

COMPARISON OF TEACHING METHODS FOR PRESENTING
CONCEPTS RELATED TO DIABETES AND THE DIABETIC
DIET TO NURSING STUDENTS ENROLLED IN AN
ELEMENTARY NUTRITION COURSE

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CHAPTER I

INTRODUCTION

There is an increasing interest in the implementation of non-traditional methods of instruction at all levels of the educational process. Non-traditional methods include the use of modules and various auto-instructional devices. Using the non-traditional teaching techniques, the emphasis is changed from the teacher and teaching method to the learner and the learning process (1). Auto-instructional devices encourage students to become more active and responsible for their own learning. The instructional process is individualized and learners may accomplish educational goals at their own pace and repeat lessons as many time as desired. The students that excel in their classwork may continue on as rapidly as possible. Those students who have learning difficulties or are slow learners may take steps at a pace that consists with their needs.

Instructional modules are a part of instruction which are related to a particular subject matter area (2). They are self-contained units and include any activities which might be needed to use the module. Modules can be used in any convenient setting and may be completed at the

individuals own pace. The self-instructional module is arranged so the individual can identify the objective to be accomplished. After the objective is identified, the learner follows a teaching sequence by selections from several methods of presentation. Upon completion of the sequence, evaluation of his own accomplishments is done (3).

The purpose of this study was to assess whether there was a difference in the mastery level of students receiving instruction through use of an instructional module (a non-traditional technique), the traditional lecture method, or a combination of the two methods. An instructional module on diabetes mellitus and the diabetic diet was developed and implemented in Nutrition and Food Sciences 2323, Elementary Nutrition, at Texas Woman's University. The module was utilized for comparing a non-traditional lecture method and the combination of the two methods. The objectives of this study were as follows:

- 1) to develop an instructional module on diabetes and the diabetic diet to be utilized as a non-traditional teaching method,
- 2) to measure differences in post-assessment activities among three teaching techniques,
- 3) to measure differences in levels of retention among three teaching techniques,
- 4) to measure differences in pre-post- and retention assessment activities within each individual teaching technique, and
- 5) to evaluate the effectiveness of the instructional module.

CHAPTER II

REVIEW OF LITERATURE

Traditional vs Non-traditional education

In higher education there is an increasing interest in the introduction of new forms of teaching (4). This is often a result of the desire to develop more efficient teaching methods that are more adaptive than many traditional ones. Both efficiency and adaptiveness are more or less accomplished in many different educational systems such as mastery-learning systems, programmed learning systems, or modular instruction. In these systems, study units are used that were developed systematically (4).

Changing instructional techniques from the traditional method where the teachers' lectures provides information to the student to programmed instruction programs is one step in relating education to the problems of the present. There are several terms used to signify this type of instruction: competency-based education, learner-success oriented systems, auto-instruction, or programmed instruction (5,6).

When a course is offered in a non-traditional format, it is necessary that the details of how to proceed through the course be made clear. Therefore, clarifying to the

learners the purpose of a program and the mechanics to be used in completing the program are the first priorities (7).

In this study these terms will all be noted as instructional modules. Instructional modules change the emphasis of the education from the teacher and the teaching method to the learner and the learning process. Instructional modules center on the needs and accomplishments of the learner since emphasis is placed on objectives and individualized instruction (1).

Auto-instructional devices

The value of using educational technology has been recognized for several years. In 1926, Pressey (8) asked for the release of the teacher from many of the routine jobs so that he can be a real professional teacher and not just a clerical worker. His ideal advocated an industrial revolution in education.

Later during the initial development of programmed instruction, Skinner (8) voiced the need for use of this new technology as a way of letting the teacher do real teaching. Gaudin (8) states that audio-visual devices can and should be used in the classroom but their proper place is in the language laboratory or learning center.

There are six effective roles of audio-visual materials in education. Erickson (8) listed the following as roles of audio-visual materials:

- 1) provide the teacher with means of extending the the range of experience,
- 2) help the teacher add meaningful sources of information,
- 3) give the teacher interest catching spring-boards into a large variety of learning activities,
- 4) aid the teacher in overcoming physical difficulties of present subject matter,
- 5) increase pupil worth when communicative materials are made jointly by students and teachers, and
- 6) provide the teacher with a package of tools to give diagnostic, research, and remedial work requested by up-to-date instructional purpose.

Other authors indicate that the use of instructional modules in education enlarges opportunities for students to overcome difficulties and limitations. Instructional modules exhibit equal patience for the slow as well as the fast learner. There is no discrimination between rich and poor and none in regard to race, color, or creed (8).

The area of programmed instruction and teaching machines or auto-instructional devices is a growing field which is still in its infancy (9). Changes are taking place almost daily. The number of research studies in this area is also increasing.

Auto-instruction is not new since several people for years have taught themselves things that they desired to know by reading books and other materials (10). A technique has been produced which applies the principles of learning to teaching devices designed specifically for auto-instruction.

Most people are intrigued by gadgets with buttons to push. This interest in the mechanics of presenting material seems to make learning by teaching machines exciting and motivating to the students. Another consideration is whether the device is automatic so the student can be left alone to instruct himself. Not all teaching machines are automatic (10). Teaching machines are mechanical devices which display programs to a learner (9). The machines are designed for an individual student rather than for instruction of an entire class at one time. Teaching machines offer a certain organized program of material that may be accomplished by the student at his own rate of learning. Teaching machines will not replace textbooks because not all material can or should be programmed (9).

Practically all types of students can benefit from teaching machines. Significant success has been observed with both those requiring individual attention at a slow pace and those who need freedom to proceed as quickly as possible. Make up problems and tests are reduced and different needs and interest are met more adequately through the use of teaching machines. Research indicates that some students are able to learn much more and a lot faster when teaching devices are used to supplement regular classroom procedures (9,11).

A student using an individually - paced kit of learning materials is made aware of the objectives and importance of each unit being studied (12). Therefore, he is involved in the total learning process rather than just being the receiver of it. An adequately developed individual - paced program should permit students to independently choose, start, and follow a particular learning technique on a given subject. This allows the instructor to serve, not as the traditional giver of knowledge, but as a resource expert in the area who provides individual attention when required (12).

Auto-instruction can be an effective and efficient method of instruction as seen by the wide acceptance in industry and the armed forces. Several controlled experiments have shown that auto-instruction is as effective as lectures and filmstrips. This technique has been found to be more efficient than traditional methods. Students complete the same amount of material using auto-instruction in remarkably less time than those taught by conventional instruction methods. Research has indicated that auto-instruction can be used successfully with individuals of any age. The only prerequisite being that the learner should be able to read and to see (10).

Individual instruction

Individual instruction may be defined as learning experiences made to function relatively independent of an instructor (8). As term denotes, individual instruction is an instructional process involving carefully planned materials and devices made to produce learning without necessarily requiring additional human instructional guidance (9).

A self-instructional package is a unit of information used to teach one basic concept or idea at a time. With each package, a student may proceed at his or her own rate and in his or her own way (11,13). Individualized instruction encourages students to become more active and responsible for their own instruction. Individualization tends to stimulate learners to assume some of the responsibility for their own learning. This will enable them to become independent learners who are able to proceed without being dependent on others (14). In this kind instruction, the responsibility for success is inherent in the student, with the teacher acting to guide, assist, and motivate the student. With individual success, a sense of personal achievement and self-esteem develop. The teacher becomes less a presenter of lectures and more of a learning director or guide (14). It is implied that a self-instructional device might best be regarded as an automatic tutor (8,15).

There are several suggestions for the design, selection and use of self-instructional systems. The program should be packaged in small units and a low duplication cost required. The storage must be designed to provide immediate access to the materials and to protect the unit from damage. The teaching modules should be easy to operate and the implementation of audio in addition to visual presentation is desired (3,8).

The students needs, abilities, and interests is one of the main focal points around which the instructional program centers (14). The objectives or goals should be clearly stated in performance terms (3). Statements of objectives in individual instruction will inform students what they are to accomplish, how they will attain desired objectives and how they will be evaluated. Such statements or behavioral objectives are a main part of individualized instruction because they are developed from the students viewpoint rather than the teachers (14). The four criteria for good objectives include:

- 1) express desired learner behavior,
- 2) describe an observable act,
- 3) state the condition of performance, and
- 4) state the standard of performance (16,17).

Under a cooperative goal structure, learner goal accomplishment is positively correlated. Therefore, when

one learner achieves his goal all students achieve their goals. Under an individualized goal structure, student goal achievement is independent. The goal achievement of one student is unrelated to the goal achievement of other students. Since the two ways of structuring learning lead to different interaction patterns, each promote different learning outcomes (18).

A research study conducted at The Pennsylvania State University evaluated the effectiveness of self-instruction/lecture approach. The program focused on the identity, source, and function of nutrients. The basic principles dealing with the concepts were presented by self-instruction while related current issues were presented in lecture. The effectiveness of the self-instruction approach was tested by giving pre- and post-tests designed to assess student knowledge before and after covering the self-instruction materials. There was improvement observed in the post-test over the pre-test. The percentage of students reaching post-mastery levels indicated that the self-instructional materials were effective in aiding student's mastery of the nutrition principles regardless of their background upon course entry. Course evaluation questionnaires indicated that students like the teaching approach. Ninety percent of the students rated the approach as good to excellent (19).

Instructional modules

An instructional module can be defined in many ways. Basically it is a part of instruction that is related to a particular subject matter area (2). The module is self-contained or complete in itself. Any charts, slides, illustrations, or tapes which might be needed are included in the instructional module.

Modules may be developed to include a variety of media. They may be paper with verbal and pictorial illustrations, or they may include written booklets with a slide/tape program. Modules may also utilize videotape, film, or other combinations of software and hardware (2).

Modules can be used in any setting convenient to the learner and may also be completed at the learners own pace. The unit may be used individually or by small learning groups. The self-instructional module is arranged so the learner can identify the objective to be accomplished, select the appropriate material, follow a learning sequence by selecting from several methods of presentation, and evaluate his own accomplishments (3).

The main requirement for developing instructional modules is understanding the underlying basis of the modular format. Some of the steps suggested for a modular format include the following:

- 1) modules should be based on specific objectives,
- 2) several teaching strategies may be used in preparing modules,
- 3) activities suggested for each unit ensure student participation,
- 4) individualization is achieved using modules,
- 5) student progressions can be according to his or her own pace,
- 6) the time allowed for viewing a module may be varied since they are small units and may be used in a short time period or even repeated,
- 7) since the modules are self-contained, the portability is enhanced, and
- 8) the measurement of achievement of content is simplified since it relates to the objectives specified for the given content unit (2).

The center of the module is a study guide or workbook.

The study guide serves as an organizer of the teaching-learning process with the module. In the study guide, the subject material, planned activities, content and audio-visuals are developed around a particular theme that establishes a meaningful integration on that subject matter (4).

A module must meet certain criteria for effective instruction such as planned study activities, regular feedback, and a meaningful structure. Study programs designed to meet above criteria are more effective than most traditional ones. By providing means of evaluation and test results, the job of reviewing the modules to maximize their

effectiveness is enhanced for the teacher. The use of modules in a program can occur gradually and usually does not require reorganization of an entire study program at one time (3,4).

Learning modules need to be given critical appraisal in following areas. Objectives must be stated in behavioral terms, be reasonable and attainable, and developed for appropriate age group. Subject matter should be consistent with the objectives, divided into single units for the learner, and organized in a logical sequence. It should not only be suitable for the entry level and competency of the learner but also clear, concise, and pertinent.

Design characteristics should include a self-contained unit, directions or instructions, and concepts to be learned identified. Learning activities should actively involve the learner and offer supplemental activities such as a textbook. Adaptability should take into account individual differences in learners and facilitators. For example, the differences in available time, variety of physical facilities, and variation in the size of the learning groups (2,3).

The module should be valid in the sense that the subject matter and process should assist learner in accomplishing the module's objectives. Evaluation should be included if module is to be accountable. Pre-assessment

and post-assessment activities as well as an evaluation form for feedback on this teaching learning process should be included (2,3).

Instructional module may not always be the most effective instructional technique but they are more compact and individualized for particular needs within an area. Modular activities have been more effective than the regular textbook in maintaining the interest of the learners who have reading difficulties (2).

There are some problems that can occur in instructional modules such as the programmer not knowing the material to be covered or the student. The programmer may not have the skill to make the material appear interesting or to present the material in appropriate steps or sequence. And lastly, there could be a problem if the programmer does not construct test items carefully (11,20).

Following a modular format, the various parts of effective instruction are incorporated. The goals are specified, learning content is indicated, and the tests are designed solely related to the goals indicated for that particular unit (2).

CHAPTER III

PROCEDURES AND METHODOLOGY

Development of the instructional module

An instructional module containing four units was developed for this study. The first unit described the disease, diabetes mellitus (21,22,23,24). Unit two covered diabetic diet (25,26,27). The third unit discussed the diabetic diet with an emphasis on the 1976 revised dietary exchange lists (28). The fourth unit presented how to calculate a diabetic diet when given a diet prescription (29,30). A calculation exercise for the learner to complete was included with this unit (Appendix A).

The first step in developing the instructional module was to propose not only individual unit objectives but also the main objective for the entire program (Appendix B). After the objectives were identified, a detailed outline was developed (Appendix C). The outline was used in order to make sure all the objectives would be met. Before and after the objectives were completed, they were discussed with the instructor of the elementary nutrition class in order to make sure all necessary topics were covered. Guidelines were discussed as to percent accuracy and completion time

of the units. The units were designed to ensure that they would not be too long which might cause poor student response to modules, but long enough to concur with a scheduled lecture period.

After appropriate objectives were written, the module storyboard was developed (Appendix D). The storyboard used for the units was a pictorial storyboard which consisted of a verbal narration with appropriate pictures to the left. The storyboard was arranged in the order presented in the outline of one unit. The picture frame illustrated on the storyboard was one slide of the unit and the verbal narration beside the picture frame was read as that particular slide was shown. There were four storyboards developed, one for each unit. Each unit consisted of approximately twenty to thirty frames with corresponding narration (32).

After the storyboard was developed, slides were made in correspondence to each picture frame of the storyboard. Some of the slides had to be made from artwork referred to as flats. Flats were cards of four ply cardboard which were 9" by 11". The art of image area was located 1½" from the top of the flat and 1" from each end. The bottom of the image area was 1½" from the bottom edge of the flat (31).

Once the image area was established, the pictures or captions necessary to meet the picture frame requirements on the storyboard was then mounted. The pictures or

artwork could have been drawn directly on the flat or mounted with dry mounting tissue (31). The pictures used on the flats of the four units were mounted with the tissue on colored paper which were already mounted on the cardboard flats.

The colored paper was mounted in the following manner. Dry mounting tissue was tacked to the back of colored paper. The colored paper was then trimmed to a 6" by 9" size and correctly positioned on the flat, with the tissue side down, the upper right hand and the lower left hand corner of the paper were tacked to the flat using a tacking iron. The next step was placing the flat in the press heated to an operating temperature of 180 degrees for ten seconds. During the heating process the developer had to make sure the flat was completely covered with a clean sheet of paper. This prevented direct contact with the press which could cause inks to melt and smear.

The pictures were then mounted on the colored paper. The dry mount tissue on the pictures must cover the entire back surface of the image material with no tissue showing at the edges. The method used to prevent this was to tack a sheet of mounting tissue to the back of an untrimmed picture using tacking iron making sure to tack at center only (31,32,33). The picture with attached tissue was trimmed to desired size. The picture was then positioned on the

horizontal flat so that it was within the 'safe area'. The 'safe area' was 1" from all sides of the image area except if the flats prepared are to be used for filmstrips, film (16mm) or television (31). The flats developed for this project, were developed for possible use on television in the future.

Lettering was also done on some of the slide flats for the captions. The type of lettering used was transfer lettering of gothic style and letter size of twenty-four point. The lettering was also kept within the 'safe area'. The spacing of the letters were done optically not mechanically. Each line was no more than twenty-two spaces long (31,32).

The importance of line spacing was also considered since lines that are too close together are difficult to read. Therefore, a minimum of $1\frac{1}{2}$ times the height of the letter was followed. Information rate was also another aspect considered. Stamper (31) recommended that there be no more than five to six lines per visual preferably only four lines. The lettering was transferred on to the colored paper which was already mounted to the flat following measurement requirements.

After the flats were completed, they were put on film using a 35mm camera and Kodachrome 64 color slide film. Using a copy stand, the flats were positioned within the

picture lens area of the camera and exposure was made with an electronic flash. There were also some live shots taken of people and food models.

After the slides were processed, the developer reviewed them to decide which slides required improvement. The tape was then made. The tape was first recorded on a reel-to-reel in order to make any necessary corrections. After the reel-to-reel was edited and completed, it was then transferred to the cassette tapes using patch cords from the monitor jack of the original recorder to the phonojack of the cassette recorder. The unit tapes were then played and sync signals were programmed (31,32).

The Caramate projector was the instrument used to present the instructional module to the students. There were two slide carousel trays, each one containing two units. These were stored in their original containers and labeled with appropriate units and frames per unit. Directions (Appendix E) accompanied the Caramate explaining the steps to the students (32).

Upon storage, the units will be in a self-contained box with label. The slides will be in plastic slide holders bound in booklets containing storyboards and other necessary information.

Implementation of the instructional module

Student nurses enrolled in Spring semester of 1979 in Nutrition and Food Sciences 2323 were the subjects for this study. During their course of study in Elementary Nutrition, they are taught the dietary exchange list and calculation of the diabetic diet. The study was conducted during this two week period of time.

Three groups of approximately 20 students were required for the study. The first group was given the instructional modules as their only means of instruction on this topic. The pre-test for this group was given the week prior to the beginning of the two week study (Appendix F). It contained questions covering all four module units. The instructional modules were made available throughout the two week period so the student could proceed at an individual pace. The modules were set up in a reference room which was used as the learning center. Study guides were available in the module kit for all four units (Appendix G). Behavioral objectives and fill in the blank responses were included in a study guide for each unit. The study guide was used in order to enhance learning during the unit and was kept by the students. Upon completion of the four units, the students were given a post-test which covered all four units

(Appendix H). A rating scale was given to the students to complete and give any suggestions on the module unit (Appendix I).

Group 2 was taught the lesson by lecture only. Two half hour lectures were given during one class period each week to present information covered in the four units. The same material including the slides were presented to this group during the lectures as were available in the module units. The students had opportunities to ask questions throughout the lecture period since the tape cassette was not utilized. The study guides were also used in this group. They were distributed at the beginning of the class for the units being covered at that lecture. This group was also given the pre-test the week prior during their nutrition lab period. The post-test was administered the week after the completion of the four units.

The third and final group also consisted of 20 nursing students. They were not only given the lecture but were also required to view the instructional modules during the two week period at their own pace. The pre-test was given the week prior to the beginning of the lectures and modules available. All four study guides were distributed at the beginning of the program since the modules might be completed before the lecture and vice versa. Their lecture consisted of the same slides and materials available in

the instructional modules. However, the modules were taped and were seen at times convenient for them during the two weeks. Their lectures were held in the same manner as Group 2 but one day later. At this time questions and immediate feedback were obtained. The post-test and evaluation of the module were given one week after the completion of the lecture and/or module units.

A retention test was given to all three groups. This was administered three weeks after the post-test. The retention test consisted of the same material as the post-test.

Statistical analysis

The post-test data was analyzed by analysis of covariance with the pre-test being the covariate. The paired t test was used to determine whether the difference was between the mean scores of the pre-test and the post-test and also the post-test and retention test for each group. The Newman-Keuls Comparison Test was done to test individual comparisons between the three instructional mode groups. An analysis of covariance was also calculated for the retention test data with the post-test being the covariate. The analysis of covariance procedures were done using ANOVA in the SPSS statistical computer package.

CHAPTER IV

RESULTS AND DISCUSSION

An instructional module on diabetes mellitus and the diabetic diet was developed for nursing students enrolled in Nutrition and Food Sciences 2323, Elementary Nutrition, at Texas Woman's University. The module was utilized to compare the mastery level of students presented information through use of an instructional module, traditional lecture, or a combination of two methods of instruction.

Development of the instructional module

An instructional module on diabetes mellitus and the diabetic diet was developed. The module consisted of the following four units: 1) diabetes mellitus, 2) diabetes and the diabetic diet, 3) the diabetic diet, and 4) calculation of the diabetic diet.

Each module was a self-contained unit consisting of slides, tape, study guide, and directions. The slides developed for the module were either made from artwork or taken live. There were approximately twenty to thirty slides in each unit. A tape was developed for each unit to correspond with the appropriate slide when viewed through the Caramate. Study guides listing the unit objectives

and pertinent fill-in-the-blank information were available for each unit (Appendix G). These were filled out as the student was viewing the module. Directions detailing the operation and activities of the module were included.

Presentation of instructional methods

Students enrolled in Nutrition and Food Sciences 2323 were the subjects for the study. The students were divided into three groups depending on the day their nutrition lab class was scheduled. The students viewing the module (Group 1) met on Wednesday, the lecture group (Group 2) only met Tuesday, while the combination teaching method group (Group 3) met Thursday.

Students in Group 1 viewed the instructional module to obtain the units on diabetes and the diabetic diet. The learning center was established in a reference study room. The module was available for two weeks and could be viewed at the students own pace between 8:00 AM and 5:00 PM.

Students in Group 2 obtained the information through the traditional lecture method. The students viewed the same slides available in the module and the lecturer discussed the same material covered on the unit tapes. The lecture period was one hour; therefore, two module units were covered each week for two weeks. Each instructional

module was approximately twenty minutes. This left classroom time for any questions or discussion.

Students in Group 3 received instruction on diabetes and the diabetic diet by attending lectures and viewing the instructional module. The lecture was given during their Thursday class period in the same manner as Group 2. As mentioned earlier, the module was viewed at the learners own pace.

Evaluation of instructional techniques

A pre-test was developed to assess the students initial knowledge of diabetes and the diabetic diet. The test consisted of short answer, fill-in-the-blank, and calculation activities. Sixty-five percent of the questions on the pre-test were recall and thirty-five percent application. The recall questions measured the knowledge and comprehensive levels of the cognitive domain. For example, the question, "list the two types of oral hypoglycemic agents", measured students recall of this information. The application questions measured students ability to apply information presented on menu planning utilizing the exchange lists and calculation of a diabetic diet from a prescription. The pre-test was administered one week prior to the beginning of the study during a scheduled class period. The post-test was identical to the pre-test except

for the arrangement of the questions. This was administered one week following the completion of the units on diabetes.

A retention test was completed by the students three weeks after the post-test. This test was administered to determine the level of retention in each instructional group. The retention test was the same as the post-test and was administered during a scheduled class period. All three tests were to be completed in twenty minutes with ninety percent accuracy.

Evaluation of the instructional module

A rating scale was developed to assess the students attitudes toward the module (Appendix I). Questions concerning the modules quality and effectiveness were included. Students utilizing the instructional module were asked to complete the rating form.

As Table 1 indicated, the majority of the students rated the module good in being interesting, well written, and organized. Areas rated as excellent included clearly stated directions and length. The instructional module averaged a good rating from both Group 1 and Group 3. A general comment from the two groups revealed that the lecture with the instructional module as a supplement was preferred.

TABLE 1
RESULTS ON STUDENT EVALUATION OF MODULE QUALITY

<u>Question</u>	<u>Rating</u>			
	Excellent	Good	Fair	Needs Improvement
	<u>Total % Responding</u>			
1. Directions clearly stated	45	32	18	5
2. Improved understanding of concepts	18	45	26	11
3. Interesting	34	47	16	3
4. Well written	34	47	19	0
5. Well organized	37	50	11	3
6. Too long	50	34	16	0
7. Attractive and appropriate slides	37	32	29	3
8. Prefer module over a lecture	21	37	24	18
9. Amount of learning	21	34	21	24

Evaluation results

Results of the pre-test indicated that none of the students attained the desired mastery level for any of the objectives. The mean, standard deviation, and range for the pre-test are illustrated in Table 2. The percent of students attaining the various mastery levels on the pre-test are illustrated in Table 3. Results of the pre-test indicated that the students had a limited amount of knowledge regarding diabetes and the diabetic diet.

One week following the completion of the units on diabetes and the diabetic diet a post-test was administered. The mean, standard deviation, and range are also presented in Table 2. The percent of students attaining the various mastery levels on the post-test is also listed in Table 3. The small percentage of students not attaining above 90% mastery level was attributed to the application questions on the test. Many students did not attempt to answer these questions. The researcher recommended that additional teaching and feedback be administered in these areas. Data presented in Table 4, however, indicated that a significant difference was found between the pre-test and post-test scores for all three groups. All three groups had a significant gain in the pre-test to post-test scores.

Results of the Analysis of Covariance are presented in Table 5. The pre-test was utilized as the covariate.

TABLE 2

MEANS, STANDARD DEVIATIONS, AND RANGE OF PRE-TEST,
POST-TEST, GAIN, AND RETENTION TEST BY
TYPE OF INSTRUCTION

	<u>Group</u>		
	Module n=22	Lecture n=19	Mod/Lec n=16
<u>Pre-test</u>			
Mean	18.8	23.6	18.6
SD	11.2	15.2	13.8
Range	5%-42%	1%-58%	2%-47%
<u>Post-test</u>			
Mean	54.2	55.4	66.0
SD	16.9	14.0	16.2
Range	20%-83%	28%-80%	34.5%-94%
<u>Gain</u>			
Mean	34.5	31.8	47.3
SD	14.8	15.4	16.8
Range	9%-56%	1%-57%	24%-74%
<u>Retention</u>			
	(n=13)*	(n=17)*	(n=15)*
Mean	43.4	47.8	46.3
SD	18.0	12.4	16.6
Range	11%-70%	18%-62%	12%-79%

*Retention test group size.

TABLE 3

PERCENT STUDENTS ATTAINING VARIOUS LEVELS OF MASTERY

<u>Group</u>	<u>Levels of Mastery and Assigned Grade</u>				
	Above 90%	75%-89%	60%-74%	51%-59%	Below 50%
	(A)	(B)	(C)	(D)	(F)
PRE-TEST					
Module	0	0	0	0	100
Lecture	0	0	0	5	95
Mod/Lec	0	0	0	0	100
POST-TEST					
Module	0	14	32	18	36
Lecture	0	11	26	32	32
Mod/Lec	6	31	25	25	13
RETENTION					
Module	0	0	23	15	62
Lecture	0	0	18	29	53
Mod/Lec	0	7	7	27	60

TABLE 4
COMPARISON OF MEAN TEST SCORES FOR
THE THREE METHODS OF INSTRUCTION

<u>METHOD</u>	Pre- to Post (gain)	Post- to Retention (loss)
Module	35.5*	-5.96
Lecture	31.8*	-7.4
Mod/Lec	47.3*	-19.0*

*P \leq 0.05

TABLE 5

ANALYSIS OF COVARIANCE OF POST-TEST SCORES ADJUSTED FOR
PRE-TEST SCORES BY INSTRUCTIONAL METHOD

<u>Covariates</u>	<u>Sum of Squares</u>	<u>df</u>	<u>Mean Squares</u>	<u>F</u>	<u>P</u>
PRE	2297.761	1	2297.761	11.176	0.002
<u>Main Effects</u>					
GP	1775.920	2	887.960	4.319*	.018
<u>Residual</u>	10896.538	53	205.595	--	--

*P \leq 0.05

The post-test scores of the groups were adjusted to compensate for different entry levels of the subjects. The adjusted post-test means of the three groups are presented in Table 6. Results of the Analysis of Covariance indicated significant differences in the adjusted post-test score among the three groups.

The Newman-Keuls Multiple Comparison Test was utilized to determine the differences in the post-test scores. A significant difference between the adjusted post-test mean of Group 1 (module) and Group 3 (module/lecture) was found (Table 7). Results indicated that the adjusted post-test mean of Group 3 exceeded that of Group 1. Group 3's adjusted post-test mean was significantly higher than Group 2 (lecture). The adjusted post-test means of both Group 1 and Group 2 were significantly lower than that of Group 3. However, the adjusted post-test means of Group 1 and Group 2 were not significantly different.

The mean, standard deviation, and range of the retention test scores of the three groups are presented in Table 2. The percent students attaining various levels of mastery on the retention test are illustrated in Table 3. The desired 90% mastery level was not attained by any of the students since the students did not attempt to answer the

TABLE 6

ADJUSTED POST-TEST MEANS BY
TYPE OF INSTRUCTION

<u>Group</u>	<u>Adjusted Means</u>
Module	55.07
Lecture	53.73
Mod/Lec	66.86

TABLE 7

THE NEWMAN-KEULS MULTIPLE COMPARISON TEST

<u>Groups</u>	<u>Difference</u>	<u>Minimum Sig. Range</u>
Mod/Lec - Module	11.79*	3.53
Mod/Lec - Lecture	13.13*	3.93
Module - Lecture	1.34	0.40

*Significantly different $P \leq 0.05$.

application questions on the exam. The students stated that they needed additional instruction and practice in these areas.

Analysis of Covariance on the retention tests of the three groups with the post-test as the covariate was also calculated. There was no significant differences of the adjusted retention test scores among the three groups (Table 8). The retention test scores of the groups were adjusted to compensate for the different post-assessment levels of the subjects. The adjusted retention test means of the groups are listed on Table 9.

The researcher expected that Group 3, the module/lecture group, would achieve a significantly higher retention score than the other two groups. The results of the Analysis of Covariance did not indicate this since there was no significant difference among the retention test scores of the three groups. Results seem to suggest that the level of retention was independent of the teaching method. Some of the factors observed that may have caused the test results to be biased include student attitude and absenteeism. The students attitudes were poor since results of their performance would not influence their semester grade. Since the retention test was administered near the end of

TABLE 8

ANALYSIS OF COVARIANCE OF RETENTION TEST SCORES ADJUSTED
FOR POST-TEST SCORES BY INSTRUCTIONAL METHOD

<u>Covariates</u>	<u>Sum of Squares</u>	<u>df</u>	<u>Mean Squares</u>	<u>F</u>	<u>P</u>
POST	4237.897	1	4237.897	31.260	.000
<u>Main Effects</u>					
GP	531.584	2	265.792	1.961	.154
<u>Residual</u>	5558.430	41	135.571	--	--

TABLE 9
ADJUSTED RETENTION TEST MEANS
BY TYPE OF INSTRUCTION

<u>Group</u>	<u>Adjusted Mean</u>
Module	48.22
Lecture	48.92
Mod/Lec	40.89

the semester, student absenteeism was high. The number of students completing the retention test was less than either of the other exams.

The results of the Analysis of Covariance on the post-tests of the three groups indicated that the module was useful in supplementing the lecture. If a test of this nature is attempted in the future, the researcher recommended that steps be taken to alleviate the problem areas previously mentioned.

Results of this study are similar to those of Shannon (19), Menne et al. (35), Stuck, and Manatt (34). A research study conducted at Pennsylvania State University indicated a high level of mastery for students given a self-instruction approach to nutrition (19). Another study by Menne et al. (35) indicated that taped lectures were just as effective in supplying information to college undergraduates as the regular classroom lecture. In a study by Stuck and Manatt (34) at Iowa State University, a comparison of audio-tutorial and lecture methods of teaching were performed. Results of the study indicated that the group receiving the audio-instructional method showed a significantly greater increase in achievement than did the traditional group. Results of this study indicated that a combination of the module/lecture approach was effective in presenting information on diabetes and the diabetic diet.

CHAPTER V

CONCLUSIONS

The results of this study indicated that the greatest gain in post-test over pre-test scores was accomplished by the group receiving both the module and lecture method of instruction. The group receiving the instructional module as their only means of instruction scored no higher than the group taught by the lecture method. The researcher recommended that the classroom lecture be supplemented by the instructional module for higher levels of mastery.

The retention test data revealed that there was no significant difference in retention test scores among the three groups. This could have resulted since subjects in each group who participated in the pre- and post- assessment activities did not take the retention test.

The evaluation form completed by instructional module users only, averaged a good rating from both groups. A general comment from the two groups revealed that the lecture with the instructional module as a supplement was preferred.

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APPENDIX A

CALCULATION EXERCISE

UNIT #4

Calculate the following diet prescription. Then compare with the attached key.

Carbohydrate: 270gms.

Protein: 85gms.

Fat: 65gms.

CALCULATION EXERCISE

UNIT #4

KEY

Calculate the following diet prescription before referring to this key.

Carbohydrate: 270gms.

Protein: 85gms.

Fat: 65gms.

CALCULATION METHOD:

	<u>CHOgms.</u>	<u>PROgms.</u>	<u>FATgms.</u>
Milk(2)	24	16	-
Vegetables(2)	10	4	-
Fruit(3)	30	-	-
	<u>64gms.</u>		

270gms. - 64gms. = 206gms.

206gms. \div 15gms. = 14 bread exchanges

Bread(14) = 210gms. of CHO and 28gms. of PRO

	<u>CHOgms.</u>
Milk(2)	24
Vegetables(2)	10
Fruit(3)	30
Bread(14)	210
	<u>274gms. total CHO</u>

	<u>PROgms.</u>
Milk(2)	16
Vegetables(2)	4
Bread(14)	28
	<u>48gms. total PRO</u>

85gms. - 48gms. = 37gms.

37gms. \div 7gms. = 5 meat exchanges

	<u>PROgms.</u>	<u>FATgms.</u>
Meat, Low-fat(2)	14	5
Meat, Med-fat(3)	21	15
	<u>35gms.</u>	<u>20gms.</u>
Milk(2)	16	
Vegetables(2)	4	
Bread(14)	28	
	<u>83gms. total PRO</u>	

	<u>FATgms.</u>
Meat, Low-fat(2)	5
Meat, Med-fat(3)	15
	<u>20gms.</u>

65gms. - 20gms. = 45gms.
 45gms. ÷ 5gms. = 9 fat exchanges

	<u>FATgms.</u>
Fat(9)	45
Meat, Low-fat(2)	5
Meat, Med-fat(3)	15
	<u>65gms. total FAT</u>

The diet is now ready for division into three meals plus any required snacks. The exchange lists are then used to convert the meal pattern into a useful menu.

APPENDIX B

Main Objective:

Upon completion of these units on Diabetes Mellitus, the student should be able to describe and relate diabetes in respect to the disease itself and the diet.

Course Objectives:

The student should be able to define the course objectives with 90% accuracy within two weeks.

1. Define in writing diabetes mellitus
2. List and describe the four methods diagnosing diabetes
3. Recall and define the two drug treatments for diabetes
4. Identify and describe the four physiological complications of diabetes
5. Discuss the importance of a controlled dietary regime
6. List the six diabetic exchange lists
7. Calculate the diabetic diet based on guidelines given in the instructional module

Unit #1 Objectives:

The student should be able to identify the unit objectives with 90% accuracy within 20 minutes.

1. Define in writing the term diabetes mellitus
2. List and define the five factors influencing diabetes
3. Recall the four stages of diabetes
4. Discuss the difference between the two types of diabetes
5. List the five symptoms of diabetes
6. List and define the four laboratory studies

Unit #2 Objectives:

The student should be able to perform the unit objectives with 90% accuracy within 20 minutes.

1. List the four types of insulin
2. List the two types of oral hypoglycemic agents
3. Discuss the relationship between regularity of meal times and insulin
4. Recall and define four complications of diabetes with relation to the diet and the disease

Unit #3 Objectives:

The student should be able to perform the unit objectives with 90% accuracy within 20 minutes.

1. Define in writing the term exchange list
2. Discuss in writing the use of the meal pattern
3. List the six exchange lists
4. Recall and list two food items from each exchange group with appropriate serving size
5. Utilize the six exchange lists by writing a days menu

Unit #4 Objectives:

The student should be able to perform the unit objectives with 90% accuracy within 20 minutes.

1. Define in writing the term meal pattern
2. Construct a meal pattern from a diet prescription

APPENDIX C

I. Diabetes Mellitus

A. Definition of diabetes mellitus

B. Factors influencing diabetes

1. Heredity
2. Obesity
3. Middle-aged person
4. Abnormal glucose tolerance during pregnancy
5. Women giving birth to high weight babies

C. Stages of Diabetes

1. Prediabetes
2. Chemical diabetes
3. Gestational diabetes
4. Clinical diabetes

D. Types of Diabetes

1. Juvenile onset
2. Growth onset

E. Diagnosis of Diabetes

1. Symptoms

- a. polyuria
- b. polydipsia
- c. polyphagia
- d. weight loss
- e. ketosis

2. Laboratory Studies

- a. glycosuria
- b. hyperglycemia
- c. glucose tolerance

F. Summary

II. Diabetes and the Diabetic Diet

A. Drug Treatment for Diabetes

1. Insulin

- a. short acting
- b. intermediate acting
- c. long acting
- d. combination

2. Oral Hypoglycemic Agents

- a. sulfonylureas
- b. biguanides

B. Complications of Diabetes

1. Acidosis or diabetic coma

- a. cause
- b. symptoms
- c. treatment

2. Hypoglycemia or insulin shock

- a. cause
- b. symptoms

3. Surgery

- a. before

- b. after
 - 4. Infection
 - a. problems
 - b. treatment
 - C. Summary
- III. The Diabetic Diet
 - A. Introduction
 - 1. History
 - 2. Revision
 - B. Definition
 - 1. Exchange list
 - 2. Meal pattern
 - C. Milk List
 - 1. Types
 - 2. Nutritive values
 - 3. Serving sizes
 - 4. Substitutions
 - D. Vegetable List
 - 1. Nutritive values
 - 2. Serving sizes
 - 3. "As desired" vegetables
 - E. Fruit List
 - 1. Nutritive values
 - 2. Serving sizes

F. Bread List

1. Types
2. Nutritive values
3. Prepared foods

G. Meat List

1. Nutritive values
2. Serving sizes
3. Types

H. Fat List

1. Nutritive values
2. Serving sizes
3. Types

I. Summary**IV. Calculation of the Diabetic Diet****A. Diet Prescription**

1. Desired calories
2. Nutritive values

B. Calculation

1. Minimum levels
 - a. milk
 - b. vegetables
 - c. fruit
2. Bread Exchanges
3. Meat Exchanges
4. Fat Exchanges

C. Meal Pattern

1. Division of meals
2. Preparation of menu

D. Summary

APPENDIX D

Diabetes Mellitus

The purpose of this instructional unit is to discuss the many facets of diabetes mellitus. It is an attempt to familiarize you with just one of the many diseases requiring essential nutritional care. This is the first of four instructional units that will be taught concerning the diabetic diet.

Picture illustrating insulin not being admitted to cell

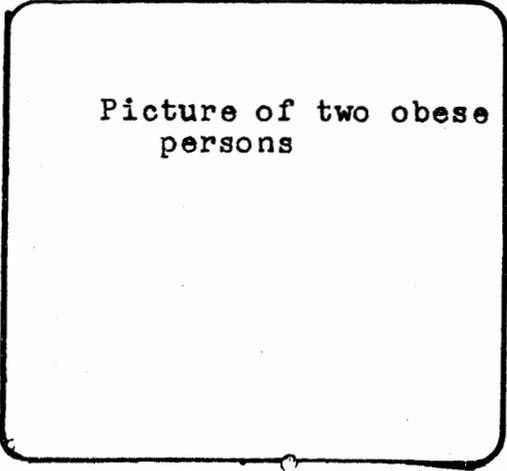
Diabetes mellitus is a genetic disease of metabolism. There is a partial or total lack of insulin. Insulin is a hormone secreted by the pancreas which assists in the use of glucose or sugar and lowers blood sugar. It is characterized by a decreased ability or total inability of the tissues to use carbohydrate. The insulin defect may be a block in its formation, liberation, or action.

Picture of seesaw with
low income side weigh-
ing more than high

Diabetes Mellitus is a prominent public health problem since it affects about 4.4 million persons in the United States. Diabetes ranks third as a causative factor of blindness. About 35,000 deaths from diabetes are reported every year in the United States. It has been noted that diabetes is more prevalent in lower economic groups. The rate in families earning less than \$4,000 yearly being more than double that of families with incomes over \$4,000.

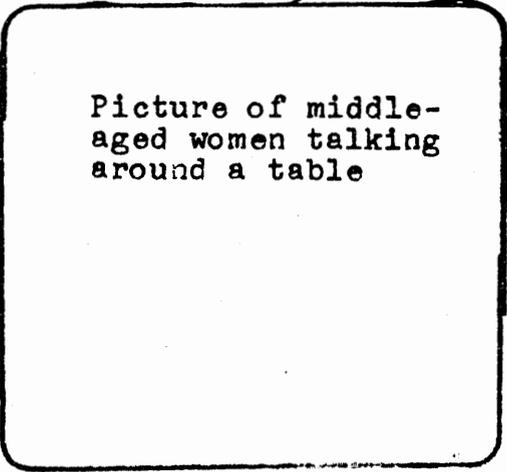
Picture of family
generation

There are several factors influencing the occurrence of diabetes. One of the factors is heredity. The disease occurs more frequently among blood relatives.



Picture of two obese
persons

A second factor characterizing high risk individuals is obesity. For an individual 50 percent overweight, diabetes is twelve times more prevalent than for an individual of normal weight.



Picture of middle-
aged women talking
around a table

Another factor influencing diabetes is persons over 40 years of age. It has been shown that glucose tolerance decreases with age.

Picture of pregnant woman looking at baby clothes

A fourth factor is women who during pregnancy have abnormal glucose tolerance curves. Most of these women become diabetic some ten to twenty years later.

Picture of new mother with newborn

The fifth and final factor influencing high risk individuals is women who give birth to babies who weigh nine pound or more.

Factors Indicating
Diabetes

Several factors will denote when diabetes will show itself. Diabetes is assumed to be present at birth, but detectable chemical and clinical signs of the disease may not be noticeable for years.

Picture of people of
different age groups

Prediabetes is the period from birth until high blood sugar is recognized.

Picture of lab with
technician doing
work

Chemical diabetes is
characterized by an abnormal
glucose tolerance test but no
symptoms are seen.

Picture of pregnant
woman leaving doc-
tors office

Gestational diabetes is
the abnormality of glucose
tolerance seen during preg-
nancy.

Picture illustrating
the different symp-
toms with a sad face

Clinical diabetes is characterized by typical symptoms. These symptoms include excessive thirst, excessive urination, and increased appetite as well as an abnormal glucose tolerance curve.

Types of Diabetes

There are two types of diabetes generally recognized. These are juvenile diabetes and adult or growth onset diabetes.

Picture of a
teen-ager

Juvenile diabetes is usually seen before the age of twenty but sometimes it may occur up to the age of fourty. In juvenile diabetes, most of the classic symptoms of diabetes are present and most have either lost weight or are normal in weight.

Picture of a woman
in her sixties

Adult diabetes occurs after thirty years of age but has its highest incidence in the fifties and sixties. This onset is usually subtle, and often none of the classic stmptoms are present. These patients may have a continuous feeling of fatigue and often complain of increased thirst, frequent urination and itching. Adult diabetics are usually obese.

Symptoms of
Diabetes

There are five classic symptoms of diabetes.

Polyuria:

excessive urination

One of the five symptoms is polyuria which is frequent urination and an abnormally high volume of urine.

Another symptom is polydipsia. Polydipsia is excessive thirst.

Polydipsia:
excessive thirst

A third symptom is polyphagia which is an increased appetite.

Polyphagia:
increased appetite

Loss of weight

The fourth symptom sometimes experienced by diabetics is a loss of weight.

Ketosis:

accumulation of
fatty acids

The fifth final symptom is ketosis. This condition is the accumulation of fatty acids in the blood which leads to the excretion of ketones (a chemical compound containing a CO grouping).

Picture of lab

There are four basic laboratory studies that are used in detecting the symptoms of diabetes.

Glycosuria:
sugar in the urine

One such laboratory study is glycosuria or the presence of an abnormal amount of sugar in the urine. This should therefore be regarded as evidence of diabetes unless proved otherwise.

Hyperglycemia:
high blood sugar

Hyperglycemia or high blood sugar is another laboratory study which may be detected after a fast of twelve hours. It is usually suggested that a fasting blood sugar of more than 140mg. per 100ml. is an indication of diabetes. However, many elderly persons have slightly elevated blood sugar levels without having diabetes.

Glucose Tolerance
Test

The glucose tolerance test is a measure of the ability of the body to use a known amount of glucose and is another laboratory study used. Usually three days prior to the test the patient is given a diet containing at least 150gms. of carbohydrate each day. A fasting blood sample is drawn 12 to 14 hours after the last evening meal. A solution containing a weighed amount of glucose is then given to the patient. Blood samples are taken at $\frac{1}{2}$, 1, 2, and 3 hours after ingestion of the glucose. Diabetes is present if the fasting and three hour sugar levels exceed the level set as norm.

Ketonuria:
ketones in the
urine

The fourth laboratory study is ketonuria. This is the excretion of ketones in the urine. Ketonuria occurs when fatty acids are incompletely oxidized in the body. A simple urine test is done to determine this condition.

1. Define diabetes
2. Five factors
3. Four stages

In summary we remember the following; 1) diabetes mellitus is a genetic disease of metabolism with a partial or total lack of insulin, 2) Factors influencing diabetes are heredity, obesity, age, pregnancy with abnormal glucose tolerance curves, and women who give birth to babies weighing nine pounds or more, 3) the four stages of diabetes are prediabetes, chemical diabetes, gestational diabetes, and clinical diabetes,

4. Two types
5. Five symptoms
6. Four laboratory studies

4) the two types of diabetes are juvenile and adult diabetes. Juvenile diabetics are usually under twenty years of age and most classical symptoms are present. Adult diabetes usually occurs after the age of thirty and the onset is subtle, 5) the five symptoms of diabetes include polyuria, polydipsia, polyphagia, weight loss, and ketosis, 6) four laboratory studies used in determining diabetes are glycosuria, hyperglycemia, glucose tolerance test, and ketonuria.

The End

This is the conclusion of Unit #1 which explained diabetes. Please turn off the equipment before leaving the area.

DIABETES AND THE DIABETIC DIET

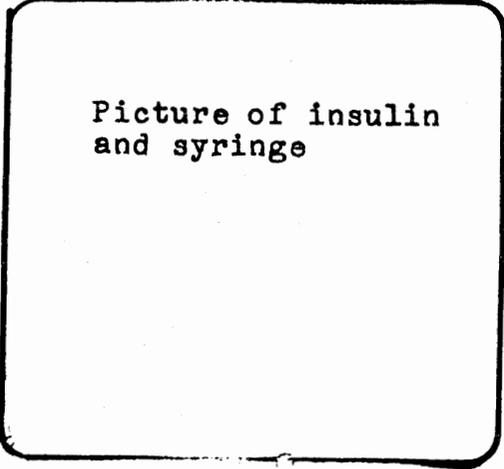
UNIT #2

Diabetes and the
Diabetic Diet

The purpose of Unit #2 is to explain the relationship between the disease diabetes and the diabetic diet.

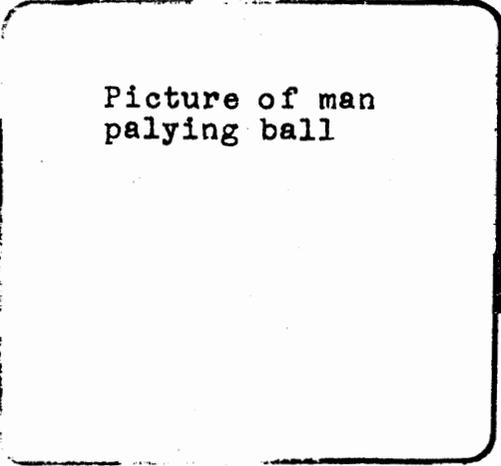
Picture of people
playing

In treating diabetes mellitus, the main goal of therapy is to maintain and prolong a healthy, productive, and satisfying life. Using drug therapy is sometimes a means of achieving these goals.



Picture of insulin
and syringe

Insulin is one of the drug treatments used. It is supplied to the body by injection.



Picture of man
palying ball

Insulin is measured in units and specific circumstances may vary the insulin requirement considerably. Such circumstances include exercise which reduces the need, while infection increases the need. Emotional upsets may also modify the utilization of insulin.

Picture illustrating
different types of
insulin with bars

There are four types of insulin used in the treatment of diabetes. These include short acting, intermediate acting, long acting, and combinations.

INSULIN

?

?

which one ?

?

The factors influencing the choice of insulin are the response of blood glucose levels to meals, quantity and distribution of dietary carbohydrate, physical activity, and individual response.

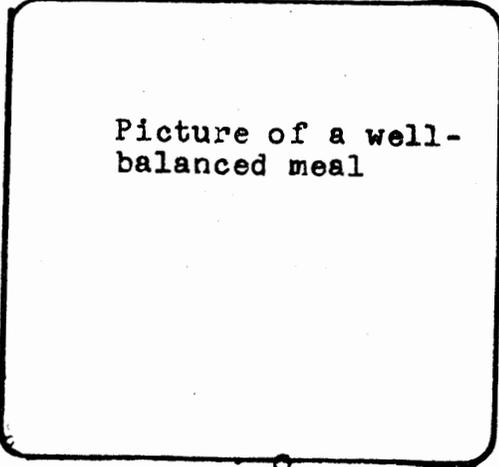
Oral Hypoglycemic
Agents

(picture of different
colored pills)

Another drug treatment
used in diabetes is oral
hypoglycemic agents.

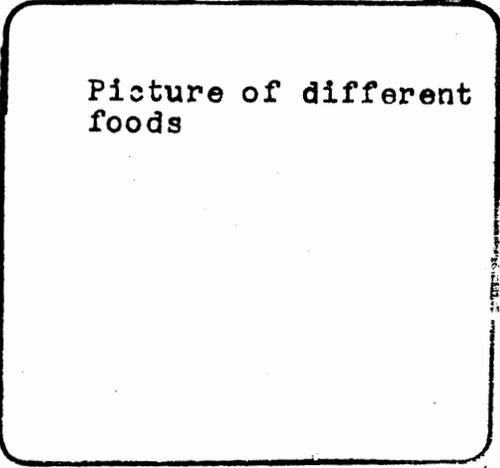
Picture illustrating
the two different
compounds

There are two groups
of oral compounds now in use.
These are the sulfonylureas
and the biguanides. These
compounds are used when
sufficient insulin is still
being produced.



Picture of a well-balanced meal

The oral drugs are only useful in the management of adult diabetes when it cannot be controlled by diet alone. These drugs are not satisfactory for juvenile, severe, and unstable diabetics. Oral hypoglycemic agents should not be substituted for a controlled diet.



Picture of different foods

Dietary control is an essential part of diabetic management with or without medication.

Woman weighing
on scales

A primary objective for all diabetics is the control of calorie intake to reach normal weight. The calorie allowance is basically the same as that of non-diabetic individuals.

Picture of a face
next to a card in-
dicating diet and
medication

If the diabetic is using medication, his diet and medication are regulated so the blood sugar is kept within normal limits and the the urine is free of sugar. It is important that the diet is not only controlled but individualized. Everyone's eating habits vary and every measure must be taken to assure a likeable diet.

Picture of three
different clocks
and times

Establishing a regular eating pattern is desirable for persons taking medication. Meals should be spaced to match the availability of insulin. A delay in eating might cause hypoglycemia (low blood sugar) and an excess of carbohydrate might cause hyperglycemia (high blood sugar). The physicians diet order will indicate meal frequency according to your institutions diet manual.

Complications of
Diabetes

There are some complications which can occur to the diabetic if certain situations are present.

Diabetic Coma

omitting insulin
overeating
guessing dose

One dreaded complication in diabetes is diabetic coma or acidosis. The diabetic coma may be caused if the patient consumes additional foods, or if the patient failed to take the correct amount of insulin and maybe even omitting the dosage. Some of the signs of diabetic coma includes headaches, anorexia, nausea, vomiting, abdominal pain and other various aches and pains. The patients skin is hot, dry, and flushed and an acetone odor on the breath with rapid breathing and drowsiness. Prompt measures must be taken immediately or symptoms of shock, unconsciousness, and death will soon follow.

Picture of someone
getting a shot

For treatment of diabetic coma, small repeated doses of insulin are given along with small carbohydrate feedings when early signs of ketosis are observed. Due to the serious nature of the diabetic coma, close medical care is needed at a hospital.

Insulin Shock

overdose
extra activity
food loss

Another complication of diabetes is hypoglycemia or insulin shock. This may be caused by an overdose of insulin, omission of food, loss of food by vomiting or diarrhea, or an increase in physical exercise without adjusting insulin dosage.

Picture of someone
in bed after surgery

A third complication is surgery. For surgery, a glycogen reserve is essential and is only assured if sufficient carbohydrate is included in the diet twelve hours prior to surgery with enough insulin supplied for its utilization. After surgery, carbohydrate feedings should begin within three hours whether parentally or orally.

Picture of someone
hurt

Another complication involving diabetes is infection. The infection increases insulin requirement as it lowers carbohydrate tolerance. Sometimes infection may lead to coma or a mild diabetic become severe.

1. Four types insulin
2. Two oral drugs
3. Regularity of meals
4. Four complications

In summary we remember, 1) the four types of insulin; short acting, intermediate acting, long acting, and combinations, 2) two types of hypoglycemic agents; the sulfonylureas and the biguanides, 3) the relationship between regularity of meal times and insulin. Meals should be spaced to match with the availability of insulin. 4) four complications of diabetes with relation to the diet and the disease; diabetic coma or acidosis, hypoglycemia or insulin shock, surgery, and infection.

The End

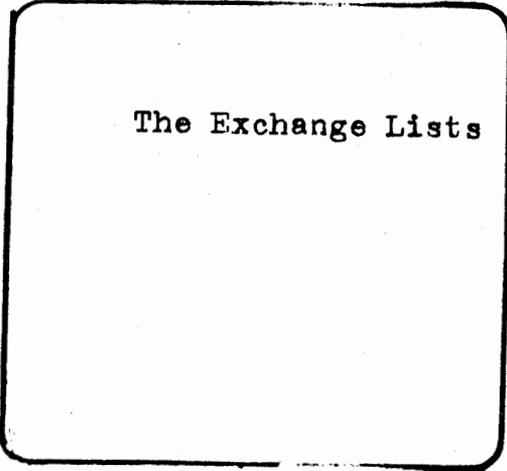
This is the end of Unit #2 which has attempted to explain the importance of diabetes and the diabetic diet. Please turn off the equipment before leaving the area.

The Diabetic Diet

THE DIABETIC DIET

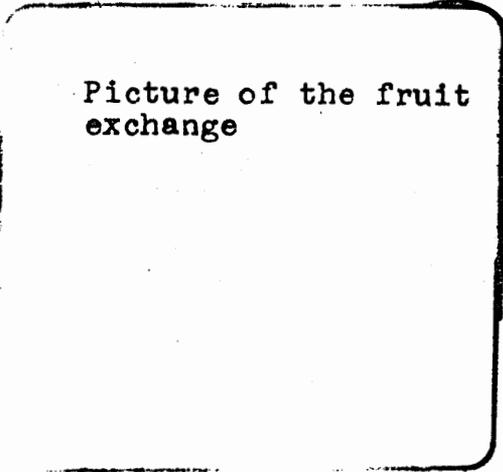
UNIT #3

This instructional module which is Unit #3, deals with the diabetic diet and the use of the exchange lists.



The Exchange Lists

Dietary control is an important part of management for the diabetic. The diabetic diet is unique in a sense that it contains various food groups called exchange lists. The exchange lists were introduced in 1950 with the latest major revision in 1976. The main concept of the new revision was to direct the diet therapy toward food low in fat content. Patients with diabetes have a tendency for premature vascular disease, therefore the new lists stress polyunsaturated fats.



Picture of the fruit exchange

An exchange list is a grouping of foods in which specified amounts of all foods listed are approximately equal in carbohydrate, protein, and fat values. Thus, any food within a certain group can be substituted or exchanged for another in that same group.

Picture of various
foods

The foods of each exchange make a specific contribution. No one exchange group can supply all the nutrients needed for a well-balanced diet. It takes all six of them working together as a team to supply the diabetics nutritional needs.

Picture of a sample
meal pattern

A meal pattern consisting of the required calories which is ordered by the physician, is made up of the various exchange groups. This meal pattern is obtained from your hospital diet manual and is followed when preparing the patients meals.

Picture of the milk group

The first group is the milk group. It includes non-fat, low-fat, and whole milk. One exchange of milk contains 12gms. of carbohydrate, 8gms. of protein, a trace of fat, and 80 calories.

Picture of milk and yogurt with serving sizes

Each food item in the milk exchange varies in amounts allowed for one exchange. Milk, whether it is non-fat or whole is one cup. Evaporated milk either non-fat or whole, is $\frac{1}{2}$ cup. And low-fat and regular yogurt is one cup per exchange.

Picture of milk with
fat exchanges listed
for each different
type of milk

For the milk group, the basic exchange is non-fat milk. If low-fat or whole milk is used, then the appropriate number of fat exchanges must be taken out. For example, if whole milk is used two fat exchanges must be taken off the meal pattern. If 2% milk is used, one fat exchange is removed, and if low-fat milk is used, $\frac{1}{2}$ fat exchange is eliminated.

Picture of the
vegetable group

The second group is the vegetable group. One exchange contains about 5gms. of carbohydrate, 2gms. of protein, and 25 calories. One exchange is $\frac{1}{2}$ cup for all vegetables.

Picture of as
desired vegetables

There are a few raw vegetables which may be used as desired. They include chicory, chinese cabbage, escarole, lettuce, radishes, parsley, and watercress.

Picture of the fruit
exchange

A third group is the fruit group. Each exchange contains 10gms. of carbohydrate and 40 calories. The serving size varies depending on the fruit.

Picture of the
bread exchange

The fourth group is the bread exchange which includes breads, cereals, and starchy vegetables. One exchange contains 15gms. of carbohydrate, 2gms. of protein, and 70 calories.

Picture of cornbread,
biscuits, and pancakes

Included in the bread exchange are prepared foods including biscuits, pancakes, and cornbread. Depending on the food item, some fat exchanges must be eliminated.

Picture of cottage
cheese and steak

Another group is the meat exchange. The basic exchange is lean meat which contains 7gms. of protein, and 3gms. of fat equivalent to 55 calories per exchange. The serving size varies according to food choice.

Picture of peanut
butter, pork chop,
swiss cheese, and
bologna

There are also medium fat meat items and high fat meat items. If these items are used, $\frac{1}{2}$ fat exchange must be eliminated for a medium fat meat item and one fat exchange must be eliminated for a high fat meat item.

Picture of the fat
exchange

The sixth and final exchange is the fat exchange. One exchange of fat contains 5gms. of fat and 45 calories. Serving size varies for each item.

Picture of corn oil
and bacon

The new revisions make it possible to choose between saturated and polyunsaturated fat through the selection of items in bold face (polyunsaturated) and light face (saturated).

Picture of a 1000
calorie meal pattern

Here is a 1000 calorie meal pattern. Now you have 5 minutes to design a days menu then compare it with mine when the slide continues. Use the exchange list guide available in the module kit.

Picture of sample
meal menu

For breakfast there is $\frac{1}{2}$ cup of unsweetened orange juice for the one fruit exchange, 1 slice of toast for the one bread exchange, 1 egg for the one medium fat meat exchange, $\frac{1}{2}$ tsp. butter for the $\frac{1}{2}$ fat exchange because the medium fat meat exchange required $\frac{1}{2}$ fat exchange. For lunch there is $\frac{1}{2}$ cup of cottage cheese for the 2 lean meat exchanges, 6 saltines for the one bread exchange, $\frac{1}{2}$ cup sliced tomatoes for the vegetable exchange, 1 small apple for the fruit exchange, and 1 tsp. french dressing for the fat exchange (the lettuce is free). For supper, there is 2oz. of baked chicken for the two lean meat exchanges, $\frac{1}{2}$ cup of rice for the bread exchange, $\frac{1}{2}$ cup green beans for the vegetable exchange, 2 unsw. peach halves for the fruit, and 1 cup of skim milk for the milk.

1. Define exchange list
2. Define meal pattern
3. List six exchange lists

In summary we remember;
1) an exchange list is a group of foods in which specified amounts of all foods are approximately equal in nutritive values, 2) a meal pattern is made up of exchange groups usually obtained from the hospital diet manual when ordered by the physician, 3) there are six exchange lists; milk, vegetable, bread, fruit, meat, and fat. The exchange lists make up the meal pattern which is then converted into a days menu by an individuals own choice.

The end

This is the end of Unit #3, the diabetic diet and the use of the exchange lists. Please turn off the equipment when you leave the area.

CALCULATION OF THE DIABETIC
DIET

UNIT #4

Calculation of the
diabetic diet

This is the fourth and final unit of the instructional module on diabetes. This unit will illustrate the calculation of the diabetic diet using the exchange lists when given a diet prescription.

Picture of dietitian,
nurse, and doctor

The calculation of the diabetic diet is the responsibility of not only the dietitian, but also the nurse, and the physician.

Picture of two types
of diet orders

The physician will usually order the patients diet prescription according to desired calories, such as a 1800 calorie ADA. The meal patterns are then given in the hospital diet manual according to the calories ordered. However, there are instances when the diet will be ordered by nutritive values such as carbohydrate 225gms., protein 75gms., and fat 65gms. per day. Therefore it is necessary to understand the method of calculation.

Picture of milk, fruit,
and vegetable groups
with minimum levels

Estimate the amounts of milk, vegetables, and fruits to be included. The allowances are decided somewhat by the preferences of the patient, however the following amounts are minimum levels that should be included; milk 2 exchanges, vegetables 2 exchanges, and fruits 3 exchanges.

Picture of a diet prescription using nutritive values

Let us use the diet prescription given previously (carbohydrate 225gms., protein 75gms., and fat 65gms.) and calculate the diet using the nutritive values of the food exchange lists. Milk group(C 12gms. P 8gms. CAL. 80) Vegetable group(C 5gms. P 2gms. CAL. 25) Fruit group (C 10gms. CAL. 40) Bread group(C15gms. P 2gms. CAL 70) Meat group(P 7gms. F 3gms. CAL 55) Fat group(F 5gms. CAL. 45)

	C	P	F
milk(2)	24	16	-
veg.(2)	10	4	-
frt.(3)	30	-	-
	<hr/>		
	64gms.		

First, mark down the nutritive values for the food groups previously mentioned as minimum levels to be included.

225gms. of CHO total -
164gms. = 161gms.

161gms. \div 15gms. =
11 bread ex.

Bread(11) 165gms. 22gms

To determine the number of bread exchanges, add the carbohydrate value of the three groups above and subtract this from the amount of carbohydrate prescribed. Divide the remainder by 15gms. which is the carbohydrate value of one bread exchange. From this figure use the nearest whole number of bread exchanges. Next mark down the nutritive values of these bread exchanges.

Milk(2)	24gms.
Vegetables(2)	10gms.
Fruit(3)	30gms.
Bread(11)	22gms.
	<hr/> 229gms.CHO

Total the carbohydrate column. If this total deviates more than five grams from the prescribed, adjust the amounts of fruits, vegetables, and bread.

Milk(2)	16gms.
Veg.(2)	4gms.
Bread(11)	22gms.
	<u>42gms. PRO</u>

75gms. total - 42gms.
= 33gms.

Next, determine the number of meat exchanges. Total the protein values of milk, vegetables, and bread. Subtract this total from the amount of protein prescribed.

33gms. \div 7gms. = 5 meat ex.

meat, lf(2)	14	5
meat, mf(3)	21	15
	<u>35</u>	20
milk(2)	16	
veg.(2)	4	
bread(11)	22	
	<u>77gms. PRO</u>	

Divide this remainder by 7gms. which is the protein value of one meat exchange. From this figure, use the nearest whole number of meat exchanges. Be sure and include medium fat and high fat meats when desired. Mark down the protein and fat values for these exchanges. Total the protein for all food eXchanges.

meat, lf(2)	5gms.
meat, mf(3)	<u>15gms.</u>
	20gms.

65gms. total - 20gms.
= 45gms.

45gms. \div 5gms. = 9 fat
ex.

To determine the number of fat exchanges total the fat values for both the meat items in that exchange. Subtract this total from the prescribed amount of fat. Divide the remainder by 5gms. which is the fat content of one fat exchange.

fat(9)	45gms.
meat, lf(2)	5gms.
meat, mf(3)	<u>15gms.</u>
	65gms.

Total the fat for this diet. Check the entire meal pattern for any computation errors. The prescription has been met with the following meal pattern.

Picture of filled
out meal pattern
card

This is then divided into three meals plus any snacks required which will look like this. From here the exchange lists are used to prepare daily menus.

The End

This completes Unit #4 of the instructional module on diabetes. Turn off the equipment and proceed to the calculation sheet in the labeled folder. Work through the exercise. Then check the key for reference in the appropriately marked folder.

APPENDIX E

DIRECTIONS FOR INSTRUCTIONAL MODULE USE

1. Select the desired unit.
2. Obtain slide carousel, tape and study guide(to be filled out during tape) for desired unit.
3. Put carousel on top of Caramate and begin slides one frame before unit slides begin. For example, if program begins on No. 1, begin carousel at 0.
4. Obtain unit tape and put in right side slot of Caramate. The labeled side toward the outside with the bottom of tape towards you.
5. Put tape in; turn Caramate projector 'on'(power).
6. Proceed with the unit by pushing the 'play' button on the right side.
7. When finished, rewind the tape and eject from Caramate and put in proper box.
8. Remove carousel by pushing top select button to 0, lift up and put in proper box.

APPENDIX F

PRE-TEST

Define the following terms:

- 1) diabetes mellitus-
- 2) exchange list-
- 3) meal pattern-
- 4) glycosuria-
- 5) hyperglycemia-
- 6) ketonuria-

Distinguish between the following terms:

- 1) juvenile diabetes vs adult diabetes-
- 2) regularity of meal time vs insulin-

Short Answer:

- 1) The five factors influencing diabetes are _____,
_____, _____, _____, and _____.

Discuss how each influence diabetes.

- 2) The four stages of diabetes are _____,
_____, _____, and _____.

- 3) The five symptoms of diabetes are _____,
_____, _____, _____, and _____.

- 4) The four types of insulin are _____,
_____, _____, and _____.

5) The two types of oral hypoglycemic agents are

_____ and _____.

6) Diabetic coma or acidosis is _____

_____.

7) Hypoglycemia or insulin shock is _____

_____.

8) The six exchange lists are _____, _____,

_____, _____, _____, and _____.

9) List two food items from each exchange group and give appropriate serving size.

10) Given the following meal pattern for Breakfast, write one menu for this meal.

BREAKFAST

YOUR SAMPLE

1 Fruit Exchange
2 Bread Exchanges
1 Meat Exchange
2 Fat Exchanges
1 Milk Exchange

11). Calculate a meal pattern from the following diet prescription: (Use the back of the test paper)

CARBOHYDRATE 245gms. PROTEIN 80gms. FAT 70gms.

APPENDIX G

UNIT #1

Objectives:

The student should be able to identify the unit objectives with 90% accuracy within 20 minutes.

1. Define in writing the term diabetes mellitus
2. List and define the five factors influencing diabetes
3. Recall the four stages of diabetes
4. Discuss the difference between the types of diabetes
5. List the five symptoms of diabetes
6. List and define the four laboratory studies

Diabetes mellitus is a _____ disease of metabolism. There is a _____ or _____ lack of insulin.

There are several factors influencing the occurrence of diabetes. These are _____, _____, _____, _____, and _____.

Several factors will denote when diabetes will show itself. The different periods of which diabetes may be detected include _____, _____, _____, and _____.

There are two types of diabetes generally recognized. These are _____ diabetes and _____ diabetes. Juvenile diabetes is usually seen _____ the age of _____ but sometimes it may occur up to the age of _____. In juvenile diabetes, most of the classic

_____ and most have either _____
 _____ or are _____ in weight. Adult diabetes
 occurs after _____ years of age but has its _____
 incidence in the _____ and _____. The onset
 is usually _____ and often _____ of the classic
 symptoms are present.

There are five classic symptoms of diabetes. They
 are _____, _____, _____, _____,
 and _____.

There are four basic laboratory studies that are used
 in detecting the symptoms of diabetes. One such labora-
 tory study is _____ or the presence of an abnor-
 mal amount of _____ in the _____. Another
 study is _____ or _____
 which may be detected after a fast of twelve hours.
 The glucose tolerance test is a measure of the _____
 of the body to use a _____ of glucose.
 The fourth laboratory study is _____ or the
 excretion of _____ in the _____.

UNIT #2

Objectives:

The student should be able to perform the unit objectives with 90% accuracy within 20 minutes.

1. List the four types of insulin
2. List the two types of oral hypoglycemic agents
3. Discuss the relationship between regularity of meal times and insulin
4. Recall and define four complications of diabetes with relation to the diet and the disease

_____ is one of the drug treatments used in treating diabetes. There are four types of insulin and they include _____, _____, _____, and _____.

Another drug treatment used in diabetes is _____. There are two groups of oral compounds now in use and they are the _____ and the _____.

Dietary control is an essential part of diabetic management with or without medication. If the diabetic is using medication, his _____ and _____ are regulated so the blood sugar is kept _____ and the urine is free of _____. Meals should be _____ to match with the _____ of _____.

There are some complications which can occur to the diabetic if certain situations are present. One dreaded complication is _____ or _____. It may be caused if the patient consumes _____, or if the patient _____ to take the _____ amount of _____. Some signs of the diabetic coma include _____, _____, _____, _____, _____, and other various aches and pains. Another complication of diabetes is _____ or _____. This may be caused by an _____ of _____, omission of _____, _____ of food, or an _____ in physical activity. A third complication is _____. A _____ reserve is essential and only assured if sufficient _____ is included in the diet _____ hours prior to surgery. Another complication involving diabetes is _____. The infection _____ insulin requirement as it _____ carbohydrate tolerance.

UNIT #3

Objectives:

The student should be able to perform the unit objectives with 90% accuracy within 20 minutes.

1. Define in writing the term exchange list
2. Discuss in writing the use of the meal pattern
3. List the six exchange lists
4. Recall and list two food items from each exchange group with appropriate serving size
5. Utilize the six exchange lists by writing a days menu

An _____ is a grouping of foods in which _____ amounts of all _____ listed are approximately _____ in _____, _____, and _____ values.

A _____ consisting of the required calories is made up of the various _____.

The first group is the _____ group. It includes _____, _____, and _____ milk. Each food item in the _____ exchange _____ in amounts allowed for _____ exchange. The basic exchange is _____ milk. If _____ or _____ milk is used, then the appropriate number of _____ exchanges must be taken out.

The second group is the _____ group. _____ exchange is _____ cup for all vegetables. There are a few raw vegetables which may be used _____. They include _____, _____, _____, _____, _____,

_____, and _____.

A third group is the _____ group. The serving size _____ depending on the fruit.

The fourth group is the _____ exchange which includes _____, _____, and _____ vegetables.

Another group is the _____ exchange. The basic exchange is _____ meat and the serving size _____ according to food choice. There are also _____ meat items and _____ meat items. If these items are used, _____ fat exchanges must be _____ for a _____ meat item and _____ fat exchange must be eliminated for a _____ meat item.

The sixth and final exchange is the _____ exchange. Serving size _____ for each item.

UNIT #4

Objectives:

The student should be able to perform the unit objectives with 90% accuracy within 20 minutes.

1. Define in writing the term meal pattern
2. Construct a meal pattern from a diet prescription

The calculation of the diabetic diet is the responsibility of not only the _____, but also the _____, and _____. The physician will usually order the patients _____ according to _____, but there are instances when the diet will be ordered by _____.

_____ the amounts of _____, _____, and _____ to be included. Minimum levels include milk _____, vegetables _____, and fruits _____.

First, mark down the _____ for the food groups above. Determine the number of _____ exchanges, add the _____ value of the _____ groups above and _____ this from the _____ of _____ prescribed. Divide the remainder by _____ and use the nearest _____ number of bread exchanges. Total the _____ column.

Next, determine the number of _____ exchanges. Total the protein values of _____, _____, and bread. Subtract this _____ from the _____ of

_____ prescribed. Divide by _____ and use the nearest _____ number of _____ exchanges. Mark down the _____ and _____ values for these exchanges. Total the _____ of all food exchanges.

To determine the number of _____ exchanges, total the _____ values for both the _____ items in that exchange. _____ this total from the _____ amount of _____. Divide the remainder by _____ and _____ the fat from this diet.

This is then divided into _____ meals plus any _____. From here the _____ are used to _____ daily _____.

APPENDIX H

POST-TEST

Define the following terms:

- 1) ketonuria-
- 2) meal pattern-
- 3) hyperglycemia-
- 4) exchange list-
- 5) glycosuria-
- 6) diabetes mellitus-

Distinguish between the following terms:

- 1) regularity of meal time vs insulin-
- 2) juvenile diabetes vs adult diabetes-

Short Answer:

- 1) The five symptoms of diabetes are _____, _____, _____, _____, and _____.
- 2) The six exchange lists are _____, _____, _____, _____, _____, and _____.
- 3) The four stages of diabetes are _____, _____, _____, and _____.
- 4) The four types of insulin are _____, _____, _____, and _____.
- 5) List two food items from each exchange and give appropriate serving size.

6) The two types of oral hypoglycemic agents are

_____ and _____.

7) The five factors influencing diabetes are _____,

_____, _____, _____, and _____.

Discuss how each influence diabetes.

8) Diabetic coma or acidosis is _____

_____.

9) Hypoglycemia or insulin shock is _____

_____.

10) Given the following meal pattern for Breakfast,

write a days menu for this meal.

BREAKFAST

YOUR SAMPLE

2 Fruit Exchanges

1 Bread Exchange

2 Meat Exchanges

2 Fat Exchanges

1 Milk Exchange

11) Calculate a meal pattern from the following diet

prescription. (Use the back of the test paper)

CARBOHYDRATE 245gms.

PROTEIN 80gms.

FAT 70gms.

APPENDIX I

Excellent	Good	Fair	Needs Improvement
(4)	(3)	(2)	(1)

1. Were the directions for this module clearly stated and understood?

2. Did the module meet your needs for understanding diabetes and the diet?

3. Did it interest you?

4. Was it well written?

5. Was it well organized?

6. Was it too long?

7. Were the slides attractive and appropriate?

8. Do you prefer the module over a lecture?

9. Did you learn more from the module than you would/ or did from the lecture?

TOTAL _____

Additional comments: