and nuts
  - potatoes

48. Which of the following has the *least* amount of fats?
- walnuts
  - hamburger
  - avocados
  - potatoes
  - peanut butter
49. Moderate daily amounts of fiber will *most* likely result in:
- brittle hair
  - constipation
  - strengthened fingernails
  - diarrhea
  - regular bowel movements
50. Cooking foods in water may *decrease* the amount of certain:
- proteins
  - fats
  - vitamins
  - calories
  - starches

## PART II INTEREST INVENTORY

There are six questions in Part II. This inventory helps to discover the areas of your nutrition interests. Please answer honestly. On your answer sheet place the number (1 through 5) that best describes your present interest level for each of the six questions.

### Key to Answering

1	2	3	4	5
very				not
interested		.....to.....	interested	

How interested are you in knowing—

- how activities, environment, family, friends, and money affect your food selection?
- the difference between food facts and fallacies?
- how today's food trends affect your eating habits and health?
- the relationship between food and disease?
- how your eating and activity patterns affect your weight?
- which foods you need to maintain a healthy body?

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APPENDIX C  
OBJECTIVES IN DEVELOPING NUTRITION KNOWLEDGE

## Objectives\*

## Cognitive:

1. Analyzes physical, mental-emotional, social and economic factors that affect an individual's diet.
2. Interprets relationships between nutritional status and disease.
3. Assesses the interrelationships of diet, activity and other factors to the control of weight.
4. Distinguishes between food fads and fallacies and diets based on scientific principles of nutrition.
5. Examines emerging trends in society that are affecting dietary patterns.
6. Develops a plan of nutritional behaviors that promotes health for himself and his family.

---

\*Glenn Darrell Passwater, The Development of an Instrument to Assess Oregon High School Students' Nutrition Knowledge (doctoral dissertation, Oregon State University), 1980.

APPENDIX D  
WORK PLAN FOR NUTRITION WORKSHOP

Lecture Schedule

Lecture	30 minutes
Summary	5 minutes
Break	5 minutes
Lecture	30 minutes
Summary	5 minutes
Small Group	10 minutes
Large Group	5 minutes

Instrumental Design Schedule

Lecture	20 minutes
Small group	10 minutes
Lecture	20 minutes
Small group	10 minutes
Slide/tape	15 minutes
Large group	15 minutes

## Workshop Outline

Day I - Tuesday, March 26, 1985

## I. Nutrients

- A. Functions of nutrients
  - 1. Provides energy
  - 2. Builds and maintains body tissue
  - 3. Regulates body processes
- B. Definition and description of six nutrients
  - 1. Carbohydrates
  - 2. Fats
  - 3. Protein
  - 4. Vitamins
  - 5. Minerals
  - 6. Water

## II. Nutrients of Special Concern to Adolescents

- A. Definition and description
  - 1. Calcium
  - 2. Iron
  - 3. Vitamin A
  - 4. Vitamin C
- B. Identify food sources for calcium, iron, vitamin A and vitamin A and vitamin C.

## III. Dietary Planning

- A. Basic Four
  - 1. Breads and cereals
  - 2. Fruits and vegetables
  - 3. Meat and proteins
  - 4. Dairy Products
- B. Emerging Trends
  - 1. Reduce sugar intake
  - 2. Reduce fat
  - 3. Reduce salt
  - 4. Increase fruits and vegetables
  - 5. Increase whole grains
- C. Eating Patterns
  - 1. Snacking
  - 2. Fast foods

## Workshop Outline

Day II - Wednesday, March 27, 1985

- I. Non-Nutrient Value of Food
  - A. Mental-Emotional
  - B. Social
  - C. Economic
- II. Fallacies About Nutrition and Disease
  - A. Food fallacies
    - 1. A balanced diet equals a disease-free body
    - 2. A balanced diet prevents colds
    - 3. You cannot lose weight eating a balanced diet
  - B. Nutrients and Disease
    - 1. Ionized salt and goiter
    - 2. Iron and anemia
    - 3. Fluoride and tooth decay
    - 4. Fat intake and heart disease
- III. Diet and Weight Control
  - A. Eat less and exercise more
  - B. Balanced Diet
    - 1. U.S. recommended Daily Allowance (USRDA)
    - 2. U.S. Dietary Goals
    - 3. Fortified food
- IV. Exercise and Nutrition
  - A. Daily eating practices
    - 1. Breakfast
    - 2. Basic four
    - 3. Snacks