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I am submitting herewith a dissertation written by Carol Williams Shanklin, entitled "The Assessment of the Feasibility for Using the Evaluation Component of a Model for Implementing and Evaluating a Competency-Based Dietetic Program." I recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy with a major in Home Economics.

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THE ASSESSMENT OF THE FEASIBILITY FOR USING THE EVALUATION COMPONENT OF A MODEL FOR IMPLEMENTING AND EVALUATING A COMPETENCY-BASED DIETETIC PROGRAM

A Dissertation

Presented for the

Doctor of Philosophy

Degree

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Carol Williams Shanklin

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ABSTRACT

A conceptual model for implementing and evaluating a competency-based dietetic program was developed for use with the Coordinated Undergraduate Program in Dietetics at the University of Tennessee, Knoxville. The feasibility for using the evaluation component of the model was assessed for five priority competencies identified as essential for an entry-level generalist dietitian in the areas of quantity food procurement, production, and service.

Sub-competencies and performance indicators were identified for each of the competencies. Didactic and clinical courses in food systems administration were reviewed to ascertain which quarter each competency was introduced and the desired level of performance at designated points in the program. Food systems administration faculty and clinical instructors identified the minimum level of acceptable performance to be achieved by the students. A pool of questions was developed for constructing criterion referenced instruments to evaluate students' cognitive performance at various times during the professional phase of the program and an analysis of exam performance indicated to both student and clinical instructors the competency or competencies and sub-competencies requiring remedial work and/or additional clinical experiences. A total of 45 students in the 1976 and 1977 classes were used to ascertain if the approach in evaluating cognitive performance was applicable to the Coordinated Program.

Four performance exams were constructed from a pool of 85 recall and 35 application questions. The content of the exams varied according

to the point in the program the students were being evaluated. Remedial work and additional experience were planned for students failing to achieve 75 per cent, the minimum of acceptable performance, on any of the competencies. No consistent relationship was found between performance on the exams and profile data such as time spent preparing projects and participating in activities related to competencies, ACT scores, and grade in course. Results on the exams indicated the benefits of continuous evaluation as an integral part of a coordinated program and the importance of testing conditions on student performance.

The model developed for implementing and evaluating a competency-based dietetic program was feasible for use with the Coordinated Undergraduate Program in Dietetics at the University of Tennessee, Knoxville. As the model was employed to only five competencies identified for food systems administration, the application of the model should be extended to incorporate all areas of the program.

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CHAPTER I

INTRODUCTION

The initiation of coordinated undergraduate programs in dietetics has brought about many changes in the organization and administration of dietetic education (Hart, 1974; Reddout, 1973; Roach et al., 1973; Spears, 1973; Wilson, 1972). Dietetics is defined as the profession concerned with the science and art of nutritional care for mankind which includes extending and imparting information about foods which will provide sufficient nutrients for health at all times throughout the life cycle and the management of congregate feeding for these purposes (Committee on Goals of Education for Dietetics, 1969). The educational framework of coordinated undergraduate programs in dietetics consists of the integration of clinical experiences with didactic instruction and is based upon the educational principle that study in the professional environment enhances learning (Anon., 1973). The coordination of didactic and clinical activities early in the program provides greater opportunities for development of competent practitioners in the delivery of nutritional care. The integration serves to provide fundamental knowledge and understanding in the following areas: principles of nutrition, communication skills, conceptual thinking, research orientation, and the biological and social sciences (Anon., 1971). The goals of the coordinated program are stated as competencies or behaviors the student will be able to demonstrate upon completion of the educational program. Specifically the Coordinated Undergraduate Program in Dietetics at the University of Tennessee, Knoxville, hereafter, referred to as the Coordinated Program, is designed so students will have developed

competencies required to qualify as entry-level generalist dietitians upon completion of the program. The entry-level dietitian is defined as the individual who has entered the profession for the first time after completion of academic and clinical experience requirements for membership in the American Dietetic Association, and received a Bachelor of Science degree (Dietetic Internship Council, 1974). At the present time, tools available to aid the implementation and evaluation of coordinated programs are limited. Two tools available to the Coordinated Program to assist in identification of competencies are Tasks Required for Entry-Level Dietitians as Identified by Dietitians in West Tennessee (Lawson, 1973) and proposed entry-level competencies of the Dietetic Internship Council (1974). A need, therefore, exists for the development of tools and methods to assist in the implementation and evaluation of coordinated undergraduate programs in dietetics.

Competencies are defined as the knowledge, skills, and behaviors to be demonstrated at a specified proficiency level by students. These competencies are derived from explicit conceptions of the responsibilities and duties of dietitians by "experts" in the field. A competency-based professional education curriculum such as the Coordinated Program implies that the following criteria are met:

a) competencies to be demonstrated are presented in advance to the student (Crabtree and Hughes, 1974; Edwards, 1973),
b) the rate the student progresses through the program is determined by demonstrating stated competencies at a specified level of achievement (Crabtree and Hughes, 1974; Roach et al., 1974),
c) the student's performance is the primary source of evidence in the assessment of whether the competency has been achieved, and
d) the instructional program is designed to facilitate the development of specified competencies and the evaluation of the student's achievement of these competencies (Crabtree and Hughes, 1974).

The directors and faculty members of coordinated programs are concerned as to whether the courses in the didactic and the integrated clinical experiences are helping the students achieve the competencies. This concern also has been stressed by those working with competency-based teacher education (Johnson and Hurley, 1976; Lindsey, 1973; Reddout, 1973; Spears, 1973; Utz and Leonard, 1971). The success of these programs is contingent on adequate assessment of the student to determine if competencies are being performed at the desired level of mastery (Andreyka and Blank, 1976; Burke and Stone, 1975; Hughes and Fanslow, 1975; Mervein, 1973). Several authors have stressed the need for the development of tools for the assessment of competencies (Elam, 1971; Hallaman, 1974; Johnson and Hurley, 1976; Towers and Vosburg, 1976). According to Wentling (1973), measurement plays an important role in a competency strategy; however, it has failed to receive emphasis proportionate to that given prespecification of objectives or the instructional strategy.

The term "measurement" used herein refers to the assessment of observable behavior resulting from or relating to some learning experience (Wentling, 1973). Too frequently, competencies have been measured by inappropriate methods such as paper and pencil test to evaluate competencies which could only be inferred by such measurements (Edwards, 1973). Criterion referenced instruments or tests are useful for ascertaining whether students have mastered the specified competencies (Cox, 1974; Dzuiban and Vickery, 1973; Popham, 1971; Wentling, 1973). These instruments are used to identify an individual student's status in comparison to a previously stated standard of performance. Specified and acceptable levels of performance referred to as the minimum level of acceptable performance should

be identified prior to assessment of student performance. This level represents a particular proportion of the material in a segment the student is expected to learn (Edwards, 1973; Houston, 1973). All mastery learning strategies, whether self-paced or group-based, assume that the student must achieve the minimum level of acceptable performance for each segment in an instructional sequence before the desired, end-of-sequence learning outcomes may be realized (Block, 1972). Therefore, it is essential that student behavior is sampled at several points in time in the program (Wentling, 1973).

The purpose of this research was to develop a model for use in implementing and evaluating a process to determine if the students in the Coordinated Undergraduate Program in Dietetics at the University of Tennessee, Knoxville have accomplished the minimum level of acceptable performance for a set of priority competencies for an entry-level generalist dietitian. The approach for testing the evaluation component of the model was to:

a) identify a set of priority competencies for quantity food procurement, production, and service which require a minimum level of achievement at strategic points in the professional phase of the program;

b) investigate the feasibility of constructing and administering written criterion referenced instruments to evaluate cognitive learning for the competencies identified;

c) examine student retention of information related to quantity food procurement, production, and service throughout the professional phase of the program.

CHAPTER II

REVIEW OF LITERATURE

I. COMPETENCY-BASED EDUCATION

Within the past five to ten years speculation, analysis, and some developmental work in education have taken the viewpoint that professional training programs can be more precisely defined through what has come to be referred to as the competency-based or performance-based approach to education. The increasing demand for accountable, relevant, and cost effective education has given this concept fresh impetus (Brown and McCleary, 1974).

Definition of Competency

Competency has been defined numerous ways by different authors. For example, Elam (1971) refers to competencies as knowledge, skills, and behaviors to be demonstrated by the learner derived from explicit conception of teacher roles and stated in such a way that assessment of student performance is possible. Competencies also have been defined as the skills, behavior, understanding, and attitudes designed to facilitate social, intellectual, physical, and emotional growth in students (Johnson et al., 1974). Another definition presented by Johnson et al. (1974) is that a competency is the knowledge, skills, and judgment to be demonstrated by the student at a predetermined proficiency level before and/or continuing certification. These definitions have been written for teacher education programs. For this research endeavor, competencies will be defined as the knowledge, skills, and behaviors to be demonstrated at a specified

proficiency level by the student which are derived from explicit conceptions of the responsibilities and duties of the dietitian by "experts" in the field.

Competencies are generally classified as belonging to one of four broad categories: basic, common, technical, and professional. Basic competencies are defined as those essential for the preservation of life, such as communicating with others in one's social group. Common competencies refers to those competencies possessed "in common" by a specified social group. A skill or method of performing some task is representative of what is meant by technical competencies. Professional competencies differ from the other three types in that they carry with them the responsibility for decision making. These competencies are more complex than the preceding types since they require the learner to use accumulated knowledge and experience, creativity, and thought processes in making decisions relative to his action (Johnson et al., 1974).

In addition to being classified as one of the four broad categories, a competency can be identified by one or more of its six components. The performance component of a competency contains observable behaviors of the performance associated with the task or field of study. Those elements of the competency associated with professional education such as principles, strategies, and techniques essential for the performance of the competency are referred to as the subject component. The process or thought component of a competency contains the elements required for the implementation of a given competency. Process in this context refers to the classification of human techniques whereby ideas are produced; design and strategies created, decisions made, and progress evaluated. The process component

can be applied to real or simulated activities or experiences. Personal characteristics or qualities which determine the manner in which an individual initiates a competency illustrate the adjustment component. In order to perform a given competency, an individual must adapt his personal characteristics for each situation. The professional component of a competency includes definitions, facts, principles, and processes associated with the profession. The attitude component represents the enabling elements of attitudes, values, and feelings essential to the performance of any competency. These components are independent yet constantly interact with each other as an individual performs a specified competency. Therefore, each of the components must be evaluated in relation to the other elements involved in the performance of the competency (Johnson et al., 1974).

Characteristics of a Competency-Based Program

Seven characteristics of a competency-based program are as follows: (1) specification of learners' objectives in behavioral terms also referred to as competency statements; (2) specification of the means for determining whether the student's performance meets the expected criterion level or minimum level of acceptable performance; (3) provision for one or more modes of instruction pertinent to the objectives through which learning may take place; (4) sharing of competencies, objectives, criteria, means of assessment, and learning activities with students, faculty involved in program development and implementation, and others interested in the program such as professionals who might hire the graduates of the program; (5) assessment of learning experiences related to competency criteria; (6) placement of the accountability for meeting stated criteria upon the

student; and (7) validation of competencies against student performance on the job (Andreyka and Blank, 1976; Brown and McCleary, 1974; Crabtree and Hughes, 1974; Edwards, 1973; Klingstedt, 1973, Kohlmann, 1975; Houston and Howsam, 1972; Lindsey, 1973; Nagel and Richman, 1972; Newell, 1976; Rosner and Kay, 1974).

Statement of competencies. Competency-based education begins with the identification of competencies for the given field. Competencies are communicated through the use of specific, behavioral objectives for which criterion levels of performance are established and given to the learner prior to the learning experiences. Instruction and evaluation of a student is focused on and limited to the specified competencies the student is to accomplish. Program evaluation includes feedback on student achievement relative to the competencies (Burns, 1972; Klingstedt, 1973; Rosner, 1972). Thus, the statement of a competency involves identifying what is to be demonstrated and the standards of performance to be required (Crabtree and Hughes, 1974; Nagel and Richman, 1972).

Assessment of competencies. In competency-based education, time is the variable while achievement is held constant. For example, if the required criterion level or minimum level of acceptable performance is 90 per cent for a given competency, the learner does not "pass" with a score of less than 90 per cent. The criterion level is the same for all students. The goal of any competency-based program is for each student to achieve the same minimum level of mastery. The need to use criterion referenced instruments rather than norm referenced instruments in evaluation of student performance is essential for competency-based programs (Klingstedt, 1973; Nagel and Richman, 1972; Rosner, 1972).

Instructional strategy. Since the emphasis is on achievement of specified objectives rather than on ranking of students, effort is made to increase the probability of learner success by providing a variety of instructional modes from which the learner selects the one most compatible with his or her learning style. Some of the routes toward the accomplishment of an objective include lecture, programmed instruction manuals, slide/tape series, or video tape presentations. If the learner is not successful in attaining the stated objectives, the student then can select from other experiences available (Klingstedt, 1973). The instructional technique provided for achievement of a competency will vary according to the institution's philosophy and available resources. The majority of supporters for the competency-based movement believe that instruction should be flexible and individualized focusing on the needs and accomplishments of the students (Edwards, 1973; Houston and Howsam, 1972; Johnson, 1974; Kohlmann, 1975). By individualizing instruction, each student can progress through the program at a speed consistent with his needs, time commitment, and achievement.

Accountability. Another essential characteristic of competency-based education is accountability. The learner knows from the start specified competencies are to be accomplished at the required level and in a generally agreed upon manner. The responsibility of achieving the objectives shifts to the student; therefore, accountability for meeting the established criteria shifts to the student. The student's performance is no longer judged by his relative standing to his classmates (Houston and Howsam, 1972).

In order to implement the preceding characteristics for a competency-based program, the following four conditions must be met: the development of measures to ascertain the degree of mastery being achieved by the students, the development of instructional material or units to guide the study and practice toward specific competencies, the development of provisions for study and practice with little delay in evaluation and feedback concerning student performance, and the development of incentives to motivate the acquisition of knowledge within a reasonable length of time (Rosner, 1972). The use of the systems approach in design and implementation of a competency-based program in which all elements of the program are integrated and mutually dependent would promote the application of the characteristics previously discussed.

Mastery Learning in Competency-Based Education

The goal of a competency-based program is to stimulate every student to achieve the same level of mastery (Nagel and Richman, 1972). This indicates that these programs operate under the philosophy of mastery learning which asserts that under appropriate instructional conditions virtually all students can and will learn most of what they are taught (Airasian, 1967; Bloom, 1971; Block, 1973; Mueller, 1973). All mastery learning strategies, whether self-paced or group-based, assume that all students must achieve the minimum level of acceptable performance for each segment of the instructional sequence before the desired, end-of-sequence learning outcomes can be realized (Block, 1972).

While many strategies exist in mastery learning, each must take into account the five variables identified by Carroll (1970): aptitude, ability to understand instruction, perseverance, quality of instruction,

and the opportunity for learning. Carroll (1970) viewed aptitude as measuring the amount of time required to learn a given criterion level under ideal instructional conditions rather than as an index of the level to which a student can achieve. The model proposed that if the student were allowed sufficient time and the required time were spent then the desired level could be attained. However, if the student were not allowed adequate time, the degree of learning would be a function of time actually spent in learning to the time required. The time actually spent was determined by the amount of time the student was willing to spend actively involved in learning which Carroll (1970) defined as perseverance, and the total time allowed. Reasons students do not or are not willing to spend the amount of time required to achieve mastery include lack of motivation, physical stamina, endurance, inability to cope with learning frustrations, and overestimates of personal achievement. Quality of instruction was defined in terms of the extent to which presentation, explanation, and ordering of learning task elements approached optimum for the learner. The final element in Carroll's (1970) model, ability to understand instruction, related to the learner's ability to profit from instruction. By emphasizing time allowed and quality of instruction, each student should be able to attain the specified level of achievement (Block, 1972; Block, 1973; Carroll, 1970; Wolf and Quiring, 1971). Once the mastery level has been determined, measurement of the student's achievement should be done within a short period of time. This serves as an indication of the student's progress in relation to his expected proficiency at any given point in the program (Block, 1972).

II. EVALUATION OF COMPETENCY-BASED EDUCATION

One of the fundamental principles of competency-based education is the ability of the student to demonstrate performance of competencies upon completion of program requirements. The success of the program hinges on adequate assessment of the student to determine if competencies can be performed at the desired level of mastery (Andreyka and Blank, 1976; Burke and Stone, 1975; Hughes and Fanslow, 1975; Mervein, 1973). Some of the problems associated with assessing performance to arrive at valid information include sampling problems involving elements of time, obtaining objective and reproducible observations, and environmental factors surrounding performance being observed (Mervein, 1973; Popham, 1975). Elam (1971) points out that the overriding problem in evaluating student performance in a competency-based program is the adequacy of the measurement instrument and procedures.

Criteria for assessment. Once the competencies have been identified the next task is to indicate the criteria which describe the required performance level to which each objective must be mastered and is used as the standard against which the student's performance is compared. Assessment criteria should be directly related to the competency (Andreyka and Blank, 1976; Byram, 1973; Shearron and Johnson, 1973; Wentling, 1973). When objectives are simple and straightforward, specifying criteria for successful demonstration of objectives under certain conditions is relatively simple. However, most competencies involve complex configuration of variables which complicates assessment. One approach to establishing criteria for the complex competencies is to identify multiple sets of

indicators for each competency. These indicators are then tested throughout the program to determine if the student has achieved the acceptable level of performance (Burke and Stone, 1975; Houston, 1973; Utz and Leonard, 1971).

Types of Evaluation

Norm referenced. Since the emphasis in a competency-based program is on exit requirements which necessitates that the student be able to perform the stated competency, the type of evaluation which teachers are accustomed to using, the norm referenced test, is not appropriate. The norm referenced test also referred to as psychometric test is designed to measure a person in relation to a normative group and is based upon the so called "normal" curve (Carver, 1974; Ebel, 1974). Grades assigned under the "normal" curve result in approximately 10 per cent of the students receiving A's and an equal proportion receiving F's. Students' failures are frequently determined by rank position within the class rather than inability to grasp the central ideas pertaining to the material covered (Ebel, 1974).

Criterion referenced. The type of evaluation best suited for a competency-based program is criterion referenced or edumetric which focuses on individual growth (Cox, 1974; Dziuban and Vickery, 1973; McClelland, 1973; Popham, 1971; Wentling, 1973). In criterion referenced evaluation the emphasis is not on discriminating between high and low student performance which separates students along the baseline of the "normal" curve, but upon measurement of each student's ability to perform the competencies. Criterion referenced tests are used to identify an

individual's status relative to a previously established standard of performance, indicating as precisely as possible whether the student has achieved the specified goal of the learning experience (Dziuban and Vickery, 1973; Klein and Kosecoff, 1973; Jones, 1972). Criterion referenced instruments also measure the effectiveness of the interaction between the instructional strategy and the learning style and ability of the learner (Burns, 1973).

Formative. The time at which measurement occurs within or following the instructional sequence determines the role of measurement (Bloom et al., 1971; Carroll, 1970; Wentling, 1973). As a diagnostic measure of performance, formative evaluation functions to determine the degree of mastery of a given learning task and to pinpoint the parts of the task which the student has not mastered. The purpose is not to grade the student but to identify the areas requiring remedial work or additional experience (Bloom et al., 1971). The formative test indicates those weaknesses to both student and teacher so that alternatives may be determined to remedy deficiencies (Wentling, 1973). Formative tests may be administered at the beginning of a course or module to determine if the student has the fundamental knowledge and skills required to begin the course or module. If the student does not show mastery of the "readiness" objectives, remedial instruction designed to help the student attain the "readiness" objectives should be provided. Only after mastering the objectives should the student be allowed to begin work on new material (Carroll, 1970). Grades usually are not assigned since formative tests are simply a means of quality control on the output of learning (Bloom et al., 1971; Wentling, 1973).

Summative. The second use of measurement instruments is of a conclusive nature and is referred to as summative evaluation. As the term indicates, this type of measurement is administered as the end-of-sequence or terminal measurement of competency. Summative evaluation is directed toward a broader assessment of the degree to which the learning outcomes have been attained over an entire course (Bloom et al., 1971; Wentling, 1973).

Methods for Evaluating Various Components of a Competency

As mentioned previously each component of a competency has to be measured differently. To effectively evaluate the performance component, one must assess the observed performance against given performance criteria. Checklists utilizing performance criteria for mastery at a specific level of proficiency seems to be the most feasible means of assessing performance available today (Johnson et al., 1974; Shearron and Johnson, 1973; Wentling, 1973). The elements comprising the subject component can be evaluated using the traditional paper and pencil tests. Once the elements have been identified, the test commonly used in college classes can be used to determine whether the student has sufficient knowledge concerning the subject to perform the competency (Bowles, 1973; Johnson et al., 1974; Wentling, 1973). The conventional paper and pencil test which represents a reliable sample of information that is essential to perform professional duties also can be used for evaluating the professional component along with a checklist for skills (Johnson et al., 1974). Processes may be evaluated by the product of either a real or simulated activity.

A performance test could be utilized for evaluating both performance and process since this type of test simulates the criterion situation which requires the respondent to perform a particular task rather than to respond to answering what action would be taken in this situation or to select the best answer from a list of alternatives (Johnson et al., 1974; Young, 1972). The type of performance tests that can be developed is limited only by the ingenuity and imagination of the test developer. Performance test may be classified as one of three types: recognition test which requires the learner to recognize essential characteristics of a performance or object; simulated condition test which requires the examinee to perform the task within a criterion level; and work sample test which provides the examinee with a controlled tryout of the task under actual working conditions (Burke and Stone, 1975; Quirk, 1974). The adjustment and attitude components of a competency might be evaluated by having the student systematically examine himself and prepare an inventory of personal characteristics, aptitudes, and deficiencies. Using the list, the student could with the help of peers and/or supervisor search for ways to capitalize on the aptitudes and overcome the weaknesses. Attitude scales are frequently used to evaluate the attitude component of a competency (Johnson et al., 1974).

Issue of Reliability and Validity

Unlike norm referenced instruments, the question of reliability and validity of criterion referenced instruments has not been agreed upon by measurement experts (Carver, 1974; Cox, 1974; Klein and Kosecoff, 1973; Popham, 1971; Woodson, 1974; Young, 1972). There are several types of validity and a variety of ways to establishing the validity of an instrument

(Ebel, 1974) but the researcher was concerned with only content validity. According to Young (1972) content validity may be estimated by having a group of "experts" in the field evaluate each test item to determine if it measures the objectives of the competency being assessed. The question of test reliability is even more debatable than validity. Cox (1974) and Young (1972) debate that the Spearman-Brown formula can be applied to criterion referenced instruments; whereas, Woodson (1974) and others state that this formula requires variability in the difficulty of test items which is not the purpose of a criterion referenced instrument. Popham (1971) states that if the instrument has validity, it also is reliable.

CHAPTER III

MODEL FOR IMPLEMENTING AND EVALUATING A COMPETENCY-BASED DIETETIC PROGRAM

The process of designing and implementing a competency-based program requires specifying in advance the expected outcomes of the program in terms of competencies to be demonstrated by the graduate upon completion of program requirements. Learning experiences are designed to facilitate student's progress toward the specified competencies. Evaluative instruments relevant to the stated competencies are constructed and administered throughout the program (Lindsey, 1973). The key to success of a competency-based program, therefore, depends upon the statement of competencies and later evaluation of performance.

Identification of Competencies

The first component of the model (Figure 3.1) for implementing and evaluating a competency-based dietetic program involves the identification of the competencies to be performed by the graduate of the program. Specifying the competencies to be acquired by the student can be accomplished by involving dietitians employed in the field, supervisors and coordinators of the program, clinical and didactic instructors, students, and other professionals involved in identifying the competencies essential for an entry-level generalist dietitian. Identification of a list of responsibilities and duties to be performed by the graduate is the product of the interaction of group members. Knowledge, skills, and behaviors expected of an entry-level dietitian are stated in terms of observable and

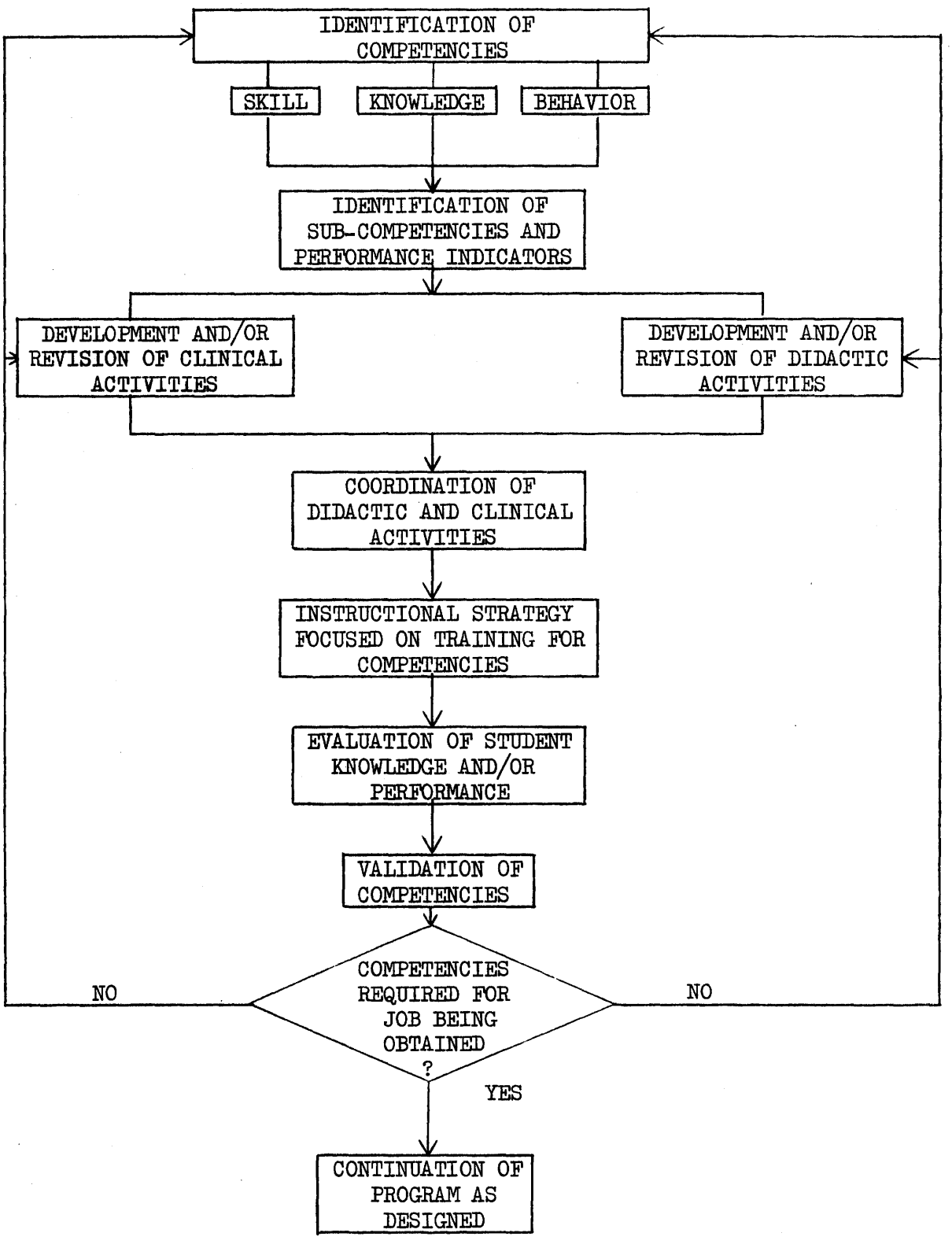

FIGURE 3.1. A MODEL FOR IMPLEMENTING AND EVALUATING A COMPETENCY-BASED DIETETIC PROGRAM

measurable acts the student should be capable of performing upon completion of program requirements. Three factors are involved in this process: (1) identifying what is to be learned; (2) specifying the condition(s) under which learning is to be demonstrated; and (3) describing the standard of performance required (Nagel and Richman, 1972). The competency statements should include behaviors representative of each of the domains--cognitive, affective, and psychomotor (Kohlmann, 1975).

Identification of Sub-Competencies and Performance Indicators

Broad competencies, once identified, should be divided into accompanying sub-competencies and performance indicators. Performance indicators also are referred to as behavioral objectives. This division facilitates the evaluation process by further defining the behaviors necessary to perform the competency and identifying the criterion against which the behavior is to be judged. For each competency statement, a corresponding performance indicator and criteria for assessment should be identified. Competency statements should state explicitly the minimum level of acceptable performance or the expected mastery level under specified conditions and should identify the standards against which performance is to be evaluated (Crabtree and Hughes, 1974).

In addition to facilitating student evaluation, the performance indicators function in other ways in implementing a competency-based program. Some of these functions include: (1) a means of communication between student and teacher, (2) a basis for selecting appropriate instructional activities, (3) an aid in decision making concerning the proper sequencing of instructional events, and (4) a means of communication between the program and other professionals in health care delivery (Burns, 1972).

Didactic and Clinical Activities

The third component in the model is the development and/or revision of didactic and clinical activities. Learning experiences in both aspects of a coordinated program should be designed to facilitate acquisition, understanding, and application of theoretical knowledge. Activities in the didactic phase should emphasize the development of basic skills and knowledge necessary to perform the competencies while the clinical component of the program provides opportunities for the student to apply knowledge and basic skills (Reddout, 1973). Competency statements should function as useful tools in identifying activities of the competencies.

Coordination of didactic and clinical activities, the fourth component of the model, is essential if students are to receive the most benefit from the program and is considered one of the most crucial elements in coordinated programs (Spears, 1973). Through careful coordination of activities and experience in both phases of the program, the educational needs of the student should be met. The coordination of theory and practice should promote better understanding of the various aspects of the profession.

Instructional Strategy

The efficiency with which students attain specific knowledge and skills is dependent upon the effective integration of human, physical, and material resources. Instructional strategies used should include only those methods which will enable the student to attain the desired competencies (Rosner, 1972). The instructional methods should focus on stated objectives for one or more competencies. When possible, provision should be made so that more than one mode of instruction is available through

which the learning activity takes place. The rate of learning for individuals varies with different techniques; therefore, the availability of more than one mode of instruction would facilitate individual learning (Johnson, 1974).

An important characteristic of the model is the individualization of learning experiences. Individualization provides for self-pacing of students through modules or learning experiences allowing each student to proceed at a speed consistent with his abilities, needs, and time commitments (Houston and Howsam, 1972). A frequent means of providing for individualized instruction is through the use of audio-tutorial modules. Each module is designed to cover a limited amount of material or one sub-competency. The module is useful for providing supplemental or new information on material presented in a course or assists the student to learn new skills for use in the clinical phase of the program. Audio-tutorial modules also are useful in providing remedial work for students who are not performing at the desired level of mastery.

Evaluation

The evaluation component of the model is probably the most crucial one for the student as well as the program director. In a competency-based program the student's performance of the competencies should be the primary source in determining whether the student progresses to the next phase of the program. In addition to performance, assessment should take into consideration the student's knowledge in relation to his ability to plan, analyze, interpret, or evaluate situations or behaviors that may occur on the job (Crabtree and Hughes, 1974). The purpose of evaluation is to determine how effectively the competencies are achieved.

Instructor's evaluation. Figure 3.2 illustrates the process for instructor's evaluation of student performance throughout the professional phase of the program. At the beginning of the program or instructional sequence, the student is provided with competency statements and criteria for evaluation. The instructor supervises, directs, and evaluates student's progress through the clinical and didactic activities. As the student advances through the program and participates in clinical and didactic activities, a variety of techniques is used for evaluating student performance. These techniques include paper and pencil test, oral exchange between student and instructor, observation with the aid of a checklist or observation guide, and products of a real or simulated work situation. In addition, periodic mastery examinations are administered based on criterion sampling to determine if satisfactory progression is being achieved. If the student fails to achieve the minimum level of acceptable performance, the clinical or didactic instructor discusses with the student the competencies or objectives requiring remedial work or additional clinical experiences. After participating in additional clinical experience or completing remedial work, the student is reevaluated to determine whether the minimum level of acceptable performance has been attained at this time. This process continues until the student has achieved the minimum level of acceptable performance on all competencies. At this point, the student is ready to accept a position as an entry-level generalist dietitian.

Validation of Competencies

Once the student has completed the program and is employed in the field, the next step is to determine whether the competencies taught during the program are those actually needed to perform on the job. The

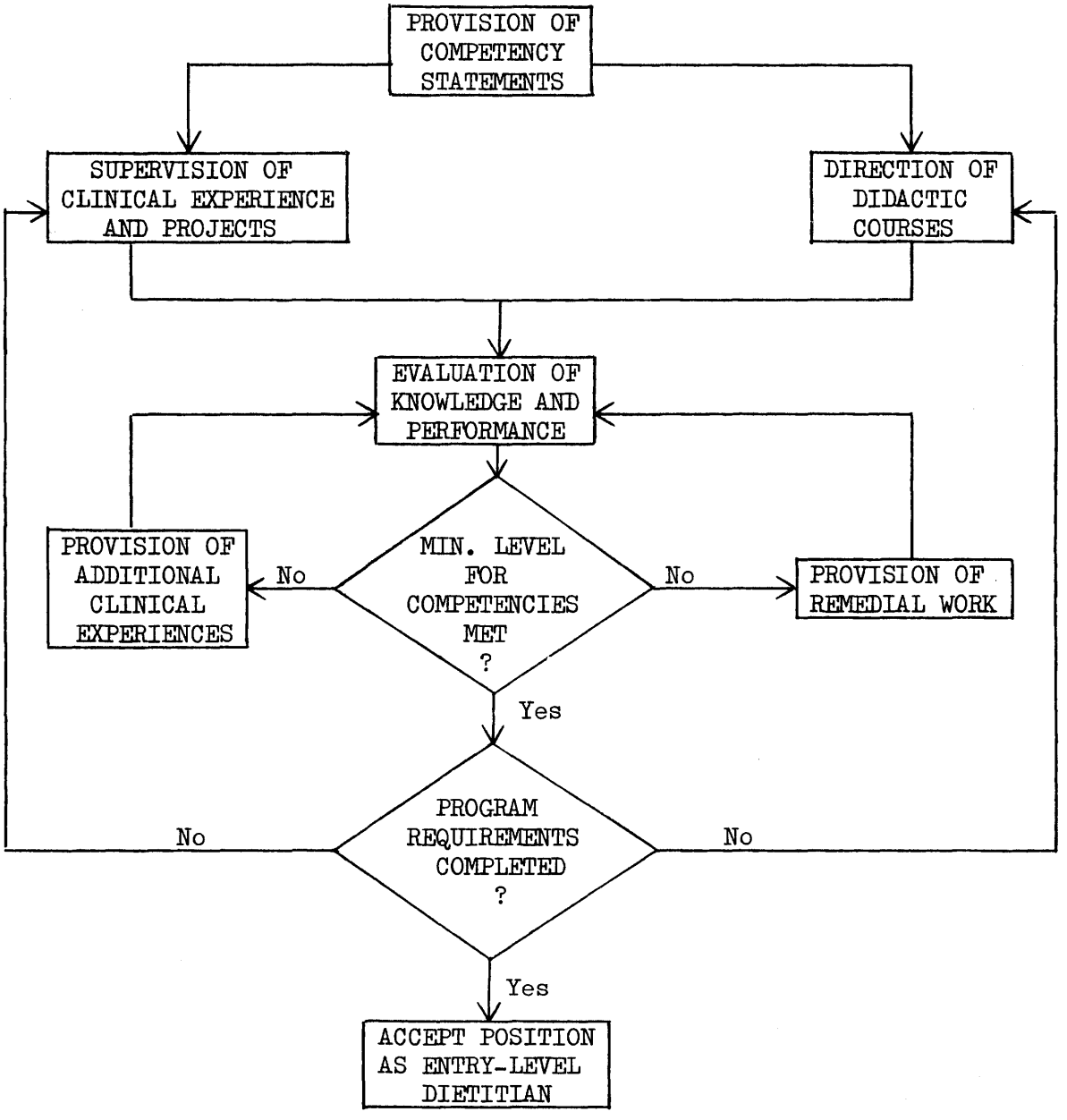

FIGURE 3.2. EVALUATION COMPONENT OF A MODEL FOR IMPLEMENTING AND EVALUATING A COMPETENCY-BASED DIETETIC PROGRAM

eighth component of the model (Figure 3.1) consists of the validation of competencies against student performance on the job at various intervals particularly after the first year. Validation studies are designed to determine the extent to which the competencies acquired to a specified level of mastery are associated with job performance. A survey instrument might be used to solicit responses of the graduates as well as their immediate supervisor to determine the competencies being performed on the job and the adequacy of preparation. After careful analysis of the resulting data, the program director and instructors should determine if the competencies required of an entry-level generalist dietitian are the same as those identified for the program. If there are discrepancies between the results of the survey and the competencies identified for the program, the program director and staff should begin again at component one of the model. However, if the results of the survey indicate that the competencies required of the generalist dietitian are the same as those identified for the program, the program should continue as designed.

Recycling of components of the model is made possible by feedback evaluation of program effectiveness. The model design makes provisions for continual updating and improving of the curriculum. The use of competency-based criteria for evaluation makes a self-reviewing system feasible. Did the student learn as a result of a particular experience or course? Did the student master all the desired competencies? If not, what modification is needed in the didactic or clinical phase? The answers to these questions enable the faculty to update experiences or modules and constantly improve the effectiveness and relevancy of the program.

CHAPTER IV

PROCEDURE

The literature was reviewed to identify the various components of a competency-based education program; the information was used as the basis for the development of a model applicable to a competency-based dietetic program. Using the conceptual model described in Figure 3.1, a procedure was developed to assess the feasibility of using the evaluation component in the Coordinated Program.

I. IDENTIFICATION OF PRIORITY COMPETENCIES

Ten competencies pertaining to quantity food procurement, production, and service were identified utilizing Tasks Required for Entry-Level Dietitians as Identified by Dietitians in West Tennessee (Lawson, 1973) and proposed entry-level competencies of the Dietetic Internship Council (1974). Three food administration faculty and four clinical instructors were consulted as to the competencies essential for an entry-level generalist dietitian. The ten competencies identified were presented to the food administration faculty and clinical instructors for selecting the five priority competencies which were developed throughout the professional phase of the program at increasing levels of proficiency.

Sub-competencies were identified for each of the competencies to further define the skills and knowledge involved in each competency. A brain-storming session consisting of food administration faculty and clinical instructors was conducted to identify the didactic and clinical activities associated with each competency and to determine at what point

in the program each sub-competency and/or competency should be achieved for the knowledge and application levels of the cognitive domain. Performance indicators were identified for each sub-competency which described how the knowledge or skill would be evaluated. The identification of performance indicators and levels of the cognitive domain--recall or application--to be accomplished at a given point in the program facilitated the development of test items for the performance exams.

II. MINIMUM LEVEL OF ACCEPTABLE PERFORMANCE

Once the competencies and accompanying sub-competencies and performance indicators had been identified, the next step in the evaluation process was the determination of a minimum level of acceptable performance which describes the least amount of end-of-sequence competence the student was expected to attain (Popham, 1971). Like most research in performance based education, the minimum level of acceptable performance was arbitrarily selected. Those setting the standard of performance must depend upon judgment and common sense since the data are not available to support which level is best. To ascertain what level of performance should be established as minimum, a brain-storming session was held with clinical instructors, didactic faculty, and experienced dietitians. Some believed that a minimum level of acceptable performance should be established for each competency since there are components of some competencies which could require 90 per cent or greater accuracy. After much debate and discussion, the minimum level of acceptable performance was set at 75 per cent for all competencies of the cognitive domain.

III. CONSTRUCTION AND ADMINISTRATION OF CRITERION REFERENCED INSTRUMENTS

Pool of Questions

A pool of questions was constructed for each phase of the program to test the student's knowledge and ability to apply the concepts related to the five competencies. The pool consisted of both recall and application level questions. The proportion of application to recall questions was dependent upon the phase of the program in which the students were evaluated. For example, the questions drawn from the pool used at the end of the junior year consisted primarily of recall questions covering the course material from Food Systems Administration (FSA) 3110, the first professional course related to the five competencies evaluated. The number of application level questions included in the performance exams increased as the student progressed through the program and applied the concepts in the clinical facility. Only short answer and essay questions were included in the pool to eliminate the probability of students answering the question simply by guessing the correct response. This decision did increase the likelihood of subjectivity in grading. To help reduce the magnitude of subjectivity in grading, key ideas or concepts required in the answer were identified.

Content validity was established by having a group of "experts" in food systems management review each test item to ascertain whether the item measured the performance indicator identified for the competency. The panelist also indicated whether the test item measured the fundamental information necessary to perform the competency and whether the item measured simple recall or application of concepts related to the competency. If

revision in the wording was needed to improve the clarity of an item, the panelist designated this to the researcher. Suggestions for revision in wording and/or presentation of an item was reviewed by the researcher and when deemed necessary changes were made in the item. Reliability of the instrument was based upon Popham's (1971) assumption that if the instrument was valid, it was reliable.

Once the test item was revised, the question was typed on a Keysort card and coded. The code identified the competency, sub-competency, performance indicator, and phase of the program for which the question was written. In constructing the performance exam, the Keysort cards were divided into the five competencies. Using a randomization process, a predetermined number of questions drawn for each competency was based on the emphasis placed on the competency during that phase of the program as determined by the instructor. Once the complete performance exam was constructed from the questions drawn from the pool, the exam was reviewed by the researcher to determine the approximate length of time required for the student to complete the exam. The total examination for the management area was limited to sixty minutes.

Administration of Performance Exams

The instruments were administered at various times during the junior and senior years of the program under as controlled conditions as possible. Two groups of students, class of 1976 (Group 1) and class of 1977 (Group 2), were administered the junior level performance exam. Students in Group 1 were given exams throughout the senior year of the program. Table 4.1 illustrates the time schedule for administration of performance exams to the students.

TABLE 4.1

TIME SCHEDULE FOR ADMINISTRATION OF PERFORMANCE EXAMINATIONS

GROUP 1 - CLASS OF 1976		GROUP 2 - CLASS OF 1977	
EXAMINATION TITLE	TIME OF ADMINISTRATION	EXAMINATION TITLE	TIME OF ADMINISTRATION
Test 1	Completion of FSA 3110 Junior Year, 1975	Test 1	Completion of FSA 3110 Junior Year, 1976
Retest-1 Week	One Week Interval Junior Year	Retest-6 Weeks	Six Week Interval Alternate Form Junior Year
Retest-3 Months	Three Month Interval Beginning Fall Quarter, 1975 Senior Year		
Test 2	Beginning Winter Quarter, 1976 Senior Year		
Test 3	Beginning Spring Quarter, 1976 Senior Year		
Test 4	Three Weeks Prior to Completing Program Requirements Senior Year		

To ascertain whether the students had memorized the material for the exam or whether they knew the material, the same exam or an alternate of the exam was administered at two different time intervals. Students in Group 1 were given the same exam (Retest-1 week) after the first exam and again at the beginning of Fall Quarter (Retest-3 months). An alternate form of the same exam (Retest-6 weeks) was given six weeks later to the students in Group 2. An alternate form of the exam rather than the same exam was administered in that some of the students in Group 1 refused to answer the same questions the second and third time the item was presented. Several of the students commented that they did not object to being evaluated over the same material but disliked being asked the same questions. In order to administer an alternate form of the exam, a seven member panel of "experts" had to unanimously agree that the test items measured the same concept and were of equal difficulty. Questions not receiving unanimous approval were revised and the panel consulted again. Once there was complete agreement among the "experts" that the performance exam evaluated the same concepts and was of equal difficulty, the exam was administered. The rational for changing the time interval for administering the junior level performance exam was to ascertain whether a more reliable decision could be made when deciding the areas the students needed to review.

The performance exam administered prior to any clinical experience in the senior year was designed to measure both retention and increased competence. The remaining exams during the senior year attempted to evaluate the student's ability to apply the concepts related to the five management competencies.

Analysis of Examinations

All exams were analyzed to determine the performance level of the students during the various stages of the professional phase of the program. A percentage value was calculated for each of the competencies based on the total number of points available for the competency as well as for overall performance. The value obtained was compared to 75 per cent, the minimum level of acceptable performance. Those students failing to achieve the minimum level of acceptable performance were considered to need remedial work or additional experience for the competency.

Feedback to Students

The results of the examinations were presented to the student either in a counseling session or in a letter. Within a month following the second administration of Test 1 in the junior phase of the program, the students were notified in a letter of the competency or competencies and sub-competencies for which they failed to achieve the minimum level of acceptable performance. They were advised to do remedial work and gain additional experience in the area or areas prior to returning to school Fall Quarter.

Within one to two weeks following the administration of the exams during the senior phase of the program, feedback was given to the students in a counseling session with the clinical instructor. This included information on the competency or competencies for which the minimum level of acceptable performance was not attained. The students were advised to review the concepts related to the competencies in which the standard of performance was not achieved and if possible to do additional clinical work in the area or areas. The information was used by the clinical instructors in planning clinical experiences for the students.

Profile and Time Data

Student information and time inventory sheets were completed by the students during various phases of the program. Information sheets were completed during the quarter the students were enrolled in FSA 3110 and at the beginning of the senior year. All students were requested to complete time inventory sheets each quarter of the senior year and during the quarter they were enrolled in FSA 3110. Time sheets covered the amount of time spent working on projects, reading assignments, reviewing class notes, and other activities which involved the competencies being evaluated. Profile data were collected on each student.

CHAPTER V

RESULTS AND DISCUSSION

The procedure outlined in Chapter IV was used to identify five priority competencies developed at increasing skill levels in the management component of the Coordinated Program and to construct criterion referenced instruments to examine student mastery at the recall and/or application levels of the cognitive domain and retention of information at designated intervals. A total of 24 sub-competencies and 53 performance indicators were identified for the five priority competencies. A panel of food systems administration faculty and clinical instructors determined the point in the program each sub-competency was achieved for the two levels of the cognitive domain. A pool of questions was developed for each phase of the program to measure student knowledge and ability to apply basic concepts related to the five priority competencies.

I. INSTRUMENTS USED FOR MEASURING STUDENT PERFORMANCE

Four different instruments were constructed from a pool of 85 recall and 35 application level questions for administration at established times during the professional phase of the program (Table 4.1). Examinations were generated utilizing criterion sampling to consist of recall and application questions (Table 5.1). The number of questions drawn for each competency was determined by the emphasis placed on it during the preceding quarter. Competency III was identified by the staff as a terminal competency at the junior level, therefore, only student retention was measured on Test 2 for the concepts related to this competency. As the emphasis on

TABLE 5.1

PERCENTAGE DISTRIBUTION OF RECALL AND APPLICATION QUESTIONS
ON CRITERION REFERENCED INSTRUMENTS

Competency Number	Junior Level Test 1		Senior Level Test 2		Test 3		Test 4	
	Recall	Application	Recall	Application	Recall	Application	Recall	Application
I	20	4	0	16.7	0	10	0	12.5
II	16	0	16.7	0	10	10	0	12.5
III	4	4	8.3	0	0	0	0	0
IV	12	0	0	33.3	0	30	0	37.5
V	28	12	0	25	0	40	0	37.5
Total	80	20	25	75	10	90	0	100.0

competencies IV and V increased, a greater number of questions were drawn for these competencies. The number of application questions included on the exams increased as the students gained additional experience in the clinical facility. All the examinations except for Test 4 were formative identifying the strengths and weaknesses of the student.

The junior level performance examination (Test 1) consisted of approximately 20 per cent application and 80 per cent recall questions and was administered to Group 1 and Group 2 just prior to or after completing FSA 3110. Students in Group 1 were given the same exam (Retest-3 months) at the beginning of Fall Quarter, 1976. The management questions for fall were incorporated into a comprehensive exam which also measured the student's knowledge of basic dietetic concepts.

The performance exam (Test 2) administered to Group 1 at the beginning of Winter Quarter, 1976 consisted of 75 per cent application and 25 per cent recall questions. As with the Fall Quarter exam, the management questions were part of a comprehensive exam which measured the student's knowledge of basic dietetic concepts which the student should have mastered at this point in the program. The management component of the exam measured the student's ability to apply the basic concepts of quantity food procurement, production, and service, as well as the student's knowledge of the material; whereas, the other areas measured only recall of basic facts.

Test 3 was administered to Group 1 at the beginning of Spring Quarter, 1976. The management component of the comprehensive exam consisted of 90 per cent application and 10 per cent recall questions. Unlike the previous comprehensive exam, the questions from the other areas measured both recall and application of knowledge.

The instrument administered to Group 1 at the end of Spring Quarter, 1976 was an "in basket" exam (Test 4) designed to measure the student's ability to cope with problems that occur routinely as well as unexpectedly in a hospital dietary department. One or more situations were presented requiring application of concepts from applied nutrition, basic food science and food management, and food systems administration. The test measured the student's managerial skill as well as ability to apply basic knowledge in the solving of problems related to each area. The exam consisted of fifteen items, eight of which related specifically to the five competencies being evaluated for quantity food procurement, production, and service.

II. STUDENT PERFORMANCE ON THE EXAMS

Performance on Test 1

Figure 5.1 illustrates the results of Group 1's performance on the junior level examinations. Test 1 was administered at two different times; students 1-13 took the test one week prior to the end of Spring Quarter, 1975 as part of their final exam for FSA 3110. The instructor had previously agreed to use the exam constructed by the researcher as the final exam for the course; however, approximately ten additional questions were added to the exam. The students were allowed only fifty minutes to complete the exam which meant several questions had to be left unanswered. This could account for 77 per cent of the students failing to achieve the minimum level of acceptable performance on Test 1. Students 14-31 were administered the exam the first week of Spring Quarter, 1975 since they had completed FSA 3110 Fall Quarter, 1974 or Winter Quarter, 1975. Of this group

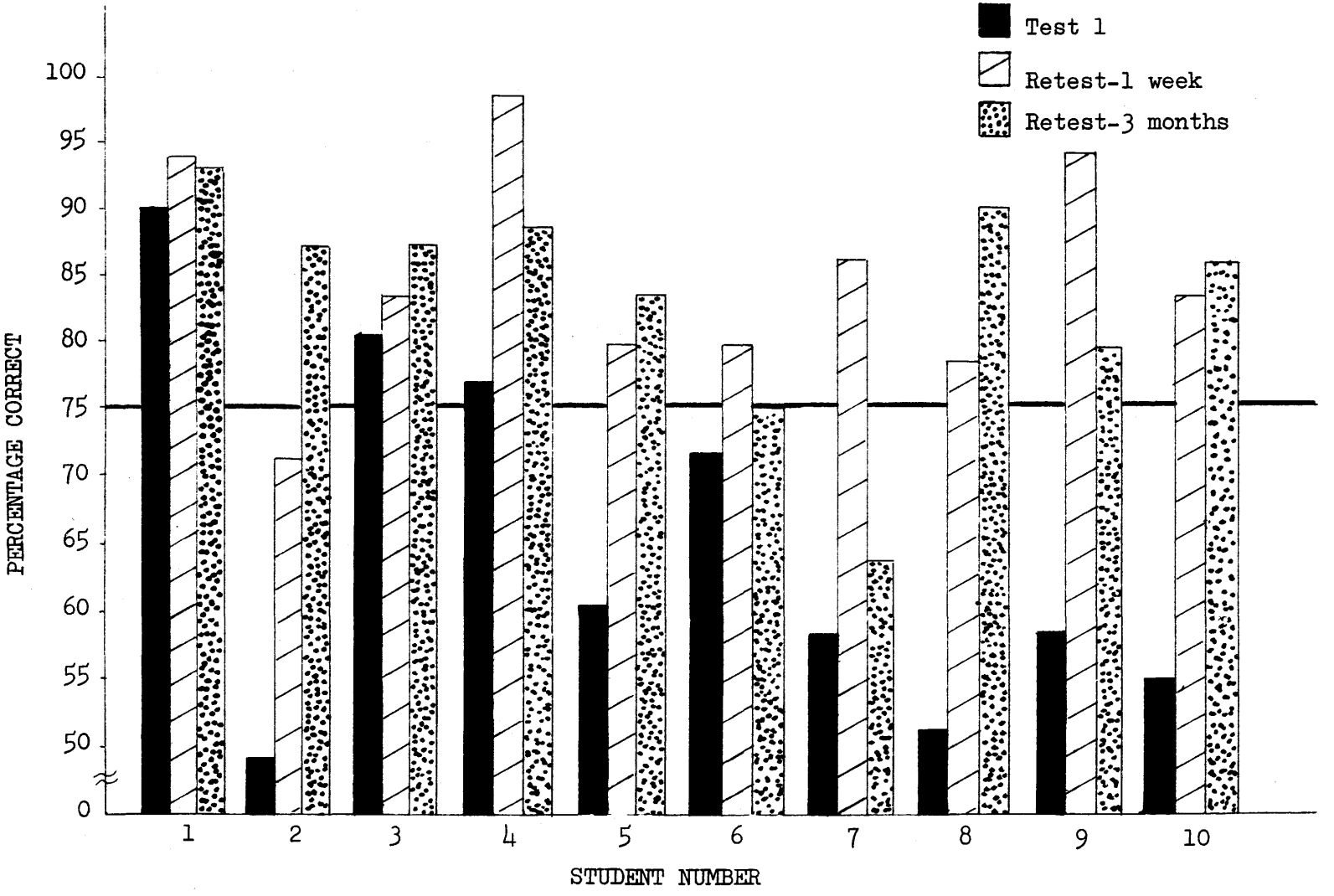

FIGURE 5.1. PERFORMANCE OF GROUP 1 (CLASS OF 1976) ON EXAMINATIONS DURING THE JUNIOR PHASE OF THE PROGRAM

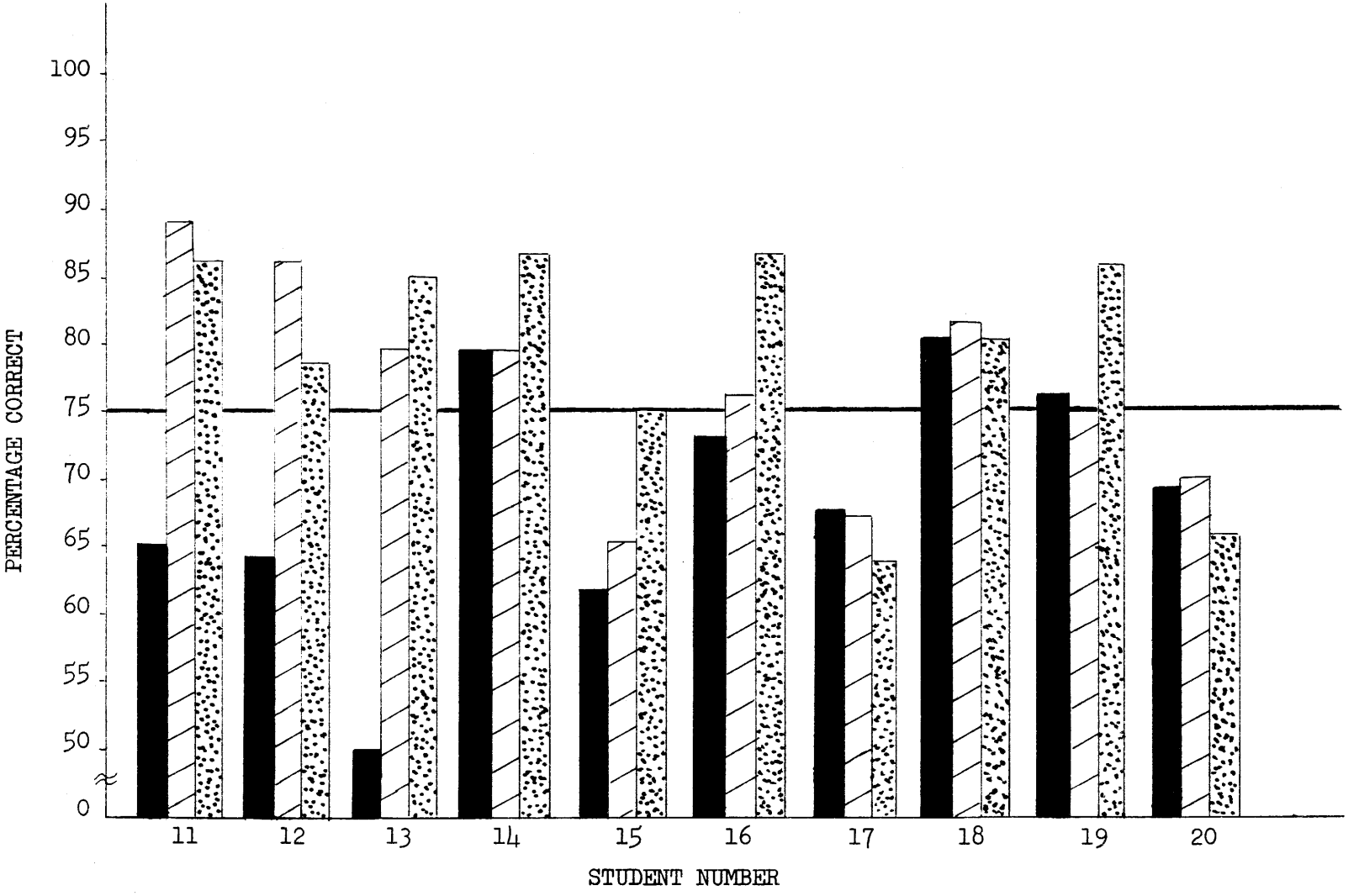

FIGURE 5.1. (CONTINUED)

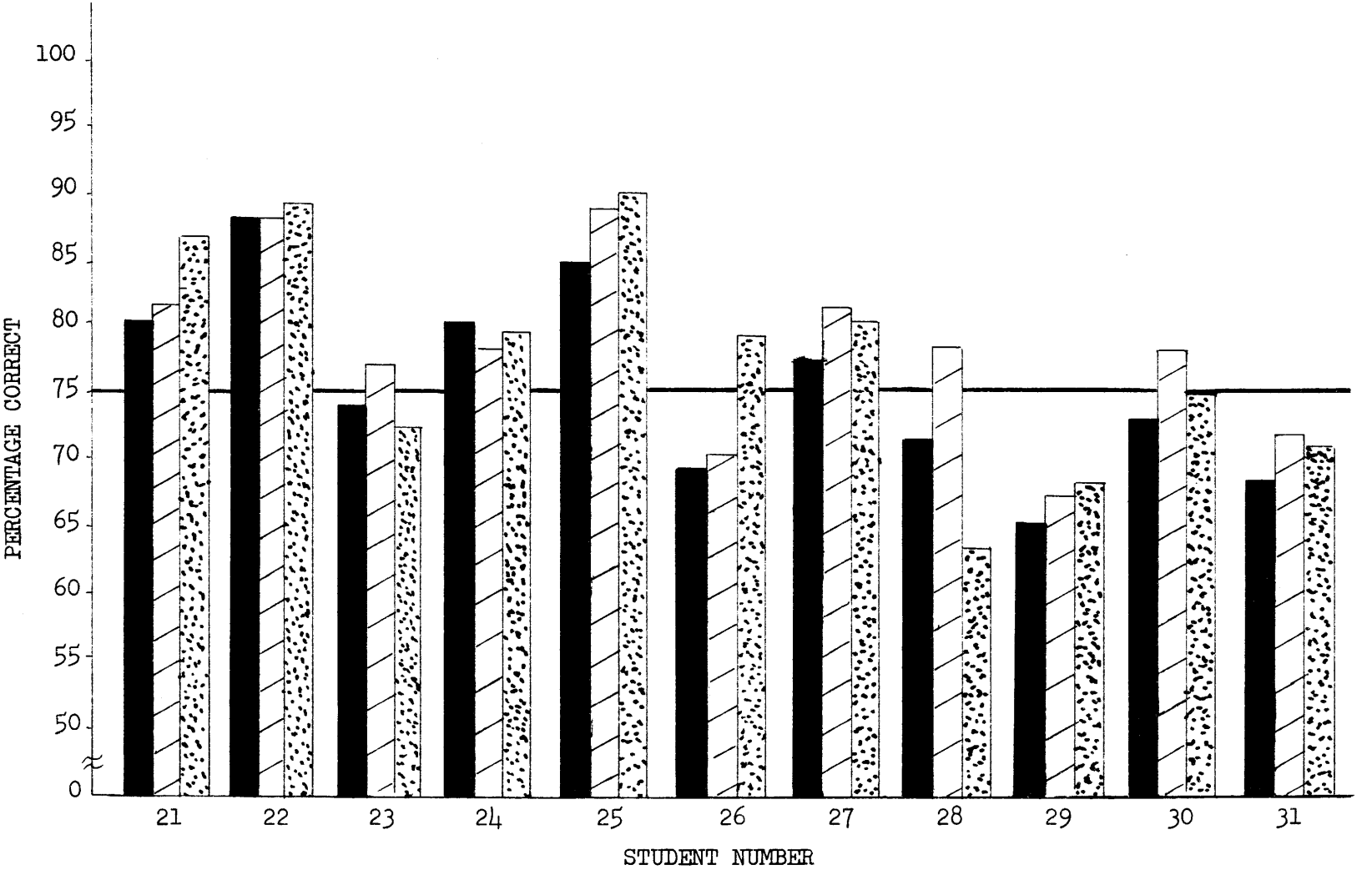

FIGURE 5.1. (CONTINUED)

44.4 per cent scored 75 or higher on the exam, thus a total of 55.6 per cent of the students did not achieve the minimum level of acceptable performance.

The second examination (Retest-1 week) was given to all the students one week later. The majority of students 1-13 taking FSA 3110 Spring Quarter, 1975 scored 4.5 to 38 points higher on the second examination than on the first administration. Scores of students 14-31 ranged -1 to +7 points of their original scores. Two factors that might help clarify this increase in score for students 1-13 could be that the instructor went over the final exam of the course the same day the second exam (Retest-1 week) was administered to the students indicating to them to remember the answers. Also, the students had sufficient time to complete the exam since the second exam (Retest-1 week) included only those questions from the researcher's original exam. To indicate that the instructor's reviewing the exam with the students had an effect upon the results, some of the students answered questions exactly like the researcher had outlined to grade the exams. Only four students 14-31 achieved the minimum level of acceptable performance on the Retest-1 week but not on Test 1 as compared to nine students 1-13. There were no students who achieved the minimum level of acceptable performance on Test 1 but who failed to do so on the Retest-1 week.

The researcher used the results of the two administrations of the junior level performance exam to identify the competency or competencies and sub-competencies the students needed to review and/or gain additional experience during the summer. Each student received a letter indicating general areas to review as well as the specific competency or competencies

and sub-competencies for which they failed to achieve the minimum level of acceptable performance. In a meeting prior to the administration of the first performance exam, the director indicated to the students that each must achieve a minimum level of acceptable performance on each competency on the Fall Quarter examination or the student would not be allowed to begin clinical experience until that level had been achieved.

Figure 5.1 illustrates that 77 per cent of the students achieved the minimum level of acceptable performance on the Retest-3 months exam when administered at the beginning of Fall Quarter, 1975. Three students achieved the minimum level of acceptable performance on this exam but not on either of the prior exams which seems to indicate that these students reviewed the suggested concepts over the summer. This was probably true for those students who scored much higher on the Fall Quarter exam. Seven students failed to achieve the minimum level of acceptable performance; however, only two of these students had achieved the minimum level of acceptable performance on either of the other exams. The possible explanation for this student's performance was that the instructor's feedback helped the student achieve the minimum level on the second exam (Retest-1 week) but the student was unable to retain the material over the summer or did not take the exam seriously. These students were told the competencies and sub-competencies for which the minimum level of performance was not achieved and asked to review the material related to the competencies prior to beginning clinical experiences.

Figure 5.2 illustrates performance of Group 2 on examinations during the junior phase of the program. Of this group 71 per cent of the students achieved the minimum level of acceptable performance on Test 1.

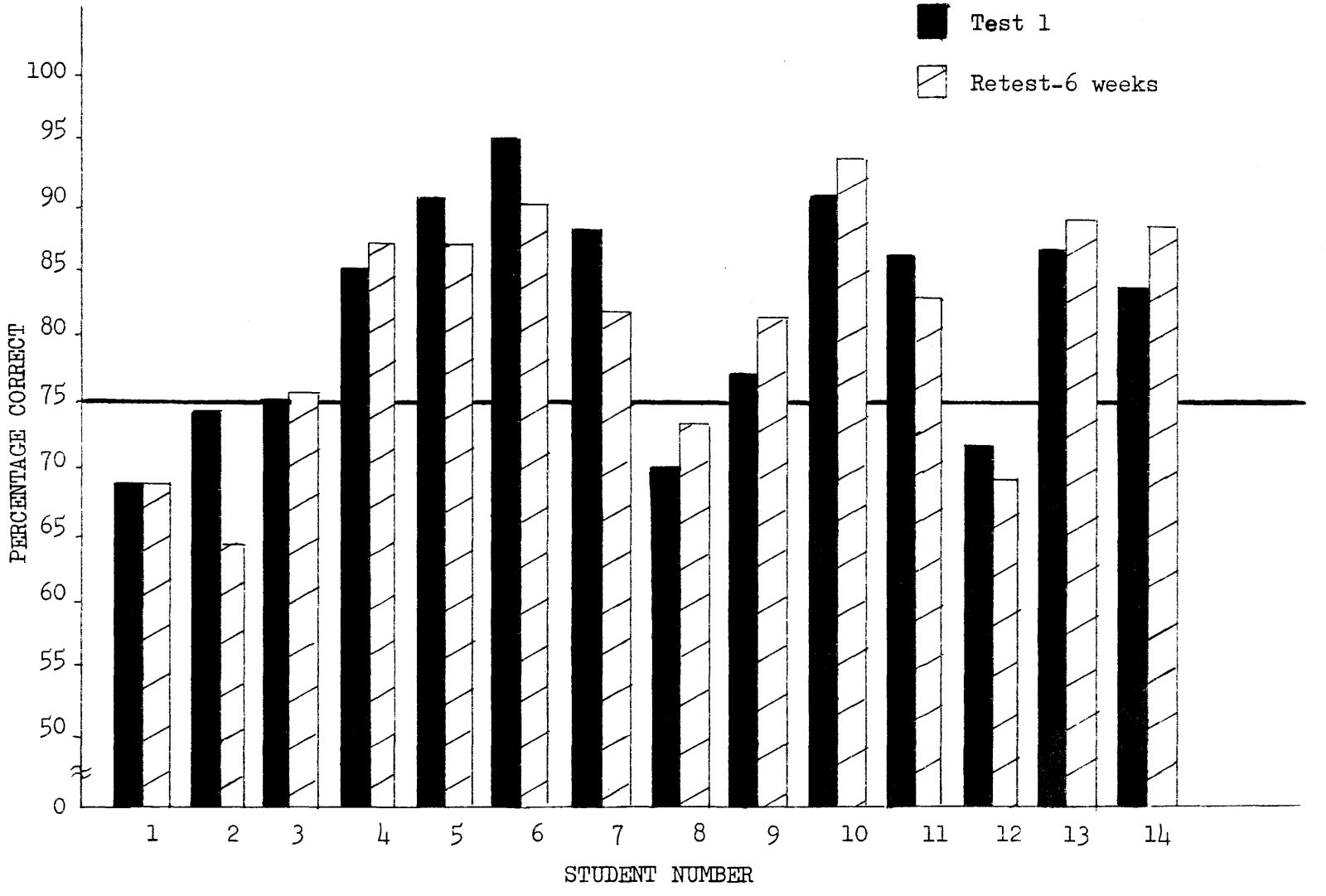

FIGURE 5.2. PERFORMANCE OF GROUP 2 (CLASS OF 1977) ON EXAMINATIONS DURING THE JUNIOR PHASE OF THE PROGRAM

An alternate form of the examination was administered to the students six weeks later (Retest-6 weeks). Of the ten students achieving the minimum level of performance on Test 1, nine students scored plus or minus five points of their original scores on Retest-6 weeks. The performance as indicated by this set of junior level scores for Group 2 was much more consistent than the students in Group 1. A probable explanation of these results was lack of instructor feedback.

Performance on Test 2

Group 1's performance on Test 2 administered at the beginning of Winter Quarter, 1976 is presented in Figure 5.3. Of the 31 students, 61.3 per cent of them achieved or exceeded the minimum level of acceptable performance indicating these students were able to retain the basic information as well as apply the information related to the competencies being evaluated. The remaining students, 38.7 per cent, were unable to apply the information but in general performed satisfactorily on the recall questions. Another possible explanation for some of the students failing to achieve the minimum level of acceptable performance was that the students did not take the exam seriously. Performance on the exam did not influence the academic grade or prevent progression to the next phase of the program.

Performance on Test 3

Figure 5.4 illustrates the performance of Group 1 on Test 3 administered at the beginning of Spring Quarter, 1976. All except one student achieved or exceeded the minimum level of acceptable performance on the exam. Probable explanations for the greater number of students achieving

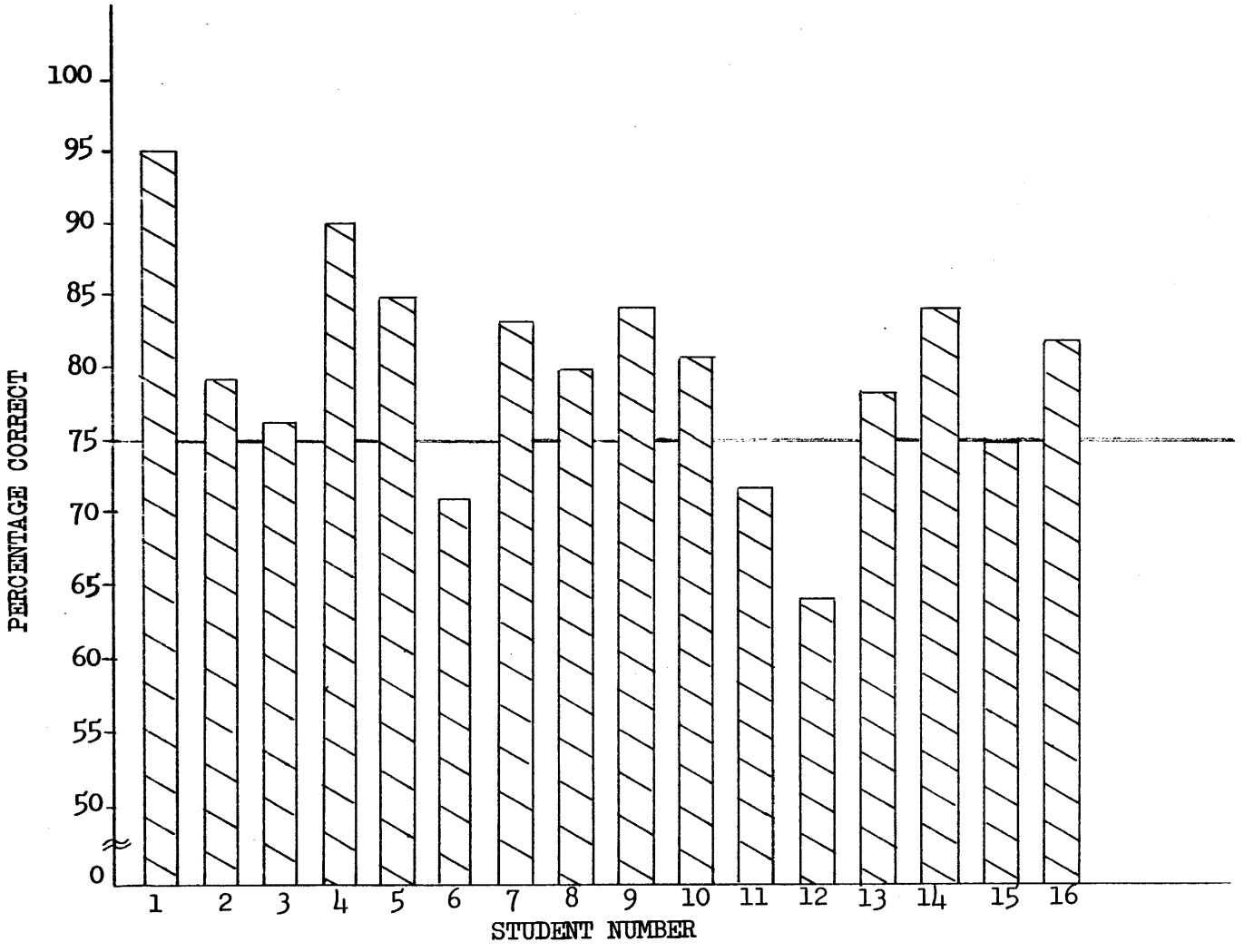

FIGURE 5.3. PERFORMANCE OF GROUP 1 (CLASS OF 1976) ON TEST 2 DURING THE SENIOR PHASE OF THE PROGRAM

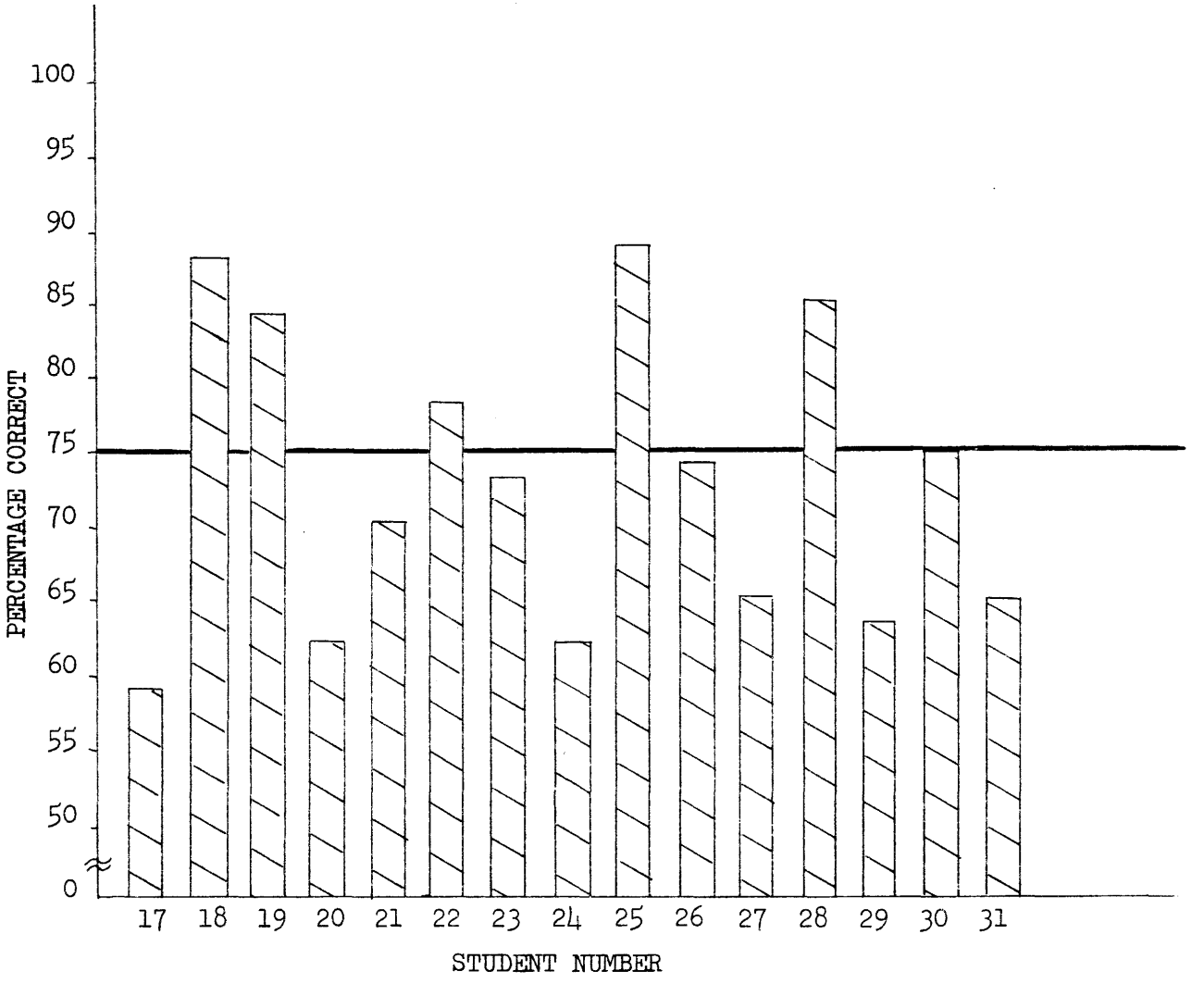

FIGURE 5.3. (CONTINUED)

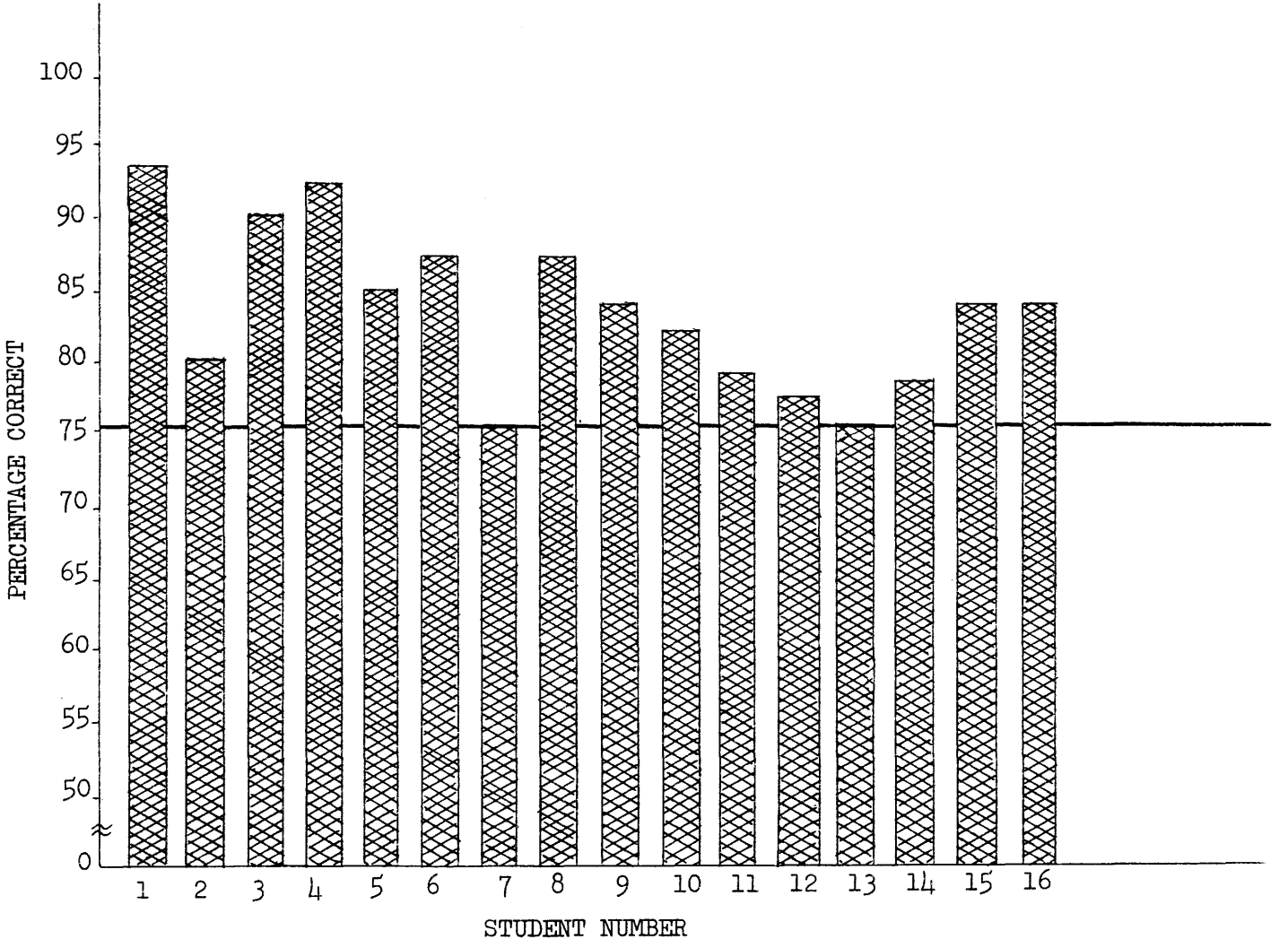

FIGURE 5.4. PERFORMANCE OF GROUP 1 (CLASS OF 1976) ON TEST 3 DURING THE SENIOR PHASE OF THE PROGRAM

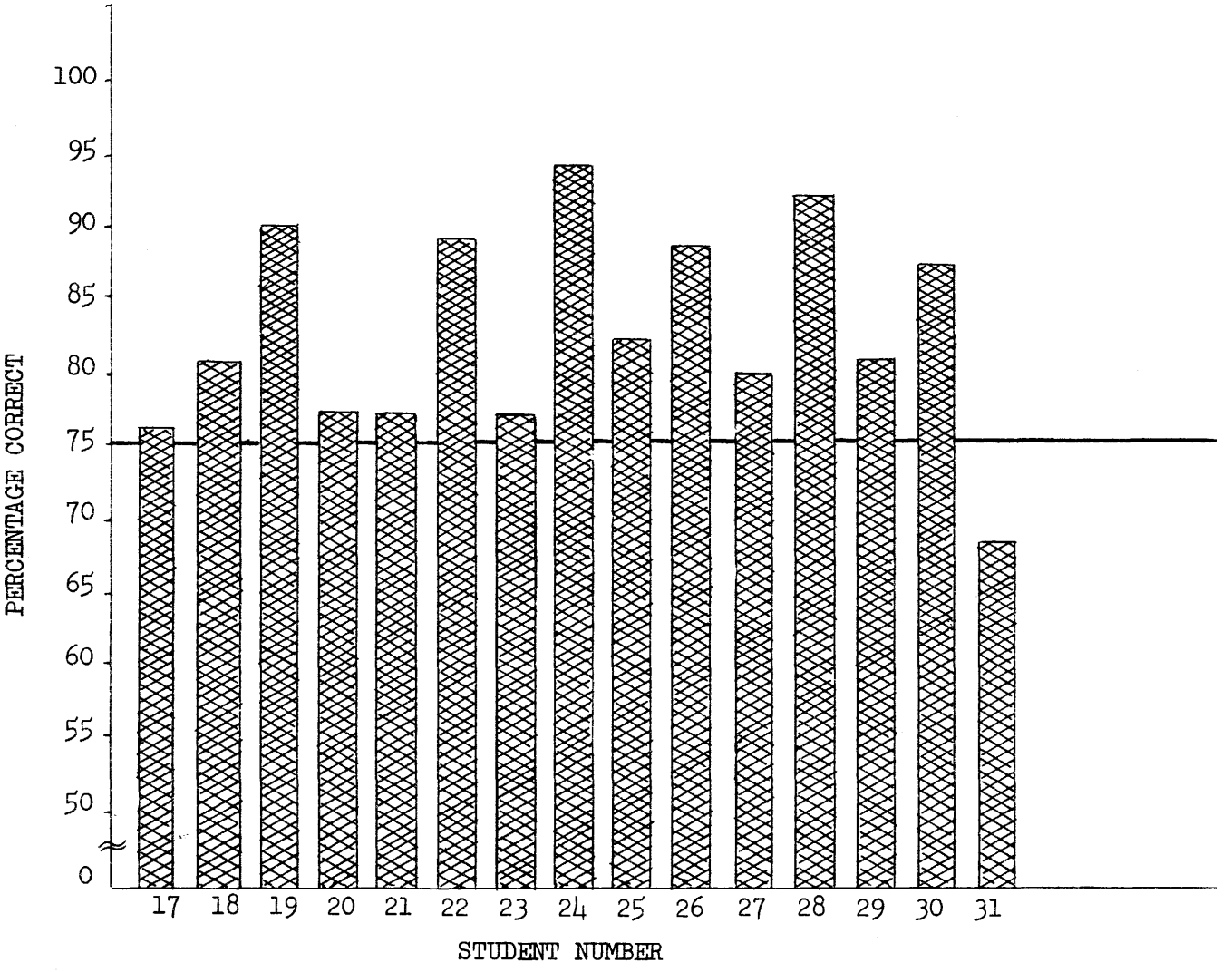

FIGURE 5.4. (CONTINUED)

the minimum level of acceptable performance include: experience in the clinical facility helped students apply the information on the exam; or, the students were becoming accustomed to taking exams in which the majority of the questions were application type. Since the student who failed also failed to achieve the minimum standard on all previous exams, additional experiences and remedial work were recommended to bring the student's performance up to the standard.

Performance on Test 4

All the students in Group 1 achieved or exceeded the minimum level of acceptable performance on the "in basket" exam (Test 4) which was administered three weeks before the end of Spring Quarter, 1976. As with the previous exams, there were still areas on which students could improve but the minimum level of acceptable performance was attained for all competencies. Since the exam was administered before the end of the quarter, the students could use the feedback on areas needing improvement to gain additional experiences while serving as staff relief the remainder of the quarter. The information was useful in letting the students know which areas to review prior to taking the examination for becoming a registered dietitian.

Comparison of Performance During the Professional Phase of the Program

Figure 5.5 shows the comparison of Group 1's performance on exams administered during the professional phase of the program excluding the final exam (Test 4). Because Test 4 was evaluated on the basis of satisfactory, satisfactory but needs improvement, and unsatisfactory rather than

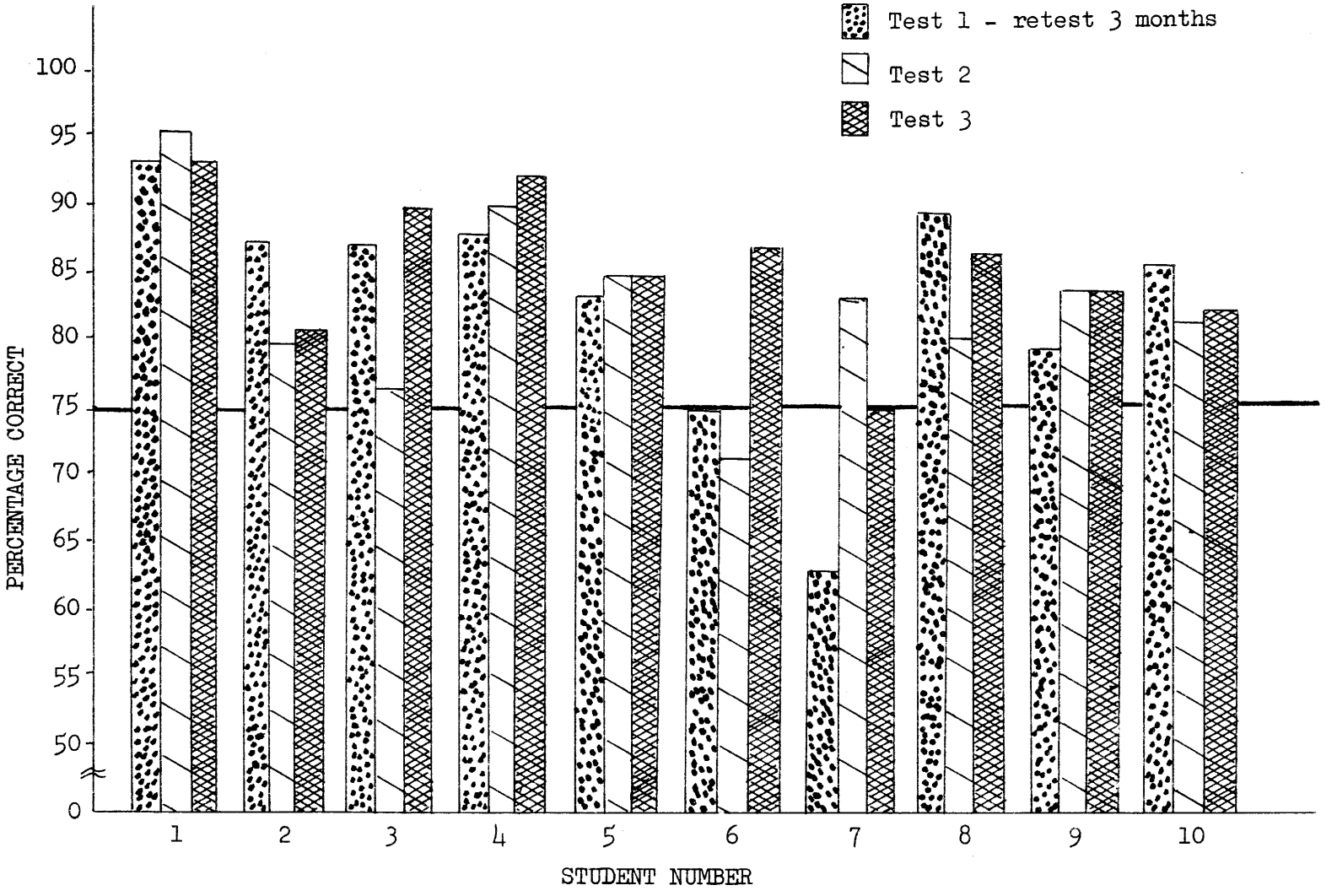

FIGURE 5.5. COMPARISON OF GROUP 1 (CLASS OF 1976) ON EXAMINATIONS DURING THE PROFESSIONAL PHASE OF THE PROGRAM

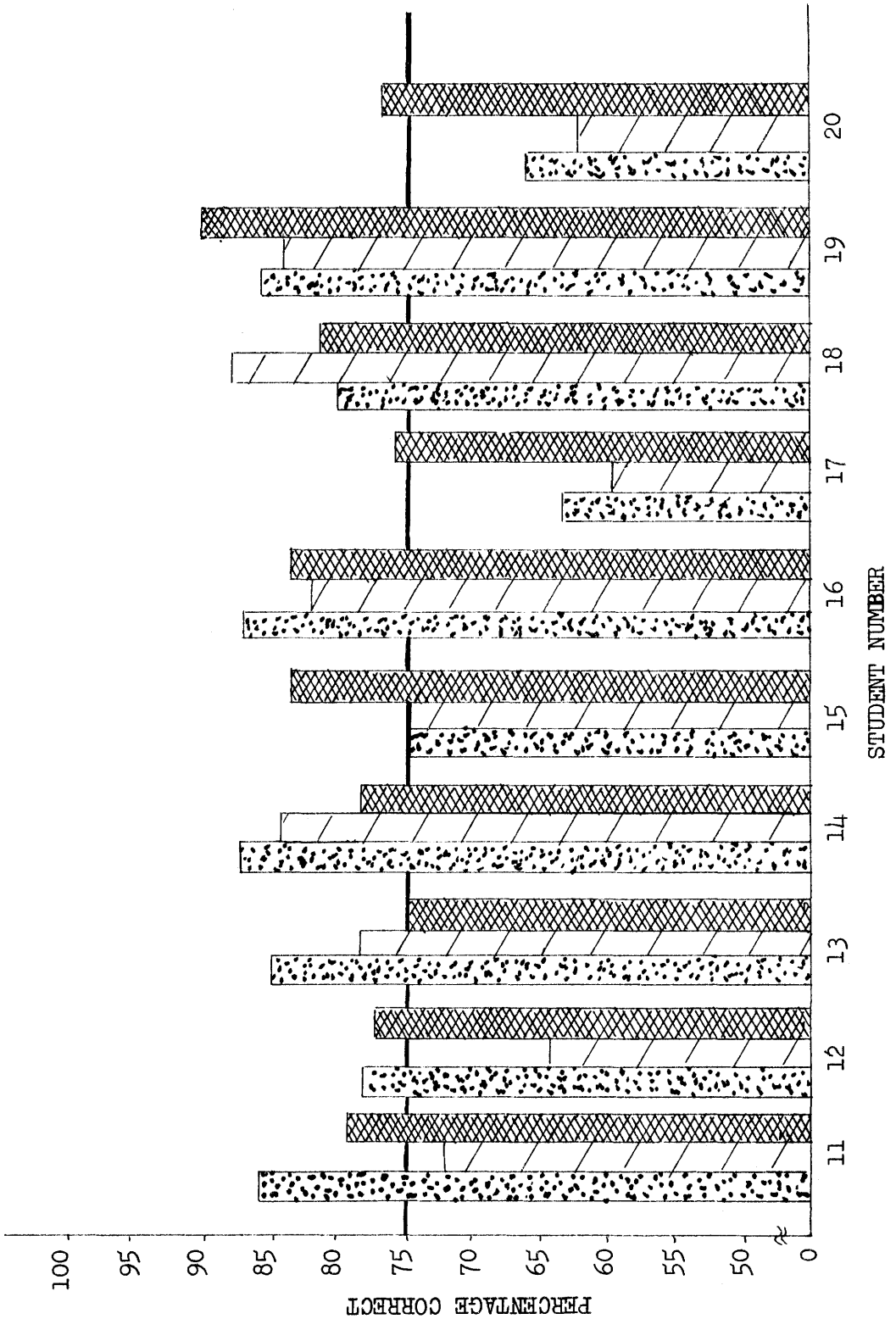

FIGURE 5.5. (CONTINUED)

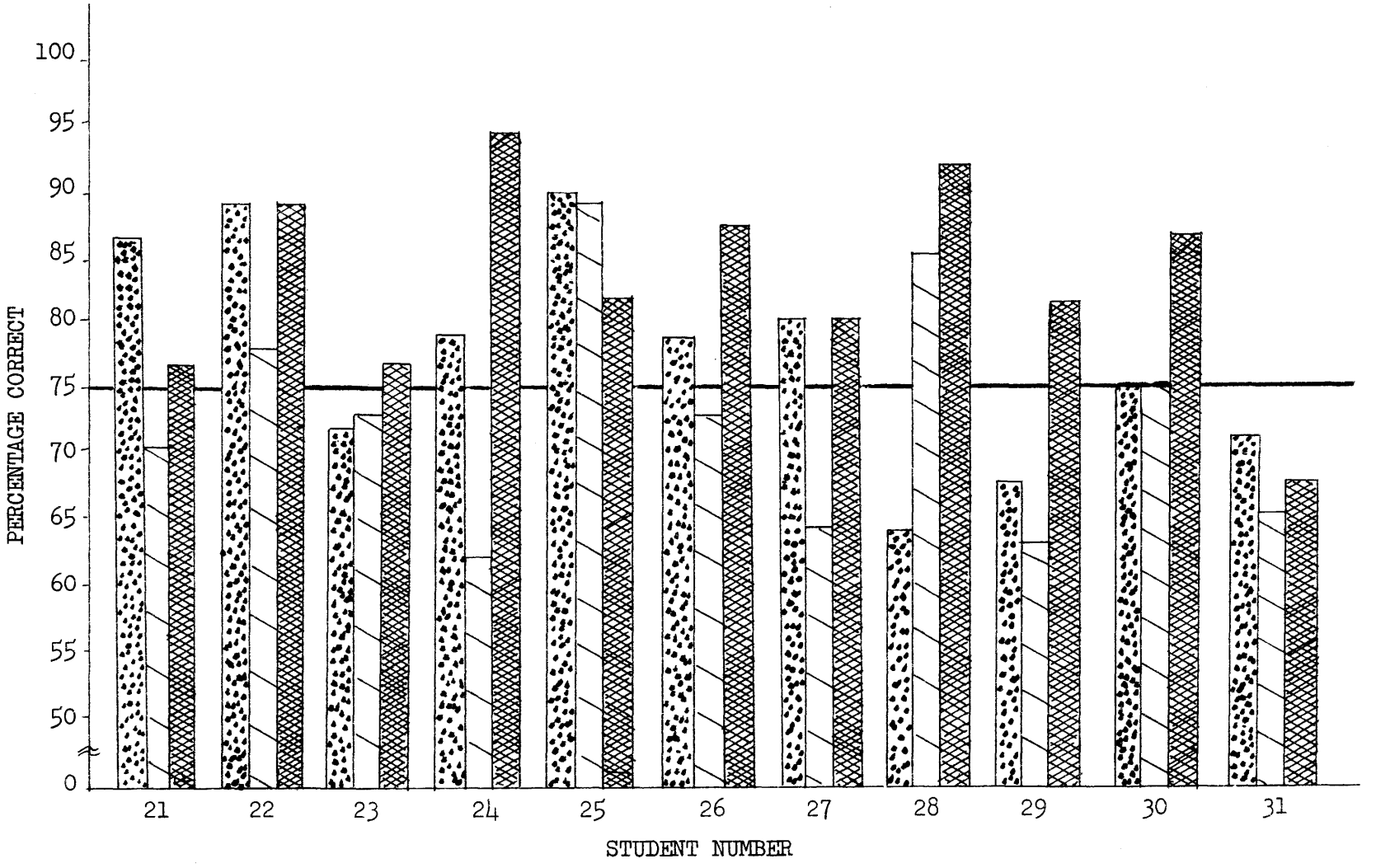

FIGURE 5.5. (CONTINUED)

on a point basis the results as previously discussed are not presented in Figure 5.5. The third administration of the junior level performance exam (Retest-3 months) was selected for comparison purposes since the variables previously discussed were controlled and the scores appeared to be more indicative of student abilities. The minimum level of acceptable performance for all three exams was attained by 54.8 per cent of the students. Scores of these 14 students varied within plus or minus ten points from one exam to the next. This type of performance indicates that the students were able to retain the basic information and achieve at a higher level of attainment throughout the professional phase of the program since each exam measured the student's ability to perform at a higher level. Seven students or 22.5 per cent of the group achieved the minimum level of acceptable performance on the junior level exam which measured primarily recall of basic information related to the five competencies but failed to attain the minimum standard on Test 2. This could indicate the students knew the basic information but were unable to apply it. All of these students, however, did achieve or exceed the minimum level of acceptable performance on Test 3. This type of performance indicates that the students' additional experience in the clinical facility helped in applying information on the exam. Another probable explanation for the improvement is that Test 3 sampled behavior in which the students had obtained clinical experience or information in didactic courses, therefore, the exam was not of equal difficulty. Two students or 6.5 per cent of the group failed to achieve the minimum level of acceptable performance on the junior level exam but met or exceeded the standard of performance on the senior level exams. These students probably reviewed the basic

information as was suggested by the clinical instructor. This along with the additional clinical experience helped them achieve or exceed the minimum level of performance indicating that remedial work and additional experience helped bring the students' performance up to the standard. Only one student failed to attain the minimum level of acceptable performance on any of the exams indicating a special need for counseling sessions, remedial work, and additional clinical experiences. A trend evident in the students' performance was that with additional experience and exposure in the clinical facility, the students were capable of achieving at a higher level once the basic material was mastered.

Profile Data

Students' performance on the exams was compared to profile data collected including time spent participating in activities and projects related to competencies being evaluated, grade point average (G.P.A.), ACT scores, and grade in FSA 3110. In most instances, students who failed to achieve the minimum level of acceptable performance either spent the most or the least amount of time participating in activities and preparing projects related to quantity food procurement, production and service. The variation in the amount of time spent by those achieving or exceeding the minimum level of acceptable performance failed to follow any pattern. Therefore, the quality of time spent and the quality of activities may have a greater influence on performance rather than the quantity of time spent. Consistent relationships were not found among G.P.A., ACT scores, and grades in FSA 3110 and performance on exams. For example, students with the higher G.P.A. and grades in FSA 3110 in some cases failed to achieve the minimum level of acceptable performance; however, this was not true

for all students. The same relationship existed with performance on the exam and ACT scores. Since a relationship did exist for a few of the students among ACT scores, G.P.A. and performance on exams, these are better predictors of student performance than the amount of time spent; however, these values should be used with additional information in selecting students for continuation in the program.

The performance exam results could be used as a criterion for selection of students to enter the senior phase of the program. Additional study of the validity of the instruments should be conducted prior to using the score as a primary criteria. Planning of clinical experiences could be based on the results of performance exams. By identifying the areas in which a student is weak, remedial work and additional experiences may be planned to help bring the student's performance up to the standard. The results are useful in counseling the student.

CHAPTER VI

CONCLUSION, RECOMMENDATIONS, AND SUMMARY

I. CONCLUSION

The model developed for implementing and evaluating a competency-based dietetic program was feasible for use with the Coordinated Undergraduate Program in Dietetics at the University of Tennessee, Knoxville. The evaluation component of the model was applied to five competencies related to quantity food procurement, production, and service and was a feasible approach for evaluating the cognitive domain of the Coordinated Program. As the model was employed to only a small segment of the management area of the program, the application of the model should be extended to include all didactic areas.

Students, faculty members, clinical instructors, and dietitians in the field should be involved in the identification of the competencies and sub-competencies for the program. Establishment of competency statements indicating the desired proficiency level expected at periodic intervals in the program could result in improved communication between students and faculty and thus improve the coordination of clinical and didactic activities. Continuous evaluation of student performance should remain an integral part of the Coordinated Program to provide necessary feedback to the student, clinical and didactic instructors, and program director as to the academic status in relation to the desired status of the student at the various phases of the program.

II. RECOMMENDATIONS

The approach used in evaluating student performance was effective for the cognitive domain and should be applied to all didactic areas of the program. Competencies, sub-competencies, and performance indicators should be identified for the following areas: basic food science and food management, experimental foods, socio-culture foods and nutrition, basic and applied nutrition, and additional ones for food systems administration. Didactic and clinical instructors, students, experienced dietitians, and the program director should identify the competencies students upon completion of the program should be competent to perform. Once this has been completed, the courses in which the competencies should be achieved and the level of performance expected should be identified. The student might be presented a list of the competencies and/or sub-competencies either at the beginning of each professional course or at the time the student enters the program.

The minimum level of acceptable performance should be reexamined to determine if 75 per cent is sufficient as a standard of performance for all competencies including the psychomotor and affective domains. The question to be answered is whether the minimum level of acceptable performance established for each competency will be the same or variable. The 75 per cent minimum level of acceptable performance for each of the five competencies used in this study seems feasible for the cognitive domain; however, additional investigation is needed to determine if this level is sufficient for certain psychomotor skills.

The sequencing of the performance exams should be reconsidered since the students are constantly being evaluated on the basis of paper

and pencil tests during the senior phase of the program. A reduction in the number of performance exams during the senior year from four exams to three at the following intervals is recommended: beginning of Fall Quarter, mid-year, and three weeks prior to completion of program requirements. The same time intervals could be used for measuring student performance during the junior year of the program to increase the number of performance exams from one to three for this phase of the program.

Testing conditions should be conducive to motivating students to achieve or exceed the minimum level of acceptable performance. One such condition might be the prevention of student progression to the next phase of the program until minimum level of performance is attained. To use performance exams as indicators of competencies, more comprehensive exams must be developed to evaluate overall performance.

Student performance in the clinical facility is an essential aspect of coordinated undergraduate programs. More similar studies are needed to investigate and develop the most effective methods for evaluating the psychomotor and affective domains. If student progress through the program is to be monitored on the basis of total performance, additional studies are essential.

Other components of the model for implementing and evaluating competency-based dietetic programs must be evaluated before the model can be entirely operational. For example, to evaluate the validation component a postgraduate questionnaire might be used to identify if the competencies being developed are those actually needed for an entry-level generalist dietitian. This would provide feedback necessary for continuous evaluation and revision of the program, as well as an opportunity for an

exchange of ideas and information between educators, practicing dietitians, and their employers. The use of new and innovative techniques such as video-taping and computer assisted instruction in presenting learning experiences that might better meet the needs of students with various learning styles also should be studied. Continuous evaluation of various instructional strategies should continue in order to identify the most effective method for presenting materials related to specific competencies.

III. SUMMARY

A conceptual model was developed for implementing and evaluating a competency-based dietetic program applicable to the Coordinated Undergraduate Program in Dietetics at the University of Tennessee, Knoxville. The feasibility for using the model was assessed utilizing five priority competencies for an entry-level generalist dietitian in the area of quantity food procurement, production, and service.

Sub-competencies and performance indicators were identified for each of the competencies. Didactic and clinical courses in food systems administration were reviewed to ascertain which quarter each competency was introduced and the desired level of performance at designated points in the program. Food systems administration faculty and clinical instructors identified the minimum level of acceptable performance to be achieved by the students. A pool of questions was developed for constructing criterion referenced instruments to evaluate students' cognitive performance at various times during the professional phase of the program and an analysis of exam performance was used to indicate to both student and

clinical instructor the competency or competencies and sub-competencies requiring remedial work and/or additional clinical experiences. A total of 45 students in the class of 1976 (Group 1) and 1977 (Group 2) were used to ascertain if the approach in evaluating cognitive performance was applicable to the Coordinated Program.

Four performance exams were constructed from a pool of 85 recall and 35 application questions. Criterion referenced instruments were utilized to evaluate whether the students had achieved the minimum level of acceptable performance, 75 per cent, on the five competencies for quantity food procurement, production, and service throughout the professional phase of the program. As the students progressed through the program and received additional experience in the clinical facility the proportion of application to recall questions on the exams increased. The performance exams were useful in monitoring student progress and in indicating the areas of strengths and weaknesses of the students. This information was useful to instructors and students in planning remedial work and/or additional clinical experiences. For those students not meeting the minimum level of performance, remedial work and additional experience did help to bring the students' performance up to the standard. Once the minimum level of performance had been attained on the basic information related to the competencies, the students usually retained the information.

Results on the exams indicated the benefits of continuous evaluation as an integral part of a coordinated program and the importance of testing conditions on student performance. Since performance on the exams did not influence the academic grade or prevent progression to the next phase of the program, some of the students did not take the exams seriously

and therefore failed to achieve the minimum level of acceptable performance. The students should be informed of the consequences of performance on exams if performance exams are effective in identifying strengths and weaknesses of the students.

No consistent relationships were found among level of performance and time spent participating in activities and projects related to competencies evaluated, G.P.A., ACT scores, and didactic course grade. Quality of time spent and quality of activities may have a greater influence on performance than the quantity of time spent. Since a relationship did exist for a few of the students among ACT scores, G.P.A. and performance on exams, these are better predictors of student performance than amount of time.

The model developed for implementing and evaluating a competency-based dietetic program was feasible for use with the Coordinated Undergraduate Program in Dietetics at the University of Tennessee, Knoxville. As the model was employed to only five competencies identified for food systems administration, the application of the model should be extended to incorporate all areas of the program.

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APPENDIX

TABLE 1

LIST OF COMPETENCIES, SUB-COMPETENCIES, AND PERFORMANCE INDICATORS

Competencies	Sub-Competencies	Performance Indicators
Competency I		
Plan menus which: a) incorporates principles of good menu planning, i.e., adequate nutritional content, color, texture, shape and variety; b) incorporates special nutritional requirements and/or taste preference of individuals or groups within the institution or program; c) conform to budget and/or cost requirements, equipment, time, personnel availability, and types and locations of temperature control system(s).	A. Recognize the importance of the menu as an administrative guide and as a key management tool. (3110-Knowledge, 4130 and 4420-Application)	1. The students will be able to discuss how the menu functions as a management tool on written exams. 2. The students will be able to identify how the menu functions as a management tool in the clinical facility.
	B. Identify basic principles and methods of menu planning. (3110-Application)	1. The student will be able to identify the basic principles and methods of menu planning on written exams. 2. The students will be able to compare and contrast cycle, selective, and set menus and give examples of each on written exams and projects.
	C. Apply basic principles of menu planning. (3110, 4410, and 4430-Application)	1. The students will be able to apply knowledge of the principles of menu planning on written exams and projects. 2. The students will apply knowledge of food composition, flavors, colors,

TABLE 1 (continued)

Competencies	Sub-Competencies	Performance Indicators
		shapes and consistency when writing menus for two or more types of food systems. 3. Given a menu, the students will be able to evaluate how well the menu meets the requirements of good menu planning. 4. Given a situation, the students will be able to plan a menu that is suitable for the stated conditions and meets the requirements of good menu planning. 5. Given a menu, the students will be able to evaluate its feasibility of being used in a specified facility.
	D. Plans nutritious menus at specified cost. (4420 and 4430-Application)	1. The student will be able to plan menus that meet the cost requirements of the institution and other requirements of good menu planning. 2. Given a day's menu, the students will be able to evaluate whether it meets the nutritional requirements of the individual or group for which it was planned.

TABLE 1 (continued)

Competencies	Sub-Competencies	Performance Indicators
Competency II		
Plans a sanitation schedule and procedures for safety and sanitation which conform to the National Sanitation Foundation, OSHA, state and local standards.	A. Apply basic knowledge of microorganisms in the storage, preparation, processing, and serving of food. (3110, 4410, 4420, and 4430-Application)	1. On written exams, the students will be able to identify and discuss the sources, causes, and symptoms of food poisoning, and the corrective action that should be taken if it should occur in a facility. 2. The students will be able to apply basic knowledge of microorganisms in the storage, preparation, processing, and service of food.
	B. Apply skills in promoting safe, sanitary practices while receiving and storing food and supplies. (4410, 4420, 4430-Application)	1. The students will be able to discuss the rules of personal hygiene, sanitary food handling procedures, and principles of sanitation on exams. 2. The student will apply the basic principles of safety and sanitation in the clinical facility. 3. On written exams, the students will be able to identify the environmental conditions crucial to providing safe food to the clientele.

TABLE 1 (continued)

Competencies	Sub-Competencies	Performance Indicators
	C. Analyze the needs of food service systems which are used as a basis for designing food service facilities and equipment. (4150-Application)	1. The students will be able to identify sanitation standards for equipment and facilities and apply this information to the layout they draft.
	D. Applies basic skills of safety and sanitation in food handling and storage. (3110, 4410, 4420, and 4430-Application)	1. The students will demonstrate the ability to apply their knowledge of safety and sanitation standards and regulations in the clinical facilities.
		2. The students will be able to establish and implement weekly safety and sanitation inspections.
		3. The students will be able to identify storage requirements for perishable and nonperishable food items from AP form to EP.
		4. The students will demonstrate the ability to make suggestions of corrective action to eliminate safety and sanitation violations observed in the clinical facility.

TABLE 1 (continued)

Competencies	Sub-Competencies	Performance Indicators
Competency III		
Develops standardized recipes to provide a consistent basis for quality and quantity control.	A. Apply knowledge of food preparation when standardizing recipes in Quantity Food's laboratory (3110-Application)	1. The students will be able to extend a home recipe of 5 servings using the factor method on written exams and projects.
		2. The students will be able to standardize a recipe in the Quantity Food's laboratory utilizing criteria for standardizing recipes.
	B. Discuss how standardized recipes help provide quality and quantity control. (3110-Application)	1. On written exams, the student will be able to discuss how standardized recipes function to control quality and quantity of food products.
	C. Apply knowledge of recipe standardization in planning recipe standardization in the clinical facility. (3110-Application)	1. The students will be able to plan and supervise the personnel in a clinical facility in standardizing a recipe.
Competency IV		
Identifies and implements quantity and quality control through: a) routine monitoring of food items produced, served and stored; b) consistent supervision of	A. Apply knowledge of quantity and quality control in quantity food's laboratory and clinical facilities--purchasing specifications and food production procedures. (3110, 4010, 4410, 4420, and 4430-Application)	1. On written exams, the students will be able to define the concept of food quality and discuss how it influences the success of a food service.

TABLE 1 (continued)

Competencies	Sub-Competencies	Performance Indicators
personnel and the identification of factors which influence productivity of personnel and c) routine monitoring of receiving, storage and sanitation procedures and conditions of areas such as temperature, humidity, and light.		2. The students will be able to identify the cause of poor quality products that are observed in the laboratory and clinical facility. 3. The students will be able to identify critical areas in procurement and production in the clinical facility to incorporate controls needed to maintain cost within the established budget.
	B. Recognize the importance of work design techniques and controls in achieving quality products. (4150-Application)	1. The students will be able to identify factors that influence the production and service of quality products that must be considered when designing a food service facility. 2. In designing the layout of a food service facility, the students will be able to demonstrate knowledge of factors affecting the production and service of quality products.
	C. Relate techniques of the production of quality products through the instruction of others. (4410 and 4420-Application)	1. The students will be able to apply the knowledge of food production techniques and quality control when supervising production personnel. 2. The students will be able to apply quality control techniques in planning and presenting in-service education classes.

TABLE 1 (continued)

Competencies	Sub-Competencies	Performance Indicators
	D. Apply knowledge of purchasing and receiving in the control of quality and quantity of items entering the facility's storage areas (3110, 4130, 4420, and 4430-Application)	1. The students will be able to compare the advantages and disadvantages of requisitioning ingredients daily from the storeroom versus a central ingredient room in standardizing preparation procedures and the quality of the finished product. 2. The students will be able to utilize standard specification information and forms when purchasing and receiving items for the facility to control the quality and quantity of items entering the institution's storage areas. 3. The students will be able to identify the conditions essential for proper storage and control of food and supplies in inventory.
	E. Demonstrate knowledge of the factors that influence productivity of personnel. (4140, 4420, and 4430-Application)	1. The students will be able to identify the factors that influence poor productivity in the clinical facility. 2. The students will be able to apply knowledge of the factors in the working environment, scheduling of personnel, and personnel-management relationships that

TABLE 1 (continued)

Competencies	Sub-Competencies	Performance Indicators
		influence productivity when discussing appropriate solutions to the problems.
	F. Develop a maintenance program for the food service facility and equipment. (3110-Knowledge, 4410 and 4430-Application)	1. The students will be able to identify factors to consider when planning a maintenance program. 2. The students will be able to plan a maintenance program in the clinical facility.
Competency V Determines the policies and procedures in cooperation with the administrative specialist for daily food purchasing, production planning and service.	A. Assist in forecasting production and personnel needs. (3110-Knowledge, 4130, 4410, 4420, 4430-Application)	1. The students will be able to identify the information essential for forecasting production and personnel needs. 2. The students will be able to forecast the amounts of food needed for cycle menus from records of popularity of items and other records of consumption. 3. Given a day's menu, the students will be able to prepare a production sheet with the assistance of the food service supervisor.

TABLE 1 (continued)

Competencies	Sub-Competencies	Performance Indicators
		4. The students will be able to utilize all available tools in forecasting production and personnel needs for one day and follow-up the results to determine the accuracy of the forecast.
	B. Plan for scheduling personnel in food production and service. (4410, 4140, 4420, and 4430-Application)	1. The students will be able to identify factors that should be considered when scheduling personnel in the clinical facility.
		2. Given a week's menus, the students will be able to schedule the required personnel in the production and service areas in the clinical facility.
	C. Applies knowledge of food purchasing and distribution. (3110, 4130, 4410, 4420, 4150, and 4430-Application)	1. The students will be able to purchase and requisition food and supplies needed for two days in the clinical facility.
		2. The students will be able to discuss the procedure of can cutting and other yield tests and their function in the purchasing process.
		3. The students will be able to discuss concepts related to purchasing and inventory control.

TABLE 1 (continued)

Competencies	Sub-Competencies	Performance Indicators
	D. Calculate daily food cost. (3110, 4410, 4430-Application)	1. The students will be able to pre-cost menus to determine if they are within the budgetary allowance for daily food cost. If any of the menus exceed or are less than the established daily food cost, the students will be able to make the necessary substitutions so that the menus meet the requirements. 2. Given a menu, the students will be able to calculate the cost of the meal.
	E. Prepare food distribution sheets. (3110-Knowledge, 4410 and 4430-Application)	1. The students will be able to prepare a food distribution schedule for a variety of menu items.
	F. Recognize the importance of record keeping as a tool for cost control. (4130, 4410, 4420, and 4430-Application)	1. On written exams, the students will be able to discuss how records function in helping to control food cost.
	G. Apply knowledge of cost control in all areas of the clinical facility. (3110-Knowledge, 4410, 4420, and 4430-Application)	1. On written exams, the students will be able to identify ways in which food cost can be controlled in the clinical facility.

VITA

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